

**Final Report - - Executive Summary
Phase One of an
Audit of the Affiliated Transactions and a
Management Audit of
Jersey Central Power & Light Company
Request for Proposal 13-X-22139
Docket No. EA20110733**

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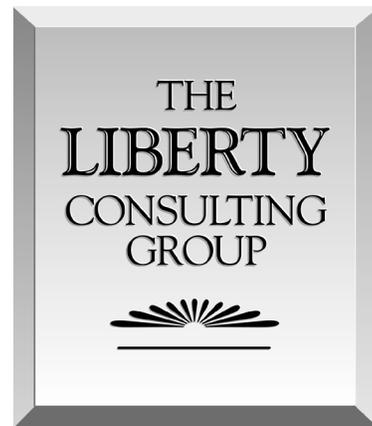
Presented to:

*Board of Public Utilities
State of New Jersey*



Presented by:

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Executive Summary

A. Introduction

This report summarizes the first, *Utility Operations*, phase of an audit of the affiliated transactions and a management audit that The Liberty Consulting Group (Liberty), conducted on behalf of the New Jersey Board of Public Utilities (Board or BPU), of Jersey Central Power & Light Company (JCP&L), FirstEnergy (FE), and its affiliates. Our examination consisted of following phases:

- Phase One: Expedited treatment of a focused series of topics grouped together to comprise a “Utility Operations” component - - this report describes the results of our examination of these topics
- Phase Two: Subsequent treatment of functions remaining to be addressed as part of a comprehensive management audit of JCP&L and an audit of the affiliated transactions among JCP&L, FirstEnergy, and its affiliates - - a second report will describe the results of our examination of topics within that scope.

We completed audit field work on the topics summarized in this report largely by September 1, 2021, but have been able to incorporate some subsequently provided information. We have yet to have time to review some information, evaluate it, and follow-up as required with management. Throughout Phase One, management has frequently failed to provide responses to audit requests in accord with either the normal durations for engagements of this type, more generous due dates acknowledging failure to meet normal ones, or requests expedited because of the shortened time schedule all understood at the outset of our engagement. We worked diligently and with strong support from BPU staff in overcoming the substantially greater degree of delay and unresponsiveness experienced here. Some improvement occurred, but without recovering past delay, preventing accumulated lag, or overcoming a continuing pattern of unresponsiveness in key areas.

We appreciate the opportunity to be of service for the BPU, we thank the BPU Staff for its strong support and understanding, and we appreciate the efforts of the JCP&L-assigned personnel for their attempts to assist in overcoming the problems that FirstEnergy has caused for the completion of our work.

B. Chapter II: Operations Organization

We examined how JCP&L’s Operations Organization and related FirstEnergy organizations:

- Provide adequate responsibility, accountability, and resources for identifying JCP&L’s unique system reinforcement, addition, enhancement, and other needs through regular, focused, formal processes
- How those individuals and groups responsible for assessing the conditions and needs of New Jersey’s electric infrastructure regularly employ comprehensive, objective, and quantifiable performance measures to guide their work
- The extent to which needs of New Jersey electric customers and the infrastructure that serves them drive the system performance expectations, operating decisions and expenditure executed by in the JCP&L service territory.

FirstEnergy Operating Responsibilities - - FirstEnergy Corporation (FE) has placed with FirstEnergy Service Company (FESC) centralized responsibility for JCP&L’s transmission and sub-transmission systems and for support of many of the distribution system functions common to its ten operating companies. One can expect this centralized operations and support model to result in cost savings to the pool of operating companies; e.g., from economies of scale in purchasing common equipment and materials and from efficiencies gained by using standardized procedures and technology platforms for work management, tracking equipment inspections and maintenance orders, tracking, analyzing and reporting reliability performance, and for outage management in the various control centers.

The service company provides centralized purchasing, accounting, business services, regulatory, legal, and communication services to the ten operating companies. It provides standardized maintenance program design and support, work management processes and technologies, and peer reviews among FirstEnergy’s operating companies. It provides transmission and substation planning and engineering, which includes high level management of the substation inspection, maintenance, and reliability programs. It also provides capital portfolio services, laboratory services, and technical subject matter experts to evaluate equipment conditions for the subsidiaries. FESC also provides multi-year Lines and Substation training programs to provide qualified apprentices to its operating companies.

FirstEnergy enhances storm preparedness and response for each operating company by providing centralized emergency preparedness, weather forecasting and analyses services and alternate/backup facilities for the individual distribution control centers. It also acts as a clearing house for internal company-to-company storm resources, and organizes and oversees the sharing of line crew, tree clearance, damage assessment, control room operations and logistics support personnel to support emergency operations.

FESC’s contributions to JCP&L’s Operations efficiencies include its Work Management (WM) organization, which provides guidance, technologies, and monitoring capabilities to each operating company, to promote effectiveness in ensuring that the construction, and the inspection and maintenance tasks completed by each utility each year comport with local program schedules, priorities, and regulatory commitments. Work Management provides the technologies and assistance that JCP&L’s district-level operating personnel use to plan, design, and schedule work. The technologies allow operations management and Work Management personnel to monitor work performance contemporaneously, and to identify inefficiencies and resource needs.

JCP&L Operating Responsibilities - - JCP&L’s Operations Services organization has responsibility for distribution lines and distribution engineering. The Lines organization has responsibility for construction, inspection and maintenance of the distribution overhead and Underground Residential Distribution circuits, pad mount switchgear and transformers, and streetlights. The Operations Support organization has responsibility for the inspection and maintenance of the substations, relay, and control installations, ducted cables, and low voltage networks. The Lines and Substation field organizations conduct their work from district offices located across the service area. Each district shop has dedicated staff. Using work management processes and technologies provided and supported by FirstEnergy, these organizations manage crew scheduling and work production effectiveness and efficiency. The work management

technologies allow the district personnel and central JCP&L management and work management functions to monitor job and crew planning, crew productivity, and job progress and completions through the use of standard tools and measures.

Work Management personnel assist district personnel in using the technologies and processes and help review and correct crew scheduling and crew performance issues. The districts do not use specific crew scheduling and performance goals (beyond timely completion of scheduled work), but district leadership focuses on improving crew scheduling and job efficiencies. Each Lines and Substation district has a manager, one or two work planner/schedulers, one or two job layout technicians, several field supervisors, and a number of construction and maintenance crew personnel. In total, JCP&L deploys 402 lines workers, which we find sufficient for timely completing the current workload of planned and emergent work.

JCP&L Engineering Responsibilities - - The Operations Services Engineering group has a staff of 101 engineers, supported by 26 FirstEnergy engineers and technicians, including distribution system planning engineers, inspection and maintenance engineers, and reliability engineers. We found the distribution system load forecasting and system planning processes appropriate for an electric distribution utility of JCP&L's size and complexity. JCP&L has not faced increasing loads on a system-wide basis, but several areas have witnessed growth resulting from new housing developments. System planning needs are monitored on a localized geographic basis, with planning engineers assigned to focus on one or two of the 14 Lines operating districts. These system planners collaborate with builders and developers, monitor building permits and other load-indicative data, run load modeling programs, and develop least cost solutions for providing for the load growth without violating any system planning or operating criteria.

JCP&L Staffing - - JCP&L's Operations organization works under a Vice President of Operations, a Director of Operations Services (Lines and Engineering), a Director of Operations Support (Substations, LV networks, Cables, Work Management, and Distribution Control Centers), and a Regional Director of Operations Services (Fleet, Facilities, Vegetation Management, and Storm Response Logistics). A manager of Emergency Preparedness also reports to the Vice President. We found the current Directors well experienced, with established firm command and control of their organizations via reporting managers, supported by the use of embedded technologies that support monitoring of work and reliability status. Two of the Directors have many years of experience with JCP&L and each previously filled the other's position. They back each other up and the Vice President - Operations as Incident Commanders for storms and other operating emergencies. The Directors are ultimately accountable for inspections, maintenance, reliability, system planning, system operations, and work efficiencies.

JCP&L's Work Management Methods - - We found planning, scheduling, and work performance tracking functions well organized and effective. The roles filled by FirstEnergy and JCP&L's work management functions offer synergies in regarding work management tools, and methods for the monitoring scheduling, job preparation, execution of JCP&L's construction and inspection and maintenance work. Using FirstEnergy technology and processes system-wide, management appropriately monitors job status and completion timeliness.

We reviewed, as requested, any fuel management performed by or for JCP&L. As a transmission and distribution company, it does not have fossil generation, fuel stock, or power production expenses. Until its sale in March 2021, JCP&L did hold a 50 percent interest in the Yards Creek pumped storage hydroelectric facility, which produced modest output.

We have no recommendations in the *Operations Organization* area.

C. Chapter III: System Planning and Load Management

JCP&L has built its electric systems to comport with National Electrical Safety Code (NESC) standards and New Jersey Administrative Code (N.J.A.C.) requirements. Systems incorporate much use of “n-1” design, which permits continued operation after a single contingency, frequently supported through automated or manual switching. Management operates its distribution system appropriately to manage circuit and substation loads, by allowing its equipment to be fully utilized, by using capacitors to minimize reactive current, and by forecasting when load growth might cause violations of operating criteria.

FirstEnergy’s energy and load forecasting organization uses a probabilistic and statistically adjusted forecast method for determining system energy and overall system demand forecasts. The distribution system planning process includes a comprehensive, data-driven, bottom-up process that provides for regular, and clear identification of gaps, needs, potential solutions, costs, and distribution system performance.

Management uses an appropriate method for predicting peak load increases on the distribution circuits and substations, and in areas experiencing load growth. It appropriately addresses weather-adjusted peak loads caused by the predicted load growth, and identifies where on the system new demand levels will result in operating criteria violations. We found the sources of data used for forecasting peak loads appropriate and circuit peak load forecasts reasonably accurate.

Management’s process for making decisions about expenditures to address New Jersey facility operations and capital needs seeks to optimize New Jersey system performance and customer costs. Management uses appropriate methods for developing, vetting, and approving growth-related capital project portfolio budgets. The capital budgeting process operates on the basis of identifying alternatives and seeking least cost means for resolving operating criteria violations and maximizing reliability improvements per dollar spent to achieve them. The distribution system capital portfolio planning process starts from the bottom up - - proposals from district engineers make their way through engineering review, JCP&L management review, and finally through FirstEnergy Portfolio review before approval and inclusion into the active capital projects portfolio.

FirstEnergy and JCP&L oversee their capital projects using effective project managers and appropriate management software tools. Distribution capital construction spending has met budgeted amounts based on our review of 2017 to 2020 data. However, FirstEnergy Service Company does not adjust budgets when projects experience delays in New Jersey transmission and sub-transmission construction under centrally-managed construction and operating responsibility. This lack of adjustment creates the appearance of underspending annual capital

budgets for transmission lines and sub-transmission line construction projects. Delayed projects get re-budgeted into following years.

We have no recommendations in the *System Planning and Load Management* area.

D. Chapter IV: Asset Management

The *Operations Organizations* chapter addressed the structure and overall resources through which the JCP&L Lines and Substation district shops plan and design work, assign and schedule crews, and track inspections and maintenance tasks to ensure timely completion. Reviewing data since 2017 discloses completion of all distribution preventive maintenance tasks on reclosers, regulators, and capacitor banks scheduled under inspection programs. Management also completed all corrective maintenance (CM) tasks either immediately upon identifying a defect or during the year following identification, depending on criticality. It also completed all corrective maintenance tasks, using a prioritizing process, for the transmission and sub-transmission system. The substation organization completed all CM tasks, except for a few non-critical tasks purposely deferred to increase efficiency by bundling the work with upcoming scheduled preventive maintenance (PM) work. Management has deferred no substation PMs in the past four calendar years.

JCP&L spent about \$9.5 million for inspections and corrective maintenance for the distribution system in 2020 and about \$5 million for similar work on the transmission system. Since 2017, inspection and CM costs have increased about 23 percent for distribution and about 38 percent for transmission related work.

The inspection and maintenance programs comport with the NESC, N.J.A.C rules and regulations, and BPU orders, and we found them consistent with good utility practices. We did, however, find reason to question the five-year inspection cycle time that management employs for overhead lines and underground equipment inspections. The advanced ages of much operating line equipment and the durations of customer interruption caused by equipment failures warrant examination of shortening the five-year cycle.

Our *Asset Management* recommendations include:

- 1. Develop, track and be accountable to annual T&D maintenance budgets based on the spending actually required to comply with inspection and maintenance program requirements.**
- 2. Develop a system-wide programmatic approach to mitigating the negative reliability impacts resulting from the failure of aging equipment.**

E. Chapter V: Vegetation Management

The *Operations Organization* chapter addressed the structure and resources that FirstEnergy Service Company and JCP&L bring to bear in vegetation management for JCP&L's electric systems. This chapter provides the results of our examination of vegetation management programs for compliance with BPU requirements.

Vegetation management comprises a central element in maintaining reliability, especially in less urban, Northeastern regions with dense tree population. Equipment- and tree-caused outages comprise JCP&L's top two causes of customer minutes of interruption (CMI). Age and the efficacy of maintenance programs drive equipment-caused outages. Major sources of tree-caused outages and their prevention include how management maintains clearances between power lines and growing tree limbs, and its efforts to remove trees likely to fall into lines, especially during storms.

The four-year cycle for vegetation management programs and practices prior to 2016 conformed to typical utility practice and BPU Orders and regulations. At that time, management expanded removals of trees to improve tree-related reliability. The expansion included on and off right of way trees presenting a clear and present hazard of falling onto power lines. Management also began to remove overhanging limbs on the portions of all circuits located between the substations and the first downstream protective device (Zone 1). The \$97 million Reliability Plus Infrastructure Investment Program (IIP) in 2019 and 2020 added to these Zone 1 overhang removals, overhanging limbs from the first protective device to the end of the main lines (Zone 2) on 277 selected circuits. Management plans to continue maintaining those circuits during the four-year cycle, as it did during the IIP projects.

Management spent about \$28 million for vegetation management per year in 2019 and 2020, including \$7.5 and \$4.4 million for hazard tree removals in 2019 and 2020 respectively. JCP&L removed almost 30,000 hazard trees in 2019 and more than 25,500 hazard trees in 2020 from its distribution and sub-transmission systems.

Management initiated a Vegetation Management Circuit Performance Program (VMCP) in 2021. For each of the 1,187 circuits, management will report on a semi-annual basis, all tree-related outages by weather condition (blue sky, minor weather days, and major events). The program also calls for a focus on the worst-performing 12 percent of circuits, measured by their System Average Interruption Duration Index (SAIDI) performance over the prior four years. Management evaluates the drivers of SAIDI on these circuits (e.g., overhanging limbs and off-corridor trees), applying improvement methods such as enhanced overhang trimming and off-corridor tree mitigation to them.

Contractors operating under the direction of the Forestry organization completed vegetation management work and established effective clearances in executing the four-year cycles, including routine trimming, removing overhanging limbs and removing hazard trees. As described in Chapter II, *Operations Organizations*, the foresters continually verify tree contractor performance for quality and adherence to standards, but formal tree contractor performance documentation is not maintained.

Management has undertaken great effort and incurred large costs for enhanced tree trimming and removal practices, especially the vegetation work recently associated with the IIP program. Nevertheless, JCP&L's overall System Average Interruption Frequency Index (SAIFI), Customer Average Interruption Duration Index (CAIDI), and SAIDI metrics have not markedly improved since 2017. Management indicated that non-tree related 34kV reliability challenges in 2020 and 2021 effectively masked significant reliability gains associated with enhanced vegetation

management practices, and new tree-related 2021 SAIFI and CAIDI data. It will take more complete data and analysis to establish post-IIP performance clearly.

Our *Vegetation Management* recommendations include:

- 1. Demonstrate that enhanced Zone 2 vegetation work conducted as part of IIP Reliability Plus was as effective in reducing SAIFI and CAIDI as predicted.**

F. Chapter VI: Contractors

Utilities generally use a mix of external contractors and internal company employees to accommodate fluctuating workloads and achieve economies without incurring significant swings in employee staffing through frequent cycles of hiring and layoffs, especially in field-construction work. Contracting also provides a means for securing specialized skills for activities whose scale does not support sufficiently full loading of in-house resources. Utilities do need to ensure, however, that contractors adhere to company safety practices and engineering and construction standards. In addition, companies need to manage their contractors, just as they manage their own personnel, to ensure that they receive the quality and quantity of work that they expect and that the customers are funding. This management entails ensuring that company supervisors of contractors have well-defined responsibilities and processes, and supporting tools, to make their monitoring tasks more effective in securing the value that the company and its customers deserve.

We evaluated how and at what levels JCP&L has used contractors over time, and explored the reasons for changes in contractor staffing levels. We examined contracting strategies and selection processes used by the FirstEnergy Service Company supply chain organization in support of JCP&L operations, including the pricing approaches applied for the types and scopes of work typically assigned to contractors. We also examined how management inspects, evaluates, and manages contractor performance.

Management contracts with a single firm, selected competitively, to perform distribution system activities associated with underground locating (mark-outs). JCP&L Engineering Services and the FirstEnergy Service Company Joint Use & Cable organization provides combined oversight of the underground locating contractor work at JCP&L.

Mark-out performance declined from 2016 through 2018, but has improved since, with the number of damages per locate request declining each year. In response to poor performance, management replaced its underground locating contractor in the first quarter of 2017 with another single firm. However, this locating contractor's performance also fell below expectations. Management adopted a performance improvement plan and worked closely with the contractor to bring performance to expectations. Management also began to closely track on-time performance, BPU Notices of Probable Violation (NOPV), and complaints from contractors and property owners. Since then, the new locating contractor's mark-out performance improved and third-party damages declined.

The very low rate of third-party damages on occasions not preceded by a mark-out request indicates success in increasing awareness of the notification system among contractors, excavators, and the public.

Management does not employ a documented process or procedure for project manager, engineering or field supervisor use in efforts to observe, evaluate, report, record, or archive the performance of the contractors relative to any model or standardized quality, schedule or cost effectiveness parameters. Management depends on its supervisors and managers to ensure individually and informally contractor performance, without any formal contractor performance recordkeeping procedure or tools.

Our *Contractors* recommendations include:

- 1. Develop a standard process to inspect, evaluate, document, and manage the quality and quantity of a contractor’s performance when measured against the standards, terms and conditions of their contract with JCP&L.**
- 2. Develop a formal contractor performance management process and a system of record to capture performance data and enable comparative analyses of the quality, efficiency and cost effectiveness of competing contractor and company resources, and support data-driven resource allocation decisions.**
- 3. Integrate the analysis of relative execution risks and the potential of reducing risk into JCP&L resource allocation decisions.**

G. Chapter VII: Reliability Programs and Smart Grid Activities

The *Operations Organization* chapter describes how JCP&L structured its reliability engineering organization to manage reliability programs and activities. The chapter explains how management assigns engineers by area to monitor reliability performance, identify problems and propose and prioritize local reliability improvement solutions. This chapter addresses JCP&L’s compilation and tracking of reliability indices, evaluation of outage causes, and initiatives and programs for improving reliable service in systemic ways.

JCP&L must meet BPU reliability targets for each of its Regions, with targeted levels based on historical reliability indices. Management’s stated asset reliability philosophy seeks first to meet BPU targets first then go beyond them, based on more aggressive internal JCP&L goals. Management employs enhanced reliability programs to augment traditional, routine inspection and maintenance and vegetation management, and highest priority (or worst- performing) circuits programs. Despite the stated philosophy, however, overall SAIFI and CAIDI reliability performance measures have not improved appreciably since 2017.

To a material extent, actual JCP&L customers’ reliability experience depends a great deal on where they live and work - - in northern or central New Jersey. Each Region’s reliability history has differed and BPU targets for each differ as well. The BPU Northern Region SAIFI targets lie 11 percent higher for SAIFI, and 37 percent higher for CAIDI as compared with targets for the Central Region. Notably, neither the BPU nor the internal JCP&L reliability targets have changed (*i.e.*, they have not targeted steadily improving performance) since 2017, and are not set to change until the expected 2023 review of the BPU’s regulations. The Northern Region’s 2020 actual SAIFI exceeded that of the Central Region by 43 percent and its CAIDI by 30 percent.

From 2017 through 2020, the Northern and Central Regions’ actual CAIDI performance each has bettered BPU required levels and nearly equaled or bettered the more stringent company targets, with the exception of Central Region 2018 CAIDI. Except for 2020, the Northern Region’s SAIFI bettered the BPU’s required SAIFI level, but did so with respect to the internal target only in 2017. The Central Region’s SAIFI bettered the BPU level in each year of the 2017 through 2020 period. Central Region SAIFI bettered or approached the internal SAIFI targets in 2017 and 2020, but did not in 2018 or 2019.

System-wide CAIDI performance typically fell near the median and in the second quartile of reporting utilities, when compared to annual IEEE nationwide surveys from 2017 through 2020. However, for 2018, JCP&L’s CAIDI fell into the third quartile. System-wide SAIFI measured against the EEI survey data shows significantly lower performance - - in the third quartile for all years except for 2019, when it fell lower, into the bottom quartile.

The two JCP&L Regions exhibit very different reliability performance. For example, had Northern’s 2019 SAIFI and CAIDI equaled Central’s overall JCP&L SAIFI and CAIDI would have placed in the middle of the second IEEE quartile.

Since 2017, tree-caused outages in the Northern Region have doubled or tripled those of the Central Region. Tree-caused outages primarily led to 2016’s inclusion in BPU regulations of a program for removing overhanging limbs in Zone 1. JCP&L added Zone 2 as part of the 2019-2020 Reliability Plus Infrastructure Investment Program (Reliability Plus IIP).

Excluding major storms, equipment and off-right-of-way trees comprised the largest causes (accounting together for over half of 2020 customer minutes of interruption). Management expenditures of \$97 million on Reliability Plus IIP in 2020 and 2021 included measures to reduce tree-related outages and improve automatic sectionalizing and restoration. Sub-transmission outages, growing each year since 2017 accounted for 16 percent of 2020 customer interruptions. Projects have been planned to improve sub-transmission reliability.

We found management’s base reliability programs and activities consistent with good utility practices and its methods for identifying reliability needs appropriate. Reliability engineers regularly examine and analyze outage data, and make sound use of Outage Management System (OMS) outage data and a reliability dashboard. Management employs appropriate means for identifying outage causes, but lacks information about a large portion (about 20 percent) of 2020 outage causes, which it has labeled as “other/unknown.”

Appropriate methods apply in justifying and prioritizing reliability projects, such as the Reliability Plus IIP, installing automatic circuit tie schemes, and installing Trip Saver electronic fuses. Management defines, develops, justifies, prioritizes, and approves projects appropriately and with primary focus on the needs of customers.

Management completed the Reliability Plus IIP within established durations and costs. We found enhanced vegetation management, additional automatic sectionalizing and restoration, and flood prevention enhancements for vulnerable substations likely to provide improved reliability and

resiliency. However, the IIP did not address aged aerial cables or other categories of aging equipment, despite the fact that equipment failures rival trees as leading outage causes.

Our *Reliability and Smart Grid Operations* recommendations include:

- 1. Implement formal process to improve field diagnoses of outage causes by troubleshooters and improve accuracy in capturing causes in the outage management system by troubleshooters and DCC personnel.**
- 2. Expedite analyses to validate that sub-transmission improvement projects planned for 2022-2026 adequately improve SAIFI and CAIDI performance.**
- 3. Systematically address the reduction of outages attributed to aerial cable and open bare wire failures.**

H. Chapter VIII: Cyber Security and System Vulnerability

FirstEnergy Service Company has responsibility for cybersecurity at its operating companies, including JCP&L. We assessed the overall cybersecurity organization and its processes, including its ability to comply with BPU cybersecurity requirements. We examined FirstEnergy's methods and practices for the monitoring, identification, and response to cybersecurity threats and attacks.

The FirstEnergy Cyber Security organization operated effectively. The centralized FirstEnergy approach served well, allowing New Jersey-specific requirements to be met. The organization employed capable resources at nearly full staffing levels. We observed a comprehensive and integrated system of processes and procedures. We found no critical breaches in cybersecurity.

Success in finding, training, and retaining human resources proved particularly notable in an industry that has faced especially strong growth in demands for capable resources. Demand for cybersecurity professionals well exceeds supply in the energy and other industries. FirstEnergy has successfully navigated this issue in a manner that keeps its organization robust. We found regular internal auditing that includes retention of firms for external examinations that seek to identify vulnerabilities.

Our *Cyber Security and System Vulnerability* recommendations include:

- 1. Fill staffing vacancies promptly.**

I. Chapter IX: System Resiliency and Restoration

System resiliency encompasses the ability of the entire electrical system from generation to transmission to distribution, and support systems, such as fuel supply, to respond to material perturbations on the network with minimal, or minimized, adverse effects. Restoration encompasses the activities associated with bringing the system back to its operable state prior to the event (*e.g.*, storm) that disturbed or damaged it. Well executed activities, such as event forecasting, preceding restoration allow for its effective and timely execution. Both system resiliency and restoration require an expansive set of activities and have broad effects. Our examination addresses six areas:

- Event Forecasting
- Authority and Process of Securing Resources
- Establishing, Updating, and Communicating Estimated Times of Restoration
- Liaison with Government Officials
- Storm Order Compliance and Metrics
- Undergrounding to Improve Reliability and Resiliency.

The first four review areas largely take on significance in relation to an “event;” the last two, Storm Order Compliance, and Undergrounding, examine JCP&L’s responsiveness to BPU directives, and provide a narrow resiliency-focused review of how management addresses undergrounding options for its worst performing circuits. A general review of the accuracy and applicability to emergency preparedness activities and functions of JCP&L’s Emergency Plan for Service Restoration (its E-Plan) supplements those six review areas.

The following paragraphs briefly summarize the result of our examination in each of the seven review areas.

Emergency Plan for Service Restoration (E-Plan) - - JCP&L developed its current E-Plan in response to a recommendation contained in a January 23, 2013, BPU Order. It uses the National Incident Management System (“NIMS”) emergency management structure, concepts, and principles, including the incident command system (“ICS”). An E-Plan database supplements the E-Plan and contains a significant amount of supporting information for use by FirstEnergy corporate and JCP&L personnel, all available electronically.

We found the E-Plan professionally prepared, well structured, comprehensive, easy to navigate, and functional in highlighting the key activities, organizational structure, reporting requirements, and emergency response to various pre-defined event levels. However, the E-Plan lacks a comprehensive update since its development in 2013 and in some areas contains inaccurate position titles, describes processes not currently followed, and unfilled reporting requirements. Some of these deficiencies could prove material under certain circumstances, but they appear not to have affected emergency preparedness in recent events. The E-Plan appears scheduled for completion of an update by year-end 2021.

The E-Plan itself, the E-Plan database, and the actual practices employed by company personnel in emergency response appear well-understood and executed by those involved and responsible, reflected in emergency planning and response results that have been, in large measure, reasonable.

Event Forecasting - - Incipient weather systems that present potentially damaging effects to an electric system require early identification and continuous monitoring and communication to emergency preparedness personnel, to ensure performance of appropriate preparations to deal with effects of the event. Adequate preparation begins with credible weather forecasts, conservative judgement applied to event magnitude and impact (or Event Level classification), and consistent and timely (re)evaluation of the impact and storm Event Level as conditions change during event approach.

FirstEnergy Service Company’s Meteorology and Unmanned Aerial Services department provide weather forecasts to JCP&L and affiliates. The department has two degreed meteorologists. The meteorologists draw raw data from the National Weather Service and input it into in-house developed algorithms and programs to produce weather forecasts for all FirstEnergy affiliates. The department uses a third-party services contract for lightning forecasts, but has not used outside weather services. Management conducts no regular, structured benchmarking of FirstEnergy developed forecasts with those of external service providers.

FirstEnergy Service Company meteorologists communicate weather event information via a system of alerts to a broad-based distribution list of JCP&L personnel and, depending on potential impact, communicate directly and regularly with JCP&L emergency preparedness staff. In addition, and as a standard practice for JCP&L, FirstEnergy meteorologists run what is known as the Outage Volume Model (OVM). This in-house developed tool estimates the number of outage orders and affected customers associated with a predicted weather event. JCP&L uses OVM output as an input into Event classification. However, the OVM lacks consistent output accuracy compared to actual outage orders experienced for major storms. Management last made a model update in 2018. Like the E-Plan, management has scheduled for year-end 2021 a new outage and damage model now under development by a third party.

The OVM serves as an input into JCP&L’s Event Classification, which consists of five levels, I – V, representing varying levels of storm impact. Level I, for example, represents less than 40,000 customers affected while Level V represents greater than 600,000 affected customers. The use of Event Level classifications, although different among different utilities, reflects standard practice in the industry and typically serves, among other uses, as a resource and organizational mobilizing device. Classifications can and do change over time, as more accurate weather information becomes known. JCP&L Event Classifications, however, do not directly correlate with estimated resource requirements. Nor is there clear evidence that Event Classifications are consistently announced prior to an event, although company personnel seemingly do understand the magnitude of events requiring response. In some cases, event classifications seem to occur post-event - - to correspond to what was experienced rather than pre-event to serve as an organizing catalyst.

Authority and Process of Securing Resources - - The process of securing resources begins with the identification of need. Contemporaneous with weather alerts, the Outage Volume Model, based on specific weather parameter inputs, produces a range of outage orders and customers affected for weather events affecting affiliates, including JCP&L. The Event Impact Estimation Tool, developed in 2018 but only recently (2020) deployed, then approximates the number of line resources required to return the system to its pre-event service level within a given restoration-day estimate. That estimate serves as an input to internal JCP&L storm management discussions about the number of resources required for restoration.

Available internal and on-premises contractor resources are compared with the number of estimated resources deemed necessary for restoration. If sufficient internally sourced resources are not available, JCP&L contacts the FirstEnergy Emergency Operation Center (“EOC”), which has responsibility for coordinating requests for internal FirstEnergy and external resource assistance. The FirstEnergy EOC Lead, working with the FirstEnergy Logistics Support Branch Director, owns the resource allocation process. JCP&L does not have an active, external facing role, beyond

communication and coordination with FirstEnergy in resource acquisition or deployment if its needs exceed those that management can source internally.

A review of 36 Major Events during the period from 2018 – 2021 showed 12 events where JCP&L requested resources from the FirstEnergy EOC and 11 where resources ultimately came without a documented request. Resources provided proved less than those requested in only one of those 12 instances. Of note, half of JCP&L initial resource requests for those major events came on or after event arrival.

Establishing, Updating, and Communicating Estimated Times of Restoration - - Analyses in this section focused on the timeliness and accuracy of JCP&L in establishing estimated times of restoration (ETRs), in updating that information as changes in circumstances develop, and in communicating ETRs initially and on an ongoing basis to customers and local officials. We began by examining the JCP&L process to estimate restoration times for customers with a service outage, during “blue-sky” events and storms. An examination of the systems, tools, and communications channels supporting the process to develop, update, and communicate ETRs internally and externally, followed. Finally, we reviewed post-storm reports, emergency plans for storm response and communications, and considered feedback from customers following recent large storms.

JCP&L’s recent ETR process enhancements, used during Hurricane Ida, produced more localized ETRs much more quickly, thereby significantly reducing the number of customers that received global ETRs. Better ETRs provided sooner help customers and governmental officials make better decisions needed to deal with an extended power outage. Better defined ETRs available in the OMS feed all available communications channels (web, call center, social media, texting, liaisons, corporate communications) allowing customer and the public access to information they need. We recommended that JCP&L monitor and measure ETR accuracy and timeliness, including regularly surveying customers, mayors, OEMs and other stakeholders to continue to incorporate feedback as JCP&L hones this process.

Liaison with Government Officials - - This section examined the sufficiency of staffing and assignments of liaisons with government officials during normal conditions and storm events. The review examined the organizations that bear the responsibility for communications with state and local government authorities and understanding the process of assignment of employees to support officials during normal days and larger outages. The review encompassed the plans for storm response and communications, training requirements, post-storm reports, and discussions with management to understand liaison performance during recent storms. The review also examined the communications channels, systems, and technologies that support liaisons during a storm.

We found a solid foundation of JCP&L and FirstEnergy system employees available and trained to act as liaisons during a storm. Employees serve in the municipal liaison roles during normal days as well as storms, bringing territorial familiarity and existing relationships with the officials and within communities they support. JCP&L’s recent actions to improve ETR accuracy and timeliness and to provide more frequent and more individualized restoration status communications, provides valuable situational information to community and government officials to aid in decision-making as they support constituents during a storm.

JCP&L should continue its focus on ETR accuracy and timeliness. It should also continue to reach out through after-storm meetings, forums, and surveys and continue to adjust communications processes to provide a better experience for impacted customers and communities.

Storm Order Compliance and Metrics - - Adherence to utility regulatory authority directives comprises an expected, but sometimes overlooked aspect of good utility management. The BPU required JCP&L to respond to a series of recommendations related to storm performance in two of its Orders, one issued in 2018 and the other in 2020. There were twelve JCP&L-related recommendations in the former Order and nine in the latter. JCP&L responded properly and in a timely fashion to each of the recommendations.

We reviewed compliance with Board recommendations and JCP&L’s application of ‘major event’ designation to certain storm events. Such an application is important because the calculation of standard reliability performance metrics excludes the reliability effects of events that receive ‘major event’ designation. New Jersey’s official definition of what constitutes a major event applies four criteria: (a) 10 percent or more of customers being affected in an operating area, and as extended to other utility operating areas providing assistance to the affected areas, (b) service interruptions due to independent system operator (ISO) actions, (c) a state of emergency declared by the State or Federal government, and (d) providing mutual aid to another EDC or utility. The application of one or more of the major event criteria resulted in, on average during the period 2017 - 2020, over one in five days being associated with a major event (a significantly greater proportion of time than that associated with most other utilities).

Undergrounding to Improve Reliability and Resiliency - - Utilities very generally find undergrounding existing overhead lines cost prohibitive. But with weather events becoming more extreme, reliability becoming ever more central to quality of life, and certain parameters of undergrounding (such as cost and benefit assumptions) being subject to change, regularly revisiting the potential for undergrounding problematic circuits or segments of circuits makes increasing sense.

JCP&L does not regularly perform such analyses but was required, due to a 2020 Board directive, to review its five worst performing circuits to assess undergrounding as a cost beneficial option. The subsequent analysis supported JCP&L’s position that undergrounding even segments of its worst performing circuits did not make sense economically. However, the lack of a range of values for key input variables (e.g., cost, reliability impacts) limited the results to single benefit-cost values for each circuit segment. Lacking more robust results that employ ranges for variable values, coupled with the absence of actual cost and reliability data surrounding the effects of undergrounding, JCP&L should regularly review the benefits and cost associated with undergrounding its worst performing circuits. A pilot project allowing it to obtain actual undergrounding cost and benefit data to introduce JCP&L-specific values into future studies appears useful.

Our *System Resiliency and Restoration* recommendations include:

1. **Complete the update to the E-Plan and related documentation by year-end 2021, as scheduled.**
2. **Complete the development of the new OVM-like model.**
3. **Ensure clear, timely and widespread communication of storm event classification**
4. **Ensure JCP&L resource requests are timely and consistent with Event Level classification declaration.**
5. **Continue to monitor and measure JCP&L’s accuracy and success in creating, updating, and communicating ETRs.**
6. **Continue to develop and improve communications with the public, elected officials and OEM staff based on feedback gathered following storm or outage events**
7. **Provide in JCP&L Major Event reports for which the Major Event classification was based on sharing of its resources how the unavailability of those resources directly affected its ability to maintain targeted reliability levels in its operating region(s).**
8. **Conduct updates of analyses of the costs and benefits using selective undergrounding at least every two years.**
9. **Develop a pilot project for undergrounding a poorly performing line segment or a small group of them.**

J. Chapter X: Customer Service

Dealing with a global pandemic for more than a year and a half, JCP&L’s customers and employees, like everyone around the world, have faced unique challenges. Most JCP&L and FirstEnergy Service Company Customer Service employees were mobilized to work at home or start field work from home, almost immediately in March 2020, after the pandemic started in the U.S. Employees required to report in person to company locations worked under Covid-19 safety protocols. All JCP&L Customer Service operations continued, with many adaptations to accommodate customer and employee safety and to lessen the economic impact.

Management paused or modified many customer services and processes to follow government requirements. Walk-in business office locations closed to protect the public and employees and meter and field employees ceased visiting meters located inside premises or behind fences to limit employee and customer interactions. Field Collectors stopped visiting customer premises. New Jersey utilities, including JCP&L, halted service disconnections for non-payment and requirements for security deposits for customers signing up for service, initially voluntarily, and then under gubernatorial orders.

Whether adjusting to a short-term need or the new normal, JCP&L and FirstEnergy Customer Service has adapted to the changing requirements and continued to provide customer service. Call Center operations continued, without interruption, to deliver high-level service to customers, with

call volumes lower than typical. Other customer service functions have struggled due to worker shortages or increased workload; e.g., due to pandemic-related restrictions on permissible activities and working down backlogs after activity resumption. Meter Reading performance declined during the Pandemic as has Billing performance, with both closely related. A Pandemic-induced shortage of meter readers and JCP&L's recently announced plan to fully deploy smart meters combined to create a deficit in required meter readings performed, producing estimated bills, and increasing workload in the Billing department to produce these bills. Billing delays resulted for some customers.

Residential field collection enforcement has paused since March 2020, to help customers deal with the economic challenges brought on by the Pandemic. JCP&L has remained active in customer outreach and in accommodating with extended deferred payment plans, but customer arrearages have continued to grow. Management expects non-payment service disconnections to resume next Spring, following the end of the winter moratorium. Resumption will substantially increase calls to the Contact Centers as customers seek to negotiate payment plans and cover past due balances. Write-offs should grow in 2022 with the resumption of field collection activity.

Across our five-year review period, JCP&L's Customer Service expenses have run higher than those of most of its benchmarking peer group, suggesting further efficiencies obtainable through automation and process improvement. Consolidated operations in the Contact Centers, Billing, and Payment Processing have achieved cost efficiencies but opportunities exist in the Business Offices, Meter Reading, Meter Services, and Field Collections. If accomplished, JCP&L can achieve a reduction in overall Customer Service cost per customer.

Recent Customer Service initiatives and the new organization and strategy have strengthened focus on measuring and improving the customer experience. Future initiatives planned can improve communications with customers, expand and enhance self-service options, install meter reading automation in the field to reduce field costs, bring in data analytics to support continuous improvement, and automate routine manual processing.

As JCP&L moves back toward normal operations, these efforts and a sharp focus on the customer experience should correctly guide the organization in the coming months. JCP&L should commit to filling vacancies and appropriately staffing Meter Reading and Billing functions, that are stressed due to worker shortages and increasing workload and backlogs and prepare the entire Customer Service organization for the influx of activity that will occur next spring when past-due collections activities are expected to resume more normal operations.

Our *Customer Service* recommendations include:

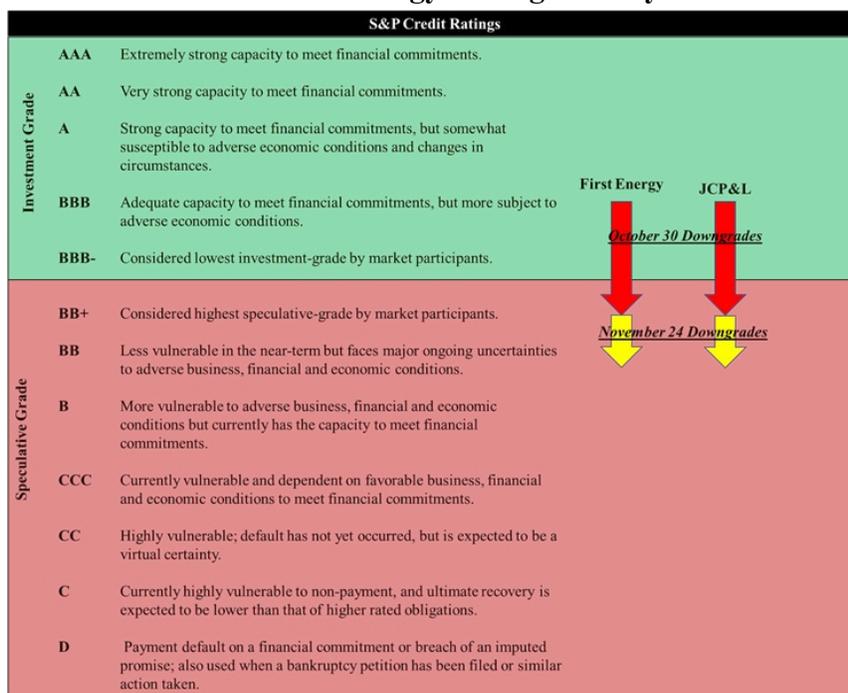
- 1. Pursue cost efficiencies and customer experience improvement opportunities, including those offered by FE Forward Customer Service recommendations.**
- 2. Staff functions sufficiently to address backlog and transaction deficits.**
- 3. Investigate options to address issues and develop and implement an action plan to address declining Customer Service employee ratings.**

4. Dedicate resources to develop a strategy and concerted approach to identifying and pursuing potential service theft.

K. Chapter XI: Financial Risks and Consequences of Parent and Affiliate Operations

FirstEnergy and its utility operating subsidiaries experienced two, late-2020 rounds of credit downgrades by two of the three ratings agencies. Standard and Poor’s (S&P’s) ratings fell below investment grade levels, as the next illustration shows.

Late 2020 FirstEnergy Downgrades by S&P



FirstEnergy, JCP&L, and some other FirstEnergy electric utilities have had S&P corporate credit ratings of BB, with a negative outlook for the future. JCP&L’s exposure to the risks of the FirstEnergy holding company has become evident with these downgrades that resulted from holding company, not JCP&L issues. Maintaining access to liquidity capital at all times comprises a tenet of a utility’s obligation to serve - - these downgrades threatened such access for JCP&L in late 2020 and in 2021. Following our drafting of this report, S&P on October 19, 2021 raised the JCP&L Issuer Credit Rating to BB+.

JCP&L has for many years had ring-fencing in place intended to insulate the utility from negative financial impacts of FirstEnergy and its other operations. Despite existing insulation, JCP&L credit ratings fell below investment grade levels in late 2020, caused by actions related to the Department of Justice (DOJ) investigations directed at actions and circumstances at the FirstEnergy level.

Our examination of the credit rating downgrades found existing ring-fencing ineffective in protecting JCP&L. S&P has appeared to recognize no effective insulation for FirstEnergy’s utility

operating subsidiaries, including JCP&L, rating it and FirstEnergy the same. Rating agency documents demonstrate that FirstEnergy’s joint operation of liquidity facilities (revolving credit facilities and money pools) for all of its companies expose JCP&L to the risks of FirstEnergy, its debt, its other businesses, and the financial legacy of FirstEnergy Solutions, since divested after falling into bankruptcy.

We sought to answer two key, threshold questions:

- Do existing ring-fencing provisions represent “best practices”
- Do they adequately protect JCP&L’s financial status and New Jersey customers?

The answer to each of these questions is clearly “No”. Best Practices for ring-fencing include extensive, detailed measures that, through a more than 20-year maturation process for utility regulatory authorities, including the BPU, have evolved to the present “state of the art.” That evolutionary process has produced measures much more effective than those protecting JCP&L from holding company or affiliate distress or downturns. As tested by real-world experience, the best example of effective ring-fencing came for Oncor Energy in Texas in 2007, designed to protect the utility from its new parent, Energy Future Holdings and its heavy debt leverage. That parent eventually filed for bankruptcy, but Oncor’s ring-fencing effectively protected the utility. The Oncor ring-fencing was also retained by the Texas PUC in the sale of the utility upon its emergence from bankruptcy. Another example of a utility that is considered to be effectively ring-fenced is at Baltimore Gas and Electric and Constellation Energy, a subsidiary of Exelon.

Meeting best practice would require large scale replacement of JCP&L’s existing ring-fencing with a new, complete set of insulation measures that fully protect JCP&L with BPU enforcement mechanisms. Moreover, introduction for JCP&L of measures not even reaching the level of best practices could substantially increase the present level of insulation that exists.

Our *Financial Risks and Consequences of Parent and Affiliate Operations* recommendations include:

- 1. Create for FirstEnergy and JCP&L lasting and enforceable ring-fencing measures sufficient for JCP&L to make the utility an “insulated entity” by Standard & Poor’s, and to be rated on its own credit characteristics by all three credit rating agencies.**
- 2. Give JCP&L full governance and operational control over all of its financing facilities.**

L. Chapter XII: External Affairs - - The “DOJ Investigation”

We examined what at the beginning of our work was described as a “DOJ Investigation.” What we knew at that time came in large part from public information about the indictment of certain Ohio legislative leadership, staff, and lobbyists in connection with payments related pending Ohio legislation that would provide financial support for two Ohio nuclear plants owned and operated by a now-former subsidiary of FirstEnergy. We also understood from FirstEnergy that it remained at the time of our first inquiries engaged with federal officials in a related investigation. We met with little success in securing from FirstEnergy information in order to perform our assigned task - -to assess its potential implications for JCP&L and its customers. From then through the drafting of this report, we faced repeated management refusals to provide significant, meaningful

information not already made public (e.g., through reports to the U.S. Securities and Exchange Commission).

Our knowledge of the investigation advanced considerably in July of 2021, but not due to any change in FirstEnergy's lack of transparency. The breakthrough came from the Office of the U.S. Attorney for the Southern District of Ohio. The Office released word of a Deferred Prosecution Agreement calling for the filing of a criminal charge of conspiracy to commit wire fraud, made subject to dismissal should FirstEnergy comply with the agreement and pay a \$230 million penalty. The agreement and a related Statement of Facts whose truth the current FirstEnergy CEO has acknowledged describe tens of millions of dollars in payments, using non-profit (Section 501(c)(4)) entities, to influence passage of legislation that would further FirstEnergy's financial interests. The acknowledged facts also include multi-million dollar payments to firms connected to an individual at the time about to become (and now the former) chair of Ohio's utility regulatory authority. Those payments related to long-standing consulting agreements with the firms; those contracts existed during periods when the connected individual also worked at a law firm serving as general counsel for an industrial group of energy users.

The contents of the Deferred Prosecution Agreement and FirstEnergy's actions reflect disastrous failures in its exercise of legislative and utility regulatory aspects of external affairs. Those failures involved a large number of senior personnel terminated or separated from FirstEnergy employment for participation in, knowledge of, or inaction regarding actions for which FirstEnergy has paid a heavy price in hopes of securing dismissal of federal criminal wire fraud charges. The FirstEnergy individuals gone include the then CEO, top external affairs leadership and senior attorneys - - all or nearly all responsible for managing or conducting affairs undertaken on behalf of all the FirstEnergy operating companies, including JCP&L.

In addition to the removal of key executives, management has undertaken organizational, programmatic, and process and procedure remediation. Those efforts have a broad and appropriate scope. Nevertheless, substantial and important questions - - answers to which FirstEnergy has refused to support - - remain. The nature and extent of the actions taken in the acknowledged circumstances were remarkable, and a broad range of organizations, leadership, and management contributed to their occurrence.

We consider it unsound to accept without corroboration that the attitudes, conduct, decisions, and inactions at issue found an outlet in only one state or involving only one set of legislative and regulatory issues. We sought but could not obtain such corroboration; FirstEnergy will not provide information important in placing informed, reasonable limits on the extent of what has happened or may happen, and on its implications for JCP&L and its customers. Management will not even provide to us in carrying out an engagement on behalf of the BPU, what it has provided to other agencies on related matters. Moreover, it will not even provide (claiming it does not have the information to do so) [REDACTED]

[REDACTED]. Senior FirstEnergy personnel at the time of those circumstances used such entities in a manner that generated the filing of a federal criminal charge; it is appropriate to consider whether it did so in other cases, and if so, with possible implications involving but extending beyond assignment or allocation of costs to JCP&L.

Accordingly, we are not in a position to determine the extent to which FirstEnergy has assigned or allocated to JCP&L costs for improper activities, although, it is reasonable to believe that none of the \$230 million penalty required by the Deferred Prosecution Agreement will be so assigned or allocated. Charges did come to JCP&L for a portion of the payments identified in the underlying Statement of Facts; FirstEnergy later reversed them after events in Ohio involving its senior leadership became public. However, management considers the costs of state regulatory examinations recoverable. We find it illogical to acknowledge the unrecoverability of costs incurred through federal but not state examination of the same and related circumstances. Legal, outside consultant, and employee costs associated with the elements of our engagement (and others the Board may undertake with respect to circumstances like those described here) should be segregated in a manner that assures that JCP&L's charges to New Jersey customers will exclude them.

Our examination found another group of questionable costs whose magnitude remains in doubt. We learned of a management examination of suspect costs from certain vendors. That investigation found some of those costs assigned or allocated to the operating companies improperly or without sufficient justification. The amount management found to have been recovered through JCP&L rates was about \$500,000 through 2020, and is anticipated to reach \$800,000 by the end of 2021. More significant than this amount, however, are the implications for cost assignment and allocation more generally. Assignment and allocation should operate objectively, fairly, and accurately at all times, not just as they affect a particular test year.

We found management's decision to examine invoices sound and its description of the results clear. However, management declined to provide information about how it selected the invoices for study, and how it may have determined whether the results obtained indicated a need for further examination. We have been left by management's refusal to provide information with an insufficient basis for concluding whether management's efforts have disclosed the full extent of the cost consequences of assignments and allocations made improperly or without sufficient justification to JCP&L.

FirstEnergy's independent accountants [REDACTED]

[REDACTED] financial statements. It requires attention to how assignments and allocations occur and their impacts on JCP&L. We will further explore those matters in Phase 2 of our engagement.

We learned through efforts to secure information about the DOJ Investigation of a potentially related matter involving audit work performed for FirstEnergy by an outside firm. An employee terminated by the firm downloaded 57 documents related to FirstEnergy audits, provided them to the Securities and Exchange Commission, has alleged that they disclose unlawful action, and has connected their downloading and provision to events associated with the DOJ Investigation.

We requested from FirstEnergy the documents (which are its own) and information about their nature, and about litigation between it and the individual. Those inquiries were made to help us

determine: (a) what light they may shed on matters where FirstEnergy has been uncooperative in providing information, and (b) whether they may disclose other material controls, assignment, allocation, or other issues within the scope of our work. We did not receive significant, useful information in response to our requests.

However, in examining the litigation, we found a judge’s order presenting substantial implications for another important aspect of managing external affairs. Protection of whistleblower identity comprises an important means for enabling enforcement and regulatory authorities to secure information material to exercising their public responsibilities. A judge’s order found that the attachment of a letter by FirstEnergy’s counsel to a public filing “...served no legitimate purpose...” and produced “...the effect of publicly identifying [the individual] as a whistleblower...”. The order went on to address implications for FirstEnergy:

*Based on this record, the best the Court can say for Plaintiffs’ counsel with respect to this filing is that they were negligent **or allowed their clients to use them** to advance improper purposes. In this view, their justifications for filing the letter, though false and unsupported in the record, walk the line of technical compliance with their obligations **while simultaneously advancing the ulterior motives of their clients**. [emphasis added]*

The 57 files and the aftermath of downloading them raise important questions left unanswered by FirstEnergy’s refusal to provide information. They provide an important example of another important external affairs failure. Finally, they show by ironic example what our efforts to gain information illustrate - - the inconsistency between FirstEnergy’s statements and its actions regarding transparency.

Our *External Affairs* - - The “DOJ Investigation” recommendations include:

- 1. Follow developments in continuing federal criminal and administrative and other state proceedings.**
- 2. Establish means for precluding the inclusion in JCP&L rates FirstEnergy and JCP&L employee and outside costs associated with state reviews of the implications of conduct related or similar to that encompassed by the DOJ Investigation.**
- 3. Provide semi-annual reports and presentations to the BPU staff regarding DOJ Investigation remediation measures.**
- 4. Provide validation of the completeness of management’ Vendor Invoice examination or, failing that, require an independent review sufficient to identify and calculate all likely impacts to JCP&L and its customers.**

M. Chapter XIII: External Affairs Organizations

We examined the management and operations of the functions that FirstEnergy for a number of years placed within the FirstEnergy Service Company external affairs organization. That organization has provided a broad range of external affairs functions for all FirstEnergy operating companies on a consolidated basis, but for many functions assigned resources dedicated to individual operating companies. JCP&L, unlike the other operating companies, had until recently

managed communications, interactions and relationships with local officials and stakeholders through its own organization, headed by a JCP&L executive reporting to the company president. FirstEnergy moved the JCP&L organization from under the utility president to the FirstEnergy Service Company External Affairs organization in August 2021.

FirstEnergy’s consolidated approach to managing state regulatory affairs before the aftermath of the revelations of circumstances (beginning in mid-2020) encompassed by the DOJ Investigation already split state regulatory affairs in a way we found sub-optimal. Its effects in New Jersey and wherever else it may have been applied, included dividing into two separate organizations responsibility for addressing state utility regulatory authority (here the BPU) communications, representation, and relationship management.

The termination and separation of a very large number of executives, managers, and lawyers may have addressed some of the root causes of events and inactions leading to the DOJ Investigation. We, however, have no way of knowing that, given the lack of transparency into the events leading to those separations. What is known is that the result of changing organizational responsibilities that has accompanied ongoing personnel replacement activity has increased from two to three the number of top executive sources of direction of key state regulatory matters:

- The CFO, who has responsibility for Rates & Regulatory Affairs personnel divided by state and charged with the more routine interfaces, largely with staff and more geared to the BPU proceedings that engage JCP&L
- The Senior Vice President, Operations, who has responsibility for State & Federal Regulatory Affairs “advisors,” who communicate and interact on what management terms broader policy issues, stakeholder processes, and higher level communications
- The Senior Vice President and Chief Legal Officer, under whom a group of attorneys responsible for addressing regulatory matters with legal ramifications operates.

This organizational approach does not recognize regulatory affairs as its own discipline, instead viewing it as an aspect of three other areas that have a clearly more defined and elevated role in the corporate view of success drivers - - finance, operations, and law. We view regulatory affairs differently in general, not to mention specifically at a company that has experienced the effects of the transgressions that FirstEnergy has.

The company emphasizes its discovery of “tone at the top” as the paramount issue it has needed to address in the wake of the effects of those transgressions. Part of what we think is missing in that tone is the voice of senior leadership focused on the centrality of regulatory affairs to an entity like FirstEnergy generally and JCP&L. There is not a regulatory voice at the top to help keep that tone true. Top management has unduly submerged regulatory affairs; it should designate a top officer, a legal professional, who regularly engages with FirstEnergy’s other senior leaders regularly and who will have control over the resources, now split among the three senior executives listed above.

Our experience in this engagement has made clear that both JCP&L top executive management and the lead FirstEnergy have assigned to JCP&L for managing state utility regulatory affairs do not have substantial influence in securing from the FirstEnergy resources from the three units identified above timely or effective support and execution in responding transparently and

otherwise appropriately to regulatory needs such as those our engagement addresses. The performance we have observed questions both timely and effective execution of regulatory activities. Consolidating responsibilities under very senior leadership can produce much needed improvement in execution. FirstEnergy has of late invested much in making ethics and compliance a more vital and positive contributor to “tone at the top” and the creation of a culture that internalizes the value of ethical conduct. A similar investment is in order in regulatory affairs.

FirstEnergy had located a successful economic development organization under its external affairs organization - - reportedly moved to a newly-created Customer Experience organization in September 2021. For what appear to be moderate expenditures on a stable organization, it has succeeded in bringing desirable and economically beneficial development projects into existence at a healthy rate - - excepting JCP&L’s region. Understanding that policy, economic, and demographic conditions differ, it nevertheless makes sense for management to work with state and local stakeholders to seek ways to bring to New Jersey at least some measure of the success attained in the areas served by the other operating companies.

We also examined communications and shareholder services, both performed through centralized FirstEnergy Service Company organizations, with stable staffing and costs. We found no concerns with their performance effectiveness. Moreover, in the case of communications, we found effective coordination and communication with local JCP&L management, promoting the development and tailoring of communications vehicles attuned to the needs and circumstances of the area of New Jersey it serves.

Our *External Affairs Organization* recommendations include:

- 1. Return to JCP&L’s lead officer responsibility for New Jersey external affairs.**
- 2. Consolidate responsibility for rate and regulatory affairs under a senior legal executive.**
- 3. Conduct a focused study of means for cost effectively improving development program success in JCP&L’s serving region.**

**Final Report
Audit of the Affiliated Transactions and a
Management Audit of
Jersey Central Power and Light Company
Request for Proposal 13-X-22139
Docket No. EA20110733**

Public Version: Confidential Materials are Redacted

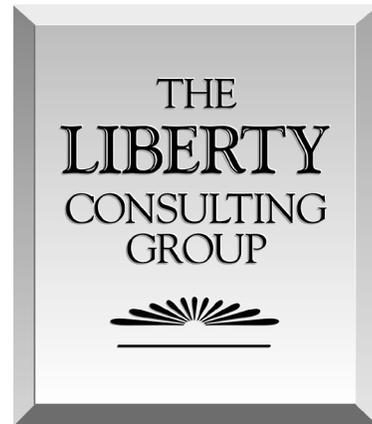
Presented to:

*Board of Public Utilities
State of New Jersey*



Presented by:

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February 7, 2023

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Chapter I: Introduction

A. Background

This report summarizes the first, *Utility Operations* phase of an Audit of the Affiliated Transactions and a Management Audit of Jersey Central Power & Light Company that The Liberty Consulting Group (Liberty), conducted on behalf of the New Jersey Board of Public Utilities (Board or BPU. We performed this audit in two phases:

- Phase One: Expedited treatment of a focused series of topics grouped together to comprise a “Utility Operations” component - - this report describes the results of our examination of the scope encompassed by these topics
- Phase Two: Subsequent treatment of functions remaining to be addressed as part of a comprehensive management audit of JCP&L and an audit of the affiliated transactions among JCP&L, FirstEnergy, and its affiliates - - a second report describes the results of our examination of topics within that scope.

The scope set for this audit made two New Jersey-specific focuses central to our work - - financial protections for New Jersey customers and New Jersey operations performance. Key elements in recent years driving the former include the bankruptcy of FirstEnergy commercial power and energy operations of and the July 2020 announcement of grand jury indictments of Ohio legislative leadership, advisors, and lobbyists as a result of conduct involving FirstEnergy. The aftermath brought termination of or separation from employment of a significant number of key corporate executives, including FirstEnergy’s Chief Executive Officer, and a series of credit ratings agency downgrades to FirstEnergy and its operation utilities (including JCP&L).

We have performed five previous management audits of this type for the NJ BPU, most recently at ACE/Exelon. Previous audits included South Jersey Gas and New Jersey Natural Gas, and two at Elizabethtown Gas, the most recent of which occurred under then parent AGLR Resources and the earlier when ETG formed part of NUI. The first ETG/NUI audit occurred under conditions where holding company created severe financial distress that threatened ETG.

We completed audit field work on the topics summarized in this report largely by September 1, 2021, but have incorporated some later received information from 2021. The accompanying Phase 2 report contains and relies on data gathered through the early part of 2022. While the subjects of some of that data overlap with the work described in this Phase One report, we have not sought to update this report to address it.

Throughout Phase 1, management frequently failed to provide responses to audit requests in accord with either the normal durations for engagements of this type, more generous due dates acknowledging failure to meet normal ones, or requests expedited because of the shortened time schedule all understood at the outset of our engagement. Some measure of delay occurs typically in work of this type, making mention of it gratuitous - - that was not so here. We worked diligently and with strong support from BPU Staff in overcoming the substantially greater degree of delay and unresponsiveness experienced here. Some improvement occurred, but without recovering past delay, preventing accumulated lag, or overcoming a continuing pattern of unresponsiveness in key areas.

The most significant area of unresponsiveness came with respect to issues involving an agreement that eventuated between FirstEnergy and the Office of the U.S. Attorney for the Southern District of Ohio and as well with respect to issues related to the investigation preceding it. That agreement called for indicting FirstEnergy on federal criminal wire charges, subject to dismissal should FirstEnergy comply with all terms that agreement imposed.

The delays occasioned by FirstEnergy’s slow and often unresponsive answers and the inability that its lack of transparency has produced in addressing questions about the DOJ Investigation that the BPU asked us to address have simply proved too great an obstacle to schedule and too expansive an impairment of our ability to provide answers to consign to the usual, acceptable, and manageable label as “what comes with the territory.”

We appreciate the opportunity to be of service for the BPU, we thank the BPU Staff for its strong support and understanding, and we appreciate the efforts of the JCP&L-assigned personnel for their attempts to assist in overcoming the problems that FirstEnergy has caused for the completion of our work.

B. Structure of This Report

This report combines the chapters that describe the findings, conclusions, and recommendations that we have reached in the “Utility Operations” areas comprising Phase One of our engagement. This report’s structure employs the following outline:

- Chapter I: *Introduction*
- “Utility Operations” Chapters:
 - Chapter II: *Operations Organization*
 - Chapter III: *System Planning and Load Management*
 - Chapter IV: *Asset Management*
 - Chapter V: *Vegetation Management*
 - Chapter VI: *Contractors*
 - Chapter VII: *Reliability Programs and Smart Grid Activities*
 - Chapter VIII: *Cyber Security and System Vulnerability*
 - Chapter IX: *System Resiliency and Restoration*
 - Chapter X: *Customer Service*
- One additional chapter due to the critical nature of its scope and required timeliness of its implications:
 - Chapter XI: *Financial Risks and Consequences of Parent and Affiliate Operations*
- Chapter XII: *External Affairs - - The “DOJ Investigation”*
- Chapter XIII: *External Affairs Organizations.*

The accompanying Phase Two report addresses the *Management Audit and Audit of Affiliated Transactions* topics of this audit’s scope.

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Chapter II: Operations Organization

A. Background

This chapter describes and presents the results of our review of the JCP&L's Operations organization and FirstEnergy's organizations that provide operations services and support to JCP&L. We focused on the structure and processes for forming plans, making decisions, and drawing asset, operational, and other support from other FirstEnergy entities in conducting New Jersey utility operations. In particular, we observed JCP&L's effectiveness in meeting New Jersey electric customers' needs by making independent decisions about planning, reinforcing, improving, maintaining, and operating its distribution system.

Subsequent chapters of this report address our detailed review of other relevant utility operations topics, including management's inspection, maintenance, and reliability programs, practices, and regulatory compliance. These later chapters also address how management plans its system, how it develops and prioritizes its capital projects resulting from those plans, and whether Capital and Operations and Maintenance (O&M) spending is consistent with financial forecasts and approved budgets.

Our examination of operations also included the requested examination of fuel management practices. Fully vertically integrated utilities generally have fleets that consume fuels in producing energy for their retail customers. Some electric distribution companies continue to have small, legacy supply facilities, including purchased power agreements, following movement of electric supply to competitive markets. Like JCP&L, however, those serving as a transmission and distribution (wires) company, own no fossil fuel-fired generation, hold no fuel stock, and lack any power production expenses. Accordingly, JCP&L has no fuel and, therefore, no Fuels Management program.

We considered in performing our examination of the Operations Organization whether management:

- Provides adequate responsibility, accountability, and resources for identifying JCP&L's unique system reinforcement, addition, enhancement, and other needs through regular, formal processes
- Assesses the condition and needs of New Jersey electric infrastructure and regularly employs comprehensive, objective, and quantifiable performance measures
- Effectively employs organizations and resources that work in common on New Jersey and other FirstEnergy facilities under performance expectations and criteria that address New Jersey system performance and costs
- Employs sufficient numbers of New Jersey dedicated resources to ensure sufficient attention to the condition of those facilities, their performance, identification of gaps, and planning for means to address such gaps.

B. Findings

1. FirstEnergy Support for JCP&L Operations

FirstEnergy Service Company has responsibility for managing JCP&L's transmission and sub-transmission systems and supports many of the distribution system functions common to its ten operating companies. FirstEnergy Service Company provides centralized purchasing, accounting, business services, regulatory, legal, and communication services to the operating companies. It provides standardized maintenance program design and support, work management processes and technologies, and peer reviews among FirstEnergy's operating companies. It provides transmission and substation planning, engineering (including high level management of the substation inspection, maintenance, and reliability programs), capital portfolio services, laboratory services, and technical subject matter experts to evaluate equipment conditions for the subsidiaries. FirstEnergy also provides multi-year Lines and Substation training programs to provide qualified apprentices to its operating companies. FirstEnergy enhances storm preparedness and response for each operating company by providing centralized weather forecasting and analyses services, and alternate/back up facilities for the individual primary distribution control centers.

The following listing identifies the FirstEnergy Service Company organizations that directly manage JCP&L equipment or that provided support to JCP&L's direct management of operations and equipment:

- VP Transmission
 - Director of Transmission Operations
 - Director of Transmission Planning and Protection
 - Director of Transmission and Substations
 - Director of Asset and Records Control
- VP Utility Operations
 - Director FEU Safety and Human Resources
 - President of JCP&L
- VP Distribution Support
 - Director ED Operations Services
 - Director Regional Workforce Development - Power System Institute
 - Director ED Operations Support
 - Director Work Management
 - Director Energy Efficiency Compliance (reportedly moved under the VP Customer Engagement after the drafting of this report)
 - Director Outage Management
 - Director Vegetation Management
 - Director Energy Efficiency Implementations (reportedly moved under the VP Customer Engagement after the drafting of this report)
 - Director Emergency Management
 - Director ADMS/GIS Project
- VP Construction and Design Services

- Director Transmission and Substation Design
- Director Transmission Project
- Director Portfolio Management
- Director Transmission Program
- Director EMT Program.

These organizations provide JCP&L with support in the following areas: Energy Delivery Operations Services, Work Management, Vegetation Management, Outage Management, New ADMS (OMS)/GIS Project, Emergency Preparedness, and Energy Efficiency Compliance and Reporting, and Energy Efficiency Implementation. Following are descriptions of descriptions of some of these organizations.

a. Delivery Services and Support

The FirstEnergy Service Company Energy Delivery Operations Services organization provides JCP&L with technical support and subject experts on operational dynamics; *e.g.*, for powerline harmonics, solar issues, system planning, and system reliability. These engineers attend technical conferences and share technical knowledge among the operating companies. FirstEnergy has two technical support engineers embedded within JCP&L. The FirstEnergy Service Company Operations Support organization supplies and supports the technologies for the distribution control centers (DCCs), it provides substation operating and equipment subject experts, and it provides substation commissioning engineers for new construction and retrofit projects and upgrades.

b. Reliability

The FirstEnergy Service Company Operations Services organization supports the reliability technologies provided to JCP&L and the operating companies for measuring, analyzing and reporting reliability performance indices. FirstEnergy organizes a peer group forum with all operating companies' reliability engineers meeting two to four times each year to discuss common reliability challenges, technologies, solutions, and costs. JCP&L shares and expands its knowledge and reliability expertise through participation in these periodic forums. To maintain both an organizational and management focus on reliability, FirstEnergy provides a daily scorecard to the operating companies, comparing actual daily performance with pro-rata targets, and indicating whether current performance is on pace to meet each year-end reliability target.

c. FirstEnergy System Planning Organization

The FirstEnergy Service Company Operations Services organization also assists JCP&L and the operating companies with system planning and with training in the use of the circuit modeling software (CYME) system planning software, an industry standard distribution circuit analysis program. Two FirstEnergy Service Company system planners are embedded in New Jersey, but they support all ten FirstEnergy utilities with EPRI (Electric Power Research Institute) collaboration and with planning software issues. JCP&L Engineering management members meet with their FirstEnergy operating company counterparts four times a year, and meet with other New Jersey utilities on an ad hoc basis to identify and mitigate common system operations issues such as distributed generation, solar integration, and demand side management. FirstEnergy Service Company's system planning group prepares JCP&L's overall energy and demand forecasts, while

JCP&L planning engineers prepare the more localized circuit-level and area-level demand forecasts.

d. Work Management

FirstEnergy Service Company's Work Management organization improves work efficiencies for JCP&L operations organizations, by providing the work management processes and technologies to ensure that all work is executed by the districts in concert with program schedules and job priorities. Work Management provides the technologies and assistance that JCP&L's districts use to plan, design, and schedule work. The technologies allow leadership and Work Management personnel to monitor workload execution in near real time, and to identify inefficiencies and resource needs.

FirstEnergy implemented a Regional Work Management organization model in 2008 to optimize and standardize work processes and practices among its operating companies. The Work Management organization within FirstEnergy Service Company has 26 positions in Akron, and it has 4 Work Management positions (including a supervisor), embedded within JCP&L. The Director of "Work Management and FEU Process Improvement" oversees three teams, each led by a manager, comprising the FEU Process Improvement Team, the Work Management Operations Support Team, and the Work Management Systems Team.

The Work Management Operations Support Team ensures that JCP&L, and the other FirstEnergy operating companies appropriately use Work Management's work preparation, resource planning, crew scheduling, and work performance tracking software technologies, and that they are following the standardized FirstEnergy Work Management procedures. The Work Management Support Team monitors JCP&L's work management practices, monitors work performance compared with performance targets, provides work performance reports, and provides insight and guidance to help correct work performance issues. This group also assists JCP&L with resource planning (by analyzing forecast labor requirements versus available labor resources) and can augment operating company resources during storms and other emergencies. Work Management conducts monthly meetings with the operating companies to review workflow performance reports and to address strengths, weaknesses, and opportunities. Best practices and lessons learned are shared between FirstEnergy Work Management and the operating companies. The Work Management Systems Team provides training and support, along with the Information Technology (IT) Team, for the various work management technologies provided to JCP&L and the other operators.

e. Vegetation Management

FirstEnergy Service Company's vegetation management organization has responsibility for transmission and sub-transmission vegetation management, and it provides guidance, standard processes, practices, and technologies for JCP&Ls distribution vegetation management organization. Economy of scale savings result from FirstEnergy's taking responsibility for vegetation management for its entire transmission system, by assisting its 10 operating companies with obtaining contractors, and by providing standardized technologies for the operating companies to conduct vegetation management activities on their respective distribution systems.

FirstEnergy Service Company's Vegetation Management Organization, under a Director of Vegetation Management, has full responsibility for vegetation management on the transmission lines in New Jersey, and has responsibility for planning and managing transmission vegetation work, and for complying with the regulatory reporting required by the BPU and North American Electric Reliability Corporation (NERC)/ Federal Energy Regulatory Commission (FERC). Its arborists plan and manage the transmission work and conduct annual aerial, driving and walking inspections along transmission rights of way. The organization has a staff of about 75, including foresters, analysts, and clerks. All FirstEnergy Service Company foresters are certified utility arborists. Distribution and sub-transmission vegetation management is 100 percent managed by JCP&L's Forestry Services Organization. However, FirstEnergy Service Company Transmission Services function has budget responsibility for sub-transmission vegetation management costs, with JCP&L system costs recovered under the FERC-authorized transmission tariff.

The FirstEnergy Service Company Vegetation Management Organization supports JCP&L distribution and sub-transmission vegetation management procedures and consults with JCP&L on BPU compliance issues, and along with the Supply Chain Organization, assists JCP&L Vegetation Management in identifying and contracting with certified and vetted vegetation contractors. FirstEnergy Service Company also provides and maintains for JCP&L the Vegetation Management System (VGMS) software program used to schedule vegetation management work, to record contractor timesheets, and to track completions in the field. The FirstEnergy Service Company Vegetation Management Organization provides monthly reports and monitors JCP&L vegetation management costs and progress. It also holds monthly vegetation management budget meetings with JCP&L and participates with JCP&L in providing sufficient vegetation management crews from other affiliates, if necessary, in preparing for and executing major storm response tree clearance work.

f. Supply Chain

FirstEnergy's Supply Chain organization leverages economies of scale in resourcing vendors, materials, and contractors to its ten operating companies. FirstEnergy Supply Chain selects vendors and contractors and provides materials purchasing, warehousing, and stores functions for JCP&L. Two directors had led FirstEnergy's Supply Chain Organization - one supporting the Utilities group and the other supporting the Regulated Generation and Corporate groups. Following the drafting of this report, management reported an October 2021 Supply Chain reorganization under a Vice President of Supply Chain responsible for three directors (for Strategic Category Management, Material Operations and Solutions/Standards).

The Utilities group has responsibility for sourcing materials and services for the operating companies, including JCP&L. The unit has multiple managers and buyers. Supply Chain buyers procure materials using a competitive bidding process involving multiple vendors, and the buyers issue purchase orders for JCP&L. Supply Chain embeds Stores personnel within the JCP&L districts, and they act as liaisons between the district managers, layout technicians, planner/schedulers, and supervisors and the centralized warehouse in Pennsylvania. The Supply Chain organization also procures contractors for JCP&L, following evaluation criteria that includes safety records, environmental issues, schedule adherence, delivery reliability, subcontractor diversity, payment terms, and each contractor's experience and demonstrated

capabilities. Once JCP&L operations has concurred with each contractor selection by Supply Chain, the buyers then issue a purchase order to the contractor.

g. Transmission and Construction and Design

JCP&L's Operation Support organization provides the resources for much of the normal day-to-day maintenance activities performed for JCP&L's transmission and sub-transmission lines, and its substations. However, FirstEnergy Service Company's Transmission and Construction and Design organizations have responsibility for construction, inspections, maintenance, and reliability of the substations and the transmission lines in New Jersey. FirstEnergy Service Company's Substation Engineering has responsibility for the design and construction of all JCP&L substations, including its distribution substations.

h. Transmission and Substation Service

JCP&L lines and substation workers execute inspections and maintenance in the substations, sub-transmission lines, and low voltage networks; however, FirstEnergy's Transmission and Substation Services organization has responsibility for the management of inspection and maintenance programs for the JCP&L transmission and sub-transmission lines and substations (including distribution substations) and the low voltage (LV) networks. This organization includes the Transmission Maintenance group, the Transmission and Substation Support group, the Relays and Controls group, and the Major Equipment and Commissioning groups.

The Transmission group provides technical support and subject matter expertise related to transmission line maintenance practices and methods, emergency response, construction methods, utility industry standards, and regulatory compliance requirements; and it develops and scopes condition-based capital projects. Examples of appropriate collaboration with JCP&L include a project prioritization process, investigating line encroachments, prioritizing defects identified by the line patrols, tracking inoperable equipment, and providing parts and outage coordination across all the operating territories.

The Substation group also provides JCP&L with very similar technical support and subject matter expertise related to substation maintenance practices and methods. Examples of collaboration with JCP&L on substation operational topics includes specifying replacement and/or repair of substation equipment, targeted circuit breaker replacements based on condition issues, and providing post-storm hazard mitigation personnel.

The use by all 10 operating companies of FirstEnergy standardized specifications and procedures is efficient and cost effective, and FirstEnergy's central staff of subject matter experts precludes the need for JCP&L to duplicate the costs of those resources.

i. Transmission System Operations

Operating two transmission control centers for the ten operating companies, rather than 10 separate control centers, provides savings for each operating company. FirstEnergy's Transmission System Operations organization has responsibility for operating JCP&L's transmission and sub-transmission systems from the Akron transmission control center, along with some of the other FirstEnergy transmission assets. Another center controls transmission facilities for the southern

operating companies. Transmission operations work with PJM, the regional transmission organization, and with JCP&L, to provide secure transmission system operation within New Jersey. The control centers are staffed 24/7 with PJM/FERC certified operators. The Transmission Operations Support groups include Transmission Metering, Outage Coordination, Tools and Technology, Power Network Analysis, Regional Transmission Organization (RTO) Energy Transactions, Compliance and Procedures, and Transmission Training. FirstEnergy’s Transmission Operations also works with JCP&L’s DCCs and the DCCs of the other operating companies for transmission and sub-transmission outage scheduling, for preparing switching instructions and orders, and for coordinating local and regional emergency restorations.

j. Regional Workforce Development

Finding qualified applicants for lines and substation workers can prove difficult; FirstEnergy provides line and substation worker training to ensure that JCP&L has an adequate pipeline of qualified apprentices and mid-career hires. The FirstEnergy organization provides trained apprentices for JCP&L’s line and substation crews. FirstEnergy’s Regional Workforce Development organization manages the parent company’s training schools, the FirstEnergy Power System Institute (PSI), which trains inexperienced applicants to be qualified as apprentices for the Lines and Substation organizations. The 24-month PSI courses includes a summer internship for orientation to actual in-field working crews. Management and the IBEW require that the applicants are tested, interviewed, background checked, and that they are required to demonstrate skills before hiring. Two of the PSI facilities are in New Jersey.

2. *FirstEnergy Costs Allocated to JCP&L Operations*

FirstEnergy allocates costs to JCP&L each year to pay for critical utility business support functions that JCP&L would otherwise need to staff internally if it operated as a standalone entity. Those costs in turn should be justified by JCP&L receiving at least the same quantity and quality of services that it would experience if providing them internally. Using its standardized and centralized business support model, FirstEnergy has the same arrangement, and allocates the same types of costs, to each of its subsidiaries.

The three FirstEnergy organizations directly serving the JCP&L Operations Organization are the Supply Chain, T&D Support, and Utility Operations organizations. The following table shows the costs allocated to JCP&L for those functions from 2017 to 2020.

FirstEnergy Allocations to JCP&L for Operations Services Provided

FE Organization	2017	2018	2019	2020	2021 Budget
Supply Chain	\$534,308	\$558,999	\$676,418	\$747,266	\$919,122
Utility Operations	\$179,535	\$217,784	\$769,787	\$834,562	\$670,829
T&D Support	\$26,406,330	\$30,917,408	\$33,295,770	\$37,442,952	\$40,739,836
Total	\$27,120,173	\$31,694,191	\$34,741,975	\$39,024,780	\$42,329,787
% Annual Increase		16.9%	9.6%	12.3%	8.5%

To execute its support services role, FirstEnergy staffs, manages and allocates employee Full Time Equivalents (FTEs) to each operating utility. The next table shows the allocations of FirstEnergy FTEs from the Supply Chain, T&D Support and Utility Operations organizations to JCP&L

operations from 2017 to 2020. The effectiveness of those FirstEnergy functions in providing support to JCP&L operations are detailed in Section C.1 above.

Using 2020 as an example, FirstEnergy Service Company allocated slightly more than \$39 Million to JCP&L for the support functions provided by about 250 FirstEnergy Service Company employees, or about \$130,000 per allocated employee. Given the depth and breadth of the services provided, we found the allocated costs appropriate and perhaps as importantly, found them very likely less than the fully loaded costs that JCP&L would incur to hire, retain and manage the staff to perform these functions internally.

FirstEnergy FTEs and Number Allotted to JCP&L

FE Organization	2017 FTEs		2018 FTEs		2019 FTEs		2020 FTEs		2021 FTEs	
	FE	JCPL								
Supply Chain	26	2.8	42	5.6	39	5.5	40	6.2	41	6.3
Utility Operations	140	53.3	140	54.2	152	57.1	149	53.5	158	55.3
T & D Support	823	167.4	1053	208	1105	235.8	1020	191.4	1231	230.8
Total & % Allocated	989	223.5	1235	267.8	1296	298.4	1209	251.1	1430	292
		22.6%		21.7%		23.0%		20.8%		20.4%
% Annual Increase allocated FTEs				20%		11%		-16%		16%

3. JCP&L Operations Organizations

JCP&L’s Lines, Engineering, and Substations organizations have experienced and knowledgeable leadership and are appropriately organized and staffed with engineers and technicians, and with qualified line and support personnel to accomplish assigned work. Work management practices focus on ensuring that all required work is completed on time.

JCP&L’s Operations organizations are led by the Vice President of Operations, who oversees four operations organizations in turn led by the three directors and one manager. The Director of Operations Services has responsibility for distribution engineering (planning, maintenance, and reliability), distribution operations (headquartered in district line shops), and damage and compensation claims (e.g., car/pole accidents). The Director of Operations Support has responsibility for the substation and underground inspections and maintenance (using substation, cable, and relay personnel assigned to substation district shops), the two distribution control centers and their staffs, and for the JCP&L’s work management team. The Regional Operations Support Director has responsibility for the vehicle fleet (managing about 900 vehicle units), facilities, meters, vegetation management program execution, and for storm response logistics. The Emergency Preparedness Manager has responsibility for ensuring that the incident command team structure is staffed, trained and prepared for major events. Except for personnel rotations and replacements, the Operations organization structure has not changed since 2017. JCP&L’s Operations Organization is standardized and follows the functional model used by nearly all FirstEnergy operating companies.

FirstEnergy encourages the movement of management personnel between and within operating companies to broaden experience, to strengthen succession planning and to promote the cross

fertilization of best practice. JCP&L's current incumbent senior directors are cross-experienced and cross-qualified and can cover the duties of each other and of the vice president. Management is developing a less senior incumbent director, four regional general managers, and a number of lines and substation managers as part of their leadership succession plan.

The JCP&L Operations Directors do not directly report to FirstEnergy management, but rather they report to JCP&L's Vice President of Operations, who in turn reports to JCP&L's President, The JCP&L President reports to FirstEnergy's Senior Vice President of Utilities.

a. Operations Services

JCP&L Operations Services (line work and distribution engineering) has about 700 employees, including about 570 field personnel reporting to fourteen geographically spread distribution lines shops, six in the northern region and eight in the central region. Two other shops handle transmission facilities. These local shops have responsibility for line work, Underground Residential Distribution (URD) work, and pad mount transformer and switchgear equipment installation and maintenance, and streetlight work. The Operations Services organization includes the engineering staff and the regional and district distribution management, district staffs, and line worker personnel.

Functions within Operations Services include distribution system planning, managing distribution inspection, maintenance, and reliability programs, field work management, planning, scheduling, and execution; and managing distribution reliability and growth projects. Four Regional General Managers and one Manager of Engineering report to the Director. The Director is ultimately responsible for the engineering and the completion of distribution system planning and overhead distribution circuit inspection, maintenance, and reliability work.

JCP&L Operations participates in monthly meetings with other FirstEnergy Operations units to discuss common, critical operating topics. The Director also periodically discusses common issues with his counterpart at PSE&G. The Operations Services Engineering group includes 101 engineers and is supported by 26 FirstEnergy engineers. The JCP&L engineering organization includes distribution system planning engineers, inspection and maintenance engineers, and reliability engineers.

Personnel assigned to each of the fourteen line shops typically include a district manager, one or two work planners/schedulers and job layout technicians, crew supervisors, a shop technician, a mechanic, line workers, and an embedded FirstEnergy stores employee.

JCP&L line crews consist of two or of three lines workers, depending on whether a crew contains an apprentice. Line workers' duties include distribution line construction and maintenance, performing troubleshooter (electric first responder) work under the direction of distribution system operators (DSOs), installing, repairing, and replacing direct buried URD cables, and maintaining streetlights. Management provides line crew chiefs with cellular connected laptop computers for remotely accessing OMS orders and Geographic Information System (GIS) maps. The FirstEnergy Service Company Transmission and Construction and Design Organizations manage transmission and sub-transmission inspection and maintenance, but JCP&L provides two crews for transmission and sub-transmission work.

JCP&L currently has 402 line-workers, an increase from 383 in 2019 designed to offset future projected retirements, and to satisfy other forecast resource needs. JCP&L deploys new line workers by hiring qualified journeymen in the marketplace from other utilities and contractors, and by maintaining a steady flow of qualified apprentices from graduates of the two PSI locations in New Jersey. Management and the IBEW require that new line workers pass written tests, be interviewed, pass background checks, and physically demonstrate line work and safety skills.

JCP&L terms its electric outage first responders “troubleshooters.” Troubleshooters work as a one-person line crew. JCP&L employs four or five troubleshooters per district; they work 24/7 shifts. Troubleshooters report through Operations Services leadership, but they take work direction from the DSOs (distribution system operators) in the DCCs, under the Operations Support Organization. All troubleshooters have laptop computers to access OMS orders and GIS maps and other data.

JCP&L has equipped its line and substation crews and troubleshooter trucks with GPS tracking. The DSOs and district management can track truck locations to aid in dispatching the closest available resource to emergent situations. The GPS capability also allows for recording daily departure and arrival times for crews and encourages productivity.

JCP&L currently deploys distribution construction and maintenance crews from four contractor companies, comprising about 44 contractor personnel. The current construction and maintenance contracting approach at JCP&L focuses on retention of contractors to perform work that exceeds the capacity of internal crews to accomplish. JCP&L’s annual work plans load company crews to full capacity, then assign the excess to contractors. Large, contracted job awards come following competitive bidding, but smaller jobs may be contracted using negotiated fixed cost or cost-plus terms and conditions. Internal crews perform all baseline inspection and maintenance work and undertake smaller, routine construction jobs, to the limits of their capacities. Otherwise, contractors work larger, externally-funded projects; *e.g.*, government-sponsored road expansions. Management also often uses competitive bidding for special initiatives, such as the \$97 million 2019 and 2020 Reliability Plus IIP project, to the extent they impose needs greater than internal forces can handle.

b. Operations Support

The Operations Support organization’s responsibilities include managing the inspections, maintenance, and reliability field work related to substations, low voltage (LV) networks, and ducted underground cables (but not direct burial URD cable), operating the JCP&L distribution system with the staffs of the two distribution control centers, and managing the and the embedded JCP&L work management team. The organization has one Director of Regional Operations Support, four General Managers of Regional Support and one Manager of Distribution System Operations (DCC), who all report to the Director.

The Operations Support organization operates three shops in the northern region and four shops in the central region. JCP&L stations 86 UC&M (substation) mechanics in the northern region and 100 in the central region. Substation mechanic hiring typically employs a pool of PSI substation school graduates; they operate under a two-year apprenticeship. FirstEnergy Service Company has responsibility for substation engineering and designs. JCP&L locates relay technicians and cable

workers at several substation districts. Management employs 28 relay and control technicians and several cable crews for installing and repairing ducted cables and for maintaining the LV networks in Morristown.

c. Lines and Substations Field Operations

JCP&L currently has sufficient field employee resources to accomplish required work each year. Management has since 2017 worked to complete all BPU-required and internally driven distribution and substation inspection and maintenance and reliability program work each year. It has maintained or increased internal line and substation personnel as work requirements and attrition have dictated.

JCP&L Line and Substation FTEs

FTE Type	2017	2018	2019	2020	2021
Line	389	402	390	383	402
Substation	127	134	135	143	154
Total	516	536	525	526	556

JCP&L has organized and staffed its Lines and Substations districts to support efficient and timely efforts to plan, schedule, and execute required work, using work management procedures and technologies. Personnel assigned to each line and substation district shop typically include a district manager, one or two work planners/schedulers and job layout technicians, crew supervisors, a shop technician, a mechanic, line workers, and an embedded FirstEnergy stores person.

Our in-person observations of working district operations found effective planning, scheduling, and executing field work. We went to several line and substation/cable shops in both regions, witnessing office and field operations across a number of technical disciplines. We monitored early morning job briefings and weekly crew scheduling meetings, and we observed the use of OMS data, work management technologies including CREWS distribution job preparation software, CASCADE substation job awareness and tracking software, CLIK job scheduling and tracking software, weekly crew assignment spreadsheets, and individual construction and maintenance job packets. A substation inspector also demonstrated CASCADE software use for substation equipment inspections.

The planner/schedulers in each district prepared, with the supervisors, “firm” crew schedules for the following week, and “soft” tentative crew schedules for the second and sometimes third week. The planner/scheduler ensured that the stores person and the district distribution tech had prepared and staged all the materials needed for the current day’s assignments for the crews, avoiding delays and allowing for efficient crew deployments each morning.

Substation planners/schedulers use CASCADE for assigning substation inspections and maintenance. All crew chiefs and troubleshooters have laptops for receiving and completing OMS orders electronically and viewing GIS maps and other operating documents online. Planners/schedulers and supervisors are always aware of crew locations, via GPS tracking technology.

Before scheduling a job, the district planners/schedulers assign a layout technician to design and prepare the job packet. The layout technician/designer uses the Crew Work Request System (CREWS) software program, which allows designers to develop project labor and material estimates. The software automatically determines the allocation of job costs to either operating expense or to capital expenses based on rules established by the accounting department. The layout technicians prepare job packets including GIS map printouts showing the task required and the estimated labor and materials resources which will be required, conducting site visits if necessary to clarify their designs.

The job packets go to a planner/scheduler. These persons and their supervisors review the job packets for key factors (*e.g.*, accuracy and buildability) before inserting the job into the district schedule for assignment to a crew. Each district has one or two locally assigned layout technicians who prepare single-phase jobs, while Morristown engineering layout technician/designers prepare larger 3-phase jobs. The supervisors and planners/schedulers communicate with customers to arrange for any required forced outages and to verify schedules and logistics for new connections or equipment replacements.

The managers, the planner/schedulers, the job layout technicians, the FirstEnergy stores person, the shop technician who prepares materials, and the supervisors all appeared to effectively coordinate, schedule and supply the workflows associated with new business requests, inoperative equipment jobs, and other corrective maintenance priorities. The involvement of district planners/schedulers and the use of work management technologies, relieve line and substation supervisors of the administrative burden of preparing the schedules and ordering and staging materials. The line crew supervisors each manage several crews. Under the work management process described above, the line crew supervisors have the capability for efficiently deploying crews to jobs in the mornings, and have the time and capacity to actively supervise the crews in the field, to conduct pre-job inspections, and to verify that jobs are completed consistent with specifications.

The work planning and scheduling technologies provided by the Work Management organization allow the districts, and management in general, to view the real time status of jobs being prepared, jobs scheduled, jobs in progress, and jobs completed. Work Management personnel monitor and measure each district's job management performance, including the accurate accounting of labor and material costs charged to each job, the comparison of estimated vs. actual scope performed and hours charged, and adherence to program schedules and priorities. As a result of this effective process, scheduled annual inspections and maintenance work tasks are completed before the end of each year, new business connections are established, and emergent events are remedied in a timely manner.

d. Distribution Control Centers

JCP&L staffs its two distribution control centers (DCCs) with distribution system operators (DSOs) and with technologies common to all the FirstEnergy operating companies. The DCC manager reports to the Director of Operations Support and the two supervisors at each DCC report to the manager. The DCC staffs are made up of DSOs, clerks, a distribution tech, and an engineer.

The Power-On OMS system is backed up with OMS systems at the FirstEnergy Transmission Control Center (TCC) and with other DCCs among the FirstEnergy operating companies. Management has configured the facilities and systems to permit any FirstEnergy DCC to control and dispatch resources to operate any of the constituent electric distribution systems. FirstEnergy's TCC in Akron, Ohio monitors and controls JCP&L's transmission and sub-transmission systems. A Wadsworth, Ohio facility serves as its backup, while a second TCC is in Fairmont, WV for support of the FirstEnergy southern operating companies.

The two JCP&L DCCs and all FirstEnergy operating companies have similar staffing, and common policies, procedures, and technologies. When necessary (*e.g.*, when a storm event affects only one region), the two JCP&L DCCs assist each other in system operations. The other operating companies' DCCs also assist the JCP&L during storm events by providing additional DSOs (either remotely or onsite) to perform dispatching and system operations duties for specific operating areas, by providing additional storm leadership to augment the JCP&L Incident Command Team and by providing additional Storm Analysis personnel to assist with OMS verification of storm outage and restoration data, and other storm and outage management functions guided by JCP&L's processes and priorities.

The DSOs direct troubleshooters, line, and substation crews to field locations based on their analysis of customer call information, OMS-predicted outage locations, and System Control and Data Acquisition (SCADA) alarms. The DSOs communicate with the TCC to maintain awareness of sub-transmission and transmission status. The DSOs have direct control of the operation of the distribution system up to the switch on the high side of the distribution substation transformers, and they write and direct switching, orders, issue clearances, monitor system conditions, review outage orders for data accuracy. The DSOs also direct the work of the DCC clerks who in turn perform callouts for field personnel during off-hours, contact NJ One-Call for underground utility locate and mark requests, request police and flagging support for traffic control, and electronically assign troubleshooter crews to OMS orders as directed by a DSO.

Following DSO review of an outage order for accuracy of cause codes and customer restoration times, the DCC Distribution Technician verifies the accuracy of the data, adjusts, and approves the order to be archived according to the FirstEnergy outage data Review and Approve process. The DCC engineer provides technical support to the DSOs, interfaces with the distribution engineering group, and leads the storm analysis team during storm events.

We conducted site visits to both DCC facilities and storm rooms - - one in Morristown for the Northern Region and the other in Holmdel for the Central Region. Each control center has SCADA and Energy Management System (EMS) monitoring and control for nearly all JCP&L distribution substations and circuits, including automatic circuit tie schemes, and smart grid installations. An Incident Command Team storm room sits adjacent to each DCC, configured with system status, OMS monitors, and communications facilities for use during major storm or other large restoration events.

JCP&L has assigned 49 employees, including four supervisors, between the two DCCs. The Morristown control room has 13 distribution system and substation operators and two supervisors, and the Holmdel facility 16 distribution system and substation operators and two supervisors. A

minimum of two DSOs remain on duty around the clock in each control room, with supervisory coverage for the first two of three rotating shifts. No supervisors are assigned to the third shift, but an experienced senior DSO remains on duty. Each DCC has have several terminals for SCADA and EMS operation, the Power-On OMS, and a large screen weather monitor. Management has been replacing the legacy Power-On OMS with a new FirstEnergy-wide network management systems that integrates the OMS, GIS, SCADA, with Energy Management systems. It can adapt the system to integrate any future AMI applications implemented. The replacement schedule calls for 2022 completion.

FirstEnergy has interconnected both DCCs, the TCC at Akron, and the DCCs for all other nine FirstEnergy operating companies with dedicated phone lines; each can monitor and operate the others' OMS systems. Met-Ed in Pennsylvania provides the primary JCP&L DCC and OMS backup facility. The FirstEnergy Meteorology Services keeps operators informed of approaching weather.

Operations Services line employees served as JCP&L's outage first responders (the "troubleshooters" described earlier), but the DSOs manage their outage response work. Management covers the Northern Region with 45 troubleshooters and the Central Region with 46, scheduling them for 24/7 coverage. Management assigns most to specific geographic service territories, but several serve as "relief" troubleshooters, covering for others during shift changes and vacations. The DSOs and the troubleshooters communicate using radios, cell phones, and laptop computers. These laptop computers connect to the OMS and the GIS systems through cellular technology, enabling troubleshooters quickly to identify trouble and outage locations and view the same outage data and circuit diagrams as the DSOs with whom they work. Management recently completed a project that verified the accuracy of the GIS system.

Receipt of a customer outage report leads to customer service or voice response unit preparation of outage order for entry into the OMS. Completion by the OMS of its diagnosis, problem identification, and a probable outage location permits a DSO to notify the assigned troubleshooter of generation of an outage ticket generated in OMS and viewable by their laptop computers. Dispatch of the troubleshooter to the predicted outage location permits confirmation of the outage, investigation of the cause, and, where possible, restore service. The troubleshooter notifies the DSO if the customer is restored. The DSO or clerk can assign another troubleshooter or request a near-by line or tree crew to assist with more extensive or complex restoration activities.

e. Inspection and Maintenance

Two engineers and four distribution technicians from the Operations Services engineering organization have responsibility for coordinating and managing inspections, maintenance, and repairs of JCP&L's distribution equipment, excepting underground cables. The distribution technicians also conduct inspections of URD system components, including pad mount transformers and switchgear. The 402 line workers of the Lines Organization field groups within the Operations Services organization work from six distribution lines shops in the Northern Region and eight in the Central Region. Another two traveling distribution construction crews and two transmission line shops exist as well. Line workers perform line inspections and maintenance, and they conduct repair work on direct buried URD cable, pad mount transformers, and streetlights. Distribution technicians in the engineering group conduct pad mount transformer inspections.

JCP&L's Operations Support organization also has responsibility for inspections and maintenance of substations, relays, ducted underground cables, and the low voltage networks. The substation field organization has three shops in the Northern Region and four shops in the Central Region. Among these substation shops are cable crews and relay technicians. Operations Services has 154 UC&M (substation) mechanics, an increase of 13 FTEs since 2017, and 26 relay technicians – three more FTEs than in 2017.

FirstEnergy Transmission organizations have responsibility for planning, designing, engineering, operating, and inspecting JCP&L's transmission and sub-transmission lines, but the JCP&L Operations Services organization provides two dedicated transmission line crews for physically maintaining those lines, and it provides two Line Inspectors for the sub-transmission system. The FERC-authorized transmission tariff addresses recovery of costs for the work on the JCP&L system. FirstEnergy Substation organizations have responsibility for planning, designing, and engineering JCP&L's substations and for the inspection and maintenance costs associated with the transmission and sub-transmission equipment in those substations. However, JCP&L conducts the inspections and maintenance of all substations, with cost recovery similarly occurring under the FERC-authorized transmission tariff.

f. Distribution Vegetation Management

The JCP&L Forestry Services organization has responsibility for scheduling, inspection, and oversight of the distribution vegetation management program (VMP) activities. Foresters annually plan and schedule cyclical tree trimming work based on prioritized circuit lists provided by the reliability engineering organization.

The JCP&L Regional Operations Support Director has responsibility for sub-transmission and distribution vegetation management. The JCP&L Forestry Services Manager reports to this Director, and the organization includes a supervisor, 11 foresters (nine of which are certified utility arborists) and an analyst spread over the Northern and Central Regions. The foresters, familiar with local tree species, analyze tree-related reliability data, determine when trees should be removed, and continually monitor tree clearances in their assigned areas. The JCP&L foresters review post storm tree-related outages and comply with directions from municipalities and shade tree commissions in executing their work. The forestry contractors notify customers and property owners about trimming and obtain permissions for tree removals on a tree-by-tree basis. They also work with the New Jersey Department of Environmental Protection (DEP) when trimming and removing trees on state owned property, and they ensure that tree crews comply with applicable state forestry regulations. As required by Order dated April 23, 2014 in BPU Docket No. EO11090543, Forestry Services investigates tree outages affecting 500 or more customers or lasting more than three hours.

Contractors directly supervise their vegetation crews; JCP&L's arborists work with those supervisors to ensure accomplishment of scheduled work and to verify trim compliance with standards and the appropriate maintenance cycles. Management bids and awards vegetation contracts, using lump sum pricing for circuit trimming and unit prices for tree removals. JCP&L has agreements with seven or eight certified vegetation management contractors who offer about 120 vegetation crews that routinely work on JCP&L facilities. Each crew uses two or three

trimmers, and often work together to minimize the road blocking durations. Some contractors use separate crews for brush spraying and removal, while others use the same personnel for both activities. These crews are also available for storm work, and if more are needed, FirstEnergy Service Company can seek to arrange for crews from the other FirstEnergy operating companies.

JCP&L’s arborists approve contractor timesheets and track scheduled and completed work using a software program. The contractor’s arborists first inspect all work, followed by JCP&L foresters, who inspect for compliance to the specifications. When necessary, the foresters require the contractors address all non-compliant work prior to payment. To improve trimming quality and verify completions, the foresters inspect 100 percent of contractor work and conduct weekly audits of the work and its costs.

g. Distribution Reliability Engineering Organization

JCP&L approaches the maintenances of system reliability comprehensively through a range of practices. Management monitors system reliability needs, based on outage causes monitored on a localized basis. JCP&L considers reliability improvement a focus since it became a FirstEnergy operating company in 2001. Early efforts to improve reliability included installation of fault locators on the overhead lines system and increasing the use of mid-circuit automatic circuit reclosers. The System Operations Engineering group has ultimate responsibility for designing reliability and resiliency programs, implementing those programs, and for monitoring outages and reliability metrics. The group operates under the Operations Services Director and the Engineering Manager.

JCP&L assigns reliability engineers to one or two specific operating districts. These reliability engineers monitor outage cause data, address customer reliability issues, and develop cost efficient solutions for mitigating reliability issues. Management compiles and distributes a reliability scorecard based on outage data each day, using a convenient dashboard display comparing daily JCP&L reliability performance to targets, and comparing that performance with results from the other FirstEnergy operating companies. The dashboard enables prompt detection of threats to meeting reliability performance targets set on an annual basis.

FirstEnergy’s reliability organization includes a transmission reliability manager, three engineers, and two analysts, a FERC/NERC compliance group, and a reliability compliance group staffed with a manager and three analysts. The JCP&L Engineering Services organization includes a general supervisor of reliability and assets (currently an open position) and a supervisor of engineering services, who leads JCP&L’s reliability engineering organization. The supervisor of Engineering Services leads the 11 district reliability engineers responsible for the 14 operating districts.

The Engineering Services organization also includes an analyst and a senior consulting engineer with extensive experience. The reliability group receives its outage and system condition real-time data from the company’s Power-On OMS system and its Plant Information system, which monitors voltage and current sensors in nearly all substations. On a monthly basis, a working group of reliability engineering and operations personnel analyze outages of more than 125,000 CMI to identify potential mitigating operations and system condition improvements. Local reliability

engineers investigate smaller outages on an ad hoc basis, but without a formal outage size or duration threshold.

The district reliability engineers and engineering management, including the Operation Services Director, routinely review data to identify cause trends and check for erroneous data. Engineering management monitors daily SAIDI reports to identify weather-caused issues. Adjustments of OMS data occur, as necessary, to ensure accurate reporting of blue-sky, minor weather, and excluded major data. All reliability personnel and management have direct access to the FirstEnergy reliability dashboard and the underlying data.

Operating company reliability engineers from across FirstEnergy conduct peer group meetings two to four times each year to discuss systematic equipment issues, technologies, and costs. Local reliability engineers and their supervisor meet weekly to discuss common and specific issues. District reliability engineers follow up on outages and customer issues, inspect locations, and working with district managers and supervisors develop proposed solutions. Generally, outage mitigation work, such as spot trimming or replacing a recloser, secures approval by the manager and the engineering team and charging to a set of “Fix It Now” reliability blanket accounts that include both O&M and capital funds. These costs are allocated according to pre-set accounting department rules. The local reliability engineers work and communicate directly with customers to address reliability issues such as addressing customers experiencing multiple interruptions (CEMI).

h. Distribution System Capacity Planning Organization

JCP&L’s system demand has not been increasing overall, but several areas have experienced growth, with new residential load a principal contributor. JCP&L’s Operations Services Engineering organization conducts distribution system capacity planning and distributed generation system planning. A planning engineer assigned to one or two operating districts monitors system needs on a localized basis. These system planners consider data that includes load growth and run load programs, using it to develop least cost solutions for meeting expected future needs in line with planning and operating criteria.

The distributed generation group accepts solar applications from residential customers, reviews the system effects of behind-the-meter solar generation, approves applications, and maintains a solar customer database. Distribution planning engineers undertake specific reviews for solar installations exceeding 300 kW. When new solar installations reach 3,000 KW, FirstEnergy-level planning personnel reviews them for transmission system effects.

Distribution Capacity Planning has responsibility for producing distribution circuit and substation peak load (demand) forecasts. JCP&L Operations Services has 20 planning engineers and technicians, a supervisor, assigning 3 distribution District Planning Engineers for each of the Central and Northern Regions. The planning engineers model the systems in their districts using FirstEnergy-provided CYME. All FirstEnergy operating companies use the same software. Integration of this software with the GIS allows graphic display of all circuits graphically and identifies voltages, line loading, phase balance, capacitor locations, and other circuit attributes.

The JCP&L system planning engineers access load data from multiple sources. These sources include real-time and peak circuit current and phase balance readings and transformer load tap changer (LTC) indicator positions, entered each month by substation inspectors into the equipment maintenance system (CASCADE via digital recording devices). This system feeds into the load flow analysis program (LFDMS). Planning engineers test peak circuit load data trends for accuracy by comparing CASCADE data to separately collected SCADA/PI Historian data. Planning Engineers use the LFDMS data to track load changes caused by new loads, by permanent load transfers, or by temporary load transfers driven by equipment outages for repairs or maintenance. The Planning Engineers develop reports for load transfers and new loads.

Planning Engineers use the circuit and substation demand growth data obtained from the LFDMS system, as gathered by the monthly substation inspections and the PI Historian data, along with:

- Historical load data,
- SCADA load profiles
- Combined observations of DCC operations, local planning engineer, customer support, area manager, and line manager and supervisor regarding possible criteria violations
- Forecast information from economic development groups (*e.g.*, the New Jersey Builder's Association)
- Predicted new business data from JCP&L's New Business Group.

Planning Engineers enter the expected load changes into the CYME circuit modeling program to identify potential planning and operating criteria violations for circuits and substations. They also use the CYME to model possible solutions for criteria violations, such as load transfers and installing step up transformers.

Planning Engineers integrate a weather factor for those circuits where increased loads are forecasted. To account for the possibility of unusually hot weather for several days leading to a peak load day, the planners adjust the increase in the calculated forecast peak load, based on the last 5 -years' peak load days weather, for an 80 percent chance that the weather conditions will not cause the actual peak load to be higher than the weather-adjusted forecasted peak load. This is called 80/20 weather normalization. However, even if the actual peak load is higher than the adjusted forecast load, JCP&L circuits can withstand excess loading for short time periods.

The six District-assigned system planning engineers also have responsibility for conducting field audits to verify GIS data and mapping accuracy, including circuit configurations, phasing arrangements, and asset conditions. Observations about these characteristics prove especially important following major storms, permitting local system component reconfiguration to assist in restoration activities. Planning engineers review the peak circuit load data trends for accuracy, using separate SCADA/PI Historian data. These six planners also work with area managers, district managers, line supervisors, customer support, and economic development groups to identify sources of new loads and possible planning or operating criteria violations, in order to develop alternative load management solutions for their districts:

FirstEnergy provides training for and supports users of the CYME circuit modeling software and LFDMS load flow software used in all ten operating companies. Two FirstEnergy planners support all ten FirstEnergy operating companies with (Electric Power Research Institute) EPRI

collaboration and with planning technology issues. They work from New Jersey locations. JCP&L engineering management meets with counterparts at other FirstEnergy operating companies four times a year; they also meet on an ad hoc basis with other counterparts from New Jersey's other electricity distribution companies to identify and mitigate system operations issues.

i. Safety

In 2019, JCP&L management intensified safety training and safety procedures compliance monitoring. Management provides annual refresher training to every crew member using its "manual of operations" as a reference, and the crew supervisors are required to review crew worker job safety practices, including the required use of personal protective equipment and compliance to grounding, switching, and tagging procedures for each job. Supervisors are also required to ensure that all crew members understand and conduct their work consistent with the company's safety practices. Management also increased their attention on compliance with all traffic laws and preventing vehicle accidents. The Operations Services (lines) and Operations Support (substations) organizations experienced 13 OSHA reportable injuries each year from 2017 to 2019. In 2020, recordable injuries decreased to 8 and that improved performance has continued into 2021.

4. *Fuels Management*

EDCs in states that have restructured electricity markets (like New Jersey) procure the energy and capacity required to serve retail customers who do not choose a competitive supplier through a combination of Non-Utility Generator (NUG) contracts, bilateral contracts with power producers or energy traders, day-ahead and real-time energy purchases from Independent System Operator (ISO) operations, and supply auctions typically known as Basic Generation Service (BGS), Standard Offer Service (SOS), or Provider of Last Resort (POLR) auctions. In New Jersey, supply for each EDC's retail load comes from New Jersey's BGS Auction process. In 2021, JCP&L sold its 50 percent interest in the Yards Creek pumped storage hydroelectric facility, which in typical years produced a modest net generation output for the total plant of 200,000 to 300,000 MWh. New Jersey retail customers may also opt out of supply service from their EDC and procure their energy from a third-party supplier (TPS). The EDC still delivers the energy to these customers.

The New Jersey BGS Auction process is a sophisticated annual process that secures full requirements (100 percent of retail customer load) through a descending clock auction format. A subsequent, chapter of our Phase Two report (*Power Supply and Market Conditions*) addresses the results of this process; all of JCP&L's energy and capacity and is procured through this process. JCP&L and the other New Jersey EDCs annually submit a joint proposal to the BPU seeking approval of the auction process for use in procurement. A third-party consultant administers the auction while a separate third party consultant serves as the auction monitor.

As of the divestiture of Yards Creek in 2021, JCP&L holds no power generating facilities. Accordingly, JCP&L holds no fuel inventory or related procurement processes. Accordingly, it has no Fuels Management program.

JCP&L also has no NUG contracts, its final one expiring in 2017. From this point, all of JCP&L's power supply comes from the NJ BGS Auctions, a process we address in Phase Two of this report.

The last of 13 NUG contracts in which JCP&L was a buyer was with Manchester Renewable Power Corp. (MRPC) which terminated on February 8, 2017.

Prior to the termination of the MRPC NUG contract, JCP&L had regularly initiated efforts to mitigate excess (above-market) costs related to NUG output. Termination of MRPC ended the need for mitigation efforts and the associated mitigation reports that JCP&L had previously submitted to the BPU. JCP&L's mitigation reports indicate that towards the end of the MRPC contract, the environmental attributes from the MRPC contract had brought the market value of the output more in line with contract prices, and in fact may have made the contract above-market due to REC prices.

C. Conclusions

1. The FirstEnergy and JCP&L Operations organizations working in cooperation have a structure, alignment and level of experienced resources and they use methods, practices, and systems sufficient to identify and plan comprehensively and appropriately for meeting system needs unique to JCP&L.

The organizations and individuals responsible for assessing the condition and needs of New Jersey's electric infrastructure regularly employ comprehensive, objective, and quantifiable performance measures to their assessments. The resources applied to JCP&L-specific system needs are sufficient in number, experience and expertise. The division of responsibilities between JCP&L and FirstEnergy promote dedicated attention to the New Jersey system, while also providing additional support, synergies, and back-up resources and systems available to the parent company. The performance expectations and criteria used appropriately address New Jersey system performance and cost issues.

FirstEnergy provides many functions in common to support and in some cases to directly manage activities common to its ten operating companies, offering an ability to combine resources to reduce total personnel numbers, to permit internalizing specialized skills that smaller enterprises must contract with outsiders to secure, to gain efficiency and performance enhancement through the development and use of standardized methods and procedures, and to facilitate cross-use of personnel when emergencies strike a part of the region FirstEnergy serves.

Work management comprises an important example of benefits produced by the sharing of responsibilities between FirstEnergy and JCP&L, with the centralized FirstEnergy staff providing and supporting the standardized maintenance programs and work management processes and technologies. Transmission and substation planning, engineering, capital portfolio services, laboratory services, and the provision of subject matter experts to evaluate equipment conditions provide further examples of synergies from the centralized model. FirstEnergy supplements storm preparedness and response in JCP&L and the other operating companies by providing weather forecast services and arranging for storm management and support personnel and organic utility and contractor line and tree resources to be shared by the affiliate companies during emergencies. FirstEnergy also provides multiple back up facilities for the DCCs.

2. FirstEnergy has located primary responsibility for New Jersey operations management within JCP&L, which has an organization, resource alignment and numbers sufficient to ensure safe, reliable, and economical service.

JCP&L's Operations organizations have responsibility for all distribution engineering functions including system planning, budgeting, maintenance and reliability programs, and the distribution vegetation management program. Management appropriately staffs these organizations. The fourteen lines shops and seven substation shops have responsibility for conducting and completing all routine and emergency distribution, subtransmission and substation field work. The shop staffs include appropriate numbers of managers, planner/schedulers, job layout techs, shop technicians, mechanics, supervisors, and crews and use FirstEnergy provided work management technologies to design, plan, schedule, and track jobs and job performance.

The JCP&L Forestry Services organization has responsibility for scheduling, inspecting and monitoring of the distribution vegetation management program (VMP) activities and are staffed appropriately to execute those functions.

3. JCP&L's lines and substation districts employ a structure and staffing sufficient to provide for timely completion of inspection and maintenance program work, new business service extensions and enhancements and emergent repairs and corrective actions.

The districts employ FirstEnergy's work management job planning, scheduling, and tracking technologies. Line and Substation district managers and planners/scheduler use OMS data, CREWS distribution job preparation software, CASCADE substation job awareness and tracking software, CLICK job scheduling and tracking software, and weekly crew assignment spreadsheets to administer the combined distribution system workload. We found the organization structured appropriately to coordinate inspection and maintenance job preparation and completion, to make new business connections, and to manage emergent events and repairs.

Data indicates completion of essentially all assigned inspections and preventive and corrective maintenance work since 2017 and timely completion of new business extensions and emergent work.

4. FirstEnergy has effectively structured organizations to assist JCP&L with required inspection and maintenance engineering, analysis and reporting capabilities and provides effective work management processes and technologies for use in inspection and maintenance activities.

FirstEnergy engineering organizations support JCP&L inspection and maintenance activities with engineering expertise. FirstEnergy also provides equipment experts who analyze inspection and testing data. FirstEnergy's Beta Laboratory performs substation equipment oil and dissolved gas tests for JCP&L and the other operating companies.

FirstEnergy's Work Management organization provides software technologies used for designing, estimating, and preparing jobs, and the software programs for scheduling jobs, tracking jobs, and for monitoring job performance. Work Management analysts monitor job performance, assist management when job execution or schedule performance falls short, and provide long-term

resource requirement forecasts for management based on predicted work hour requirements versus available personnel resources.

5. FirstEnergy has effectively structured organizations to provide JCP&L with vegetation management standards and program management tools and practices.

FirstEnergy supports JCP&L distribution and sub-transmission vegetation management standards, practices, and procedures. It consults with JCP&L on BPU compliance issues, assists in contracting with certified and vetted vegetation contractors, and provides and maintains the VGMS software program used to schedule vegetation management work, to record contractor timesheets, and to track completions. FirstEnergy provides monthly reports and monitors JCP&L vegetation management costs and progress and conducts monthly vegetation management budget meetings. FirstEnergy also arranges for the sharing of vegetation management crew resources among the operating companies to assist in major storm restoration operations.

6. FirstEnergy has effectively structured organizations to provide JCP&L with reliability engineering and reporting assistance.

FirstEnergy supports the reliability technologies provided to JCP&L, and tracks and reports reliability performance for JCP&L and the other operating companies. FirstEnergy organizes collaboration among its system's affiliate reliability engineers and JCP&L actively participates in those forums. FirstEnergy compiles and publishes a daily dashboard comparing reliability performance metrics with targets. The dashboard tracks how well year-to-date performance supports achievement of year-end targets. FirstEnergy also provides software technologies to monitor outage and reliability status and historical performance effectively.

7. FirstEnergy has effectively structured organizations to provide JCP&L with system planning assistance and with load flow software technologies.

The FirstEnergy system planning organization provides training to and assists all ten operating companies with the CYME planning software, a standard distribution circuit analysis program. Two FirstEnergy planners are located in New Jersey, but they support all ten FirstEnergy operating companies with EPRI (Electric Power Research Institute) collaboration and with planning software issues. FirstEnergy system planning management conducts JCP&L's system wide energy and demand forecasts, while JCP&L planning engineers conduct the more localized circuit and area demand forecasts.

8. FirstEnergy's centralized Supply Chain organization appropriately supports the resourcing of vendors, materials, and contractors for JCP&L.

FirstEnergy Supply Chain selects vendors and contractors using competitive bidding and provides materials purchasing, warehousing, and stores functions for JCP&L. Supply Chain's Utilities group sources materials and services for all operating companies. Supply Chain embeds within the JCP&L districts Stores personnel acting as liaisons between the district managers, layout technicians, planner/schedulers, and supervisors and the centralized warehouse in Pennsylvania. Supply Chain's procuring of contractors for JCP&L utilizes standardized evaluation criteria that include safety records, environmental compliance, schedule adherence, delivery performance, contractor and subcontractor diversity, payment terms, and each contractor's specific experience and capability.

9. Responsibilities for planning, scheduling, and tracking crew work scheduling and completion are appropriately shared and executed by FirstEnergy and JCP&L.

Embedded FirstEnergy Service Company employees assist JCP&L lines and substation management in tracking performance, identifying issues, and recommending improvements. FirstEnergy performs centralized work tracking and metrics functions, and JCP&L is locally responsible for work planning, scheduling, and work execution functions. Management has not established specific Key Performance Indicators for inspection and maintenance program performance; however, it employs comprehensive and transparent resource management methods. Its processes ensure tracking and completion of regulatory-required inspection and maintenance tasks and other critical work in the field. The Work Management organization effectively organizes, maintains, and monitors work conducted by the line and substation districts. The line and substation districts use sound standardized tools for scoping jobs, estimating labor hours, assigning materials, and for planning, scheduling, tracking, and monitoring.

JCP&L has appropriate resource management processes to effectively identify field staffing needs and recruit, hire, train, develop and deploy qualified employees. Management recruits new craft hires from contractors, other utilities, and from their own internal training and development schools. JCP&L selects apprentice line and substation workers from among the graduates of FirstEnergy’s two PSI schools, following a rigorous selection process which includes background checks, applicant interviews, and written and hands-on skills demonstration tests. The process for hiring journeyman craft personnel from contractors and other utilities includes similarly appropriate vetting and qualifications testing.

10. FirstEnergy employs an appropriately centralized and staffed Transmission Vegetation Management organization and effectively supports JCP&L’s Distribution Vegetation Management function with standards, program management tools and practices.

FirstEnergy’s vegetation management organization has responsibility for budgeting transmission and sub-transmission vegetation management, including tree trimming, tree removal and brush management for all transmission lines and rights of way in New Jersey. Their roles include planning and managing transmission vegetation work and complying with the regulatory reporting requirements of BPU and NERC/FERC. All FirstEnergy foresters are certified utility arborists. JCP&L’s Forestry Services Organization oversees and executes distribution and sub-transmission vegetation management. The FERC-authorized transmission tariff governs recovery of the costs for JCP&L sub-transmission vegetation management work.

FirstEnergy supports JCP&L distribution and sub-transmission vegetation management standards, practices, and procedures. It consults with JCP&L on BPU compliance issues, assists in contracting with certified and vetted vegetation contractors, and provides and maintains the VGMS software program used to schedule vegetation management work, to record contractor timesheets, and to track completions. FirstEnergy also coordinates the sharing of vegetation management crew resources among the operating companies to assist in major storm restoration operations.

11. JCP&L has no fuel management processes or need for one anymore.

JCP&L neither owns nor operates power plants. All of JCP&L's power is supplied by the BGS Auction process. Its last NUG contract expired more than four years ago, and it sold its last remaining interest in supply facilities (Yards Creek).

D. Recommendations

We have no recommendations in the Operations Organization area.

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Chapter III: System Planning and Load Management

A. Background

Utility electric system designs, and operating and system planning criteria, are guided by the National Electrical Safety Code (NESC) as well as New Jersey statutes and BPU orders. Transmission designs must comply with FERC/NERC requirements. Design criteria should also be guided by the condition of the existing electric system and its components. Much of JCP&L's distribution and sub-transmission electric system is aged, much traverses rights of way and roadsides in areas of high tree densities, and much has exposure to damaging car-pole accidents. This combination results in high level outage risk from tree contact, equipment failure, and third party damages.

Therefore, sound system design criteria for these conditions should include automatic sectionalizing and reclosing schemes on main and lateral circuits and should include n-1 system configurations that are designed to isolate faulted line sections or faulted substation transformers and transfer unaffected circuit loads or transformer loads to other circuits or to other substation transformers. The circuits and transformers should have the capacities to carry these temporary transferred loads from another circuit or transformer. Examples of these configurations include smart grids, manual and automatic circuit tie schemes, the use of primary circuit and secondary circuit networks, and the use of circuit conductors and substation transformers installed with planned excess capacity.

Circuit voltages and loads should be managed using appropriate conductor sizes and appropriate placement of capacitors, voltage regulators, step up transformers, and transformer load tap changers. The application of distributed generation also reduces circuit and transformer loads.

A utility's system planning organization should use engineers to monitor operating conditions and communicate with local management, new business personnel, distribution operations, and customers, to identify early where evolving loads threaten violations of design and operating criteria. System energy and system demand forecasts should be based on a comprehensive set of data using probabilistic methods including normalizing weather data. To ensure that an electric system operates within design criteria, a utility must accurately forecast future peak loads, at least for areas where new loads will be added to circuits and substations. Even where overall system loading is not increasing, forecasting future annual peak loads (demand) for specific circuits serving areas of load growth should be regular and systematic. Those forecasts should include adjustments for likely hottest weather before and during the peak load day, and they must be reasonably accurate so that the capital is efficiently spent.

The methods for identifying the need for a growth-related capital project, for developing comprehensive solutions, for estimating costs, and for vetting, prioritizing, and authorizing proposed capital projects, should be thorough and consistent. Methods should be in place to manage capital construction projects and to control variations of actual costs versus the estimated costs that were used during the prioritization process.

Management decisions about capital expenditures to address New Jersey facility operations and capital needs should seek to optimize New Jersey system performance and New Jersey customer costs.

To evaluate JCP&L’s design criteria, its methods for system planning and load forecasting, and its methods for selecting capital projects for resolving criteria violation, Liberty examined management’s:

- Electric system design and operating criteria
- System configuration effect on reliability
- Peak loads
- Distributed energy resources
- Statistically determined system energy and system demand forecasting
- Capacity planning organization
- Load information sources and accuracy
- Distribution demand forecasting
- Peak load forecasting accuracy
- Circuit and substation transformer loading
- Process for developing solutions to criteria violations
- Large customer connection process
- Capital budgeting process
- Capital portfolio management
- Management of capital projects.

B. Findings

1. JCP&L Electric System Design and Operating Criteria

An electric utility electric system should be designed and constructed to comply with the National Electrical Safety Code (NESC), New Jersey Administrative Code (N.J.A.C.), and Federal Electrical Regulatory Commission (FERC), as applicable. It also, should be designed and constructed to provide safety and reliability.

FirstEnergy developed the distribution planning criteria for JCP&L but modified them to comply with N.J.A.C. requirements. The NESC and New Jersey statutes require JCP&L to provide safe facilities and provide electric service within specific limitations. JCP&L system designers apply these requirements and system planners consider violations to the following requirements when determining the need for capital projects:

NESC Compliance - - The design standard used for JCP&L facilities comports with the code NESC standard. Management constructs its system according to Grade C and Grade B line construction, which includes stronger poles (class 2 poles replacing class 4 poles) and double cross arms, double insulators, and guyed terminal poles at crossings over main-line railroad tracks, over limited-access highways, and where spans cross each other. Management also incorporates several safety factors in line and pole calculations to provide extra strength. Installing stronger-grade poles than required and implementing the ground-line inspection program in place for many years have helped ensure that poles continue to meet strength requirements as equipment ages. These

requirements address strength required to withstand at least 0.5 inch of radial ice, with a wind loading of 4 lbs. per square foot, at 0° F. These construction requirements, however, are not intended to provide distribution line and pole strengths necessary to withstand conditions exceeding those expected worst weather conditions, or to withstand the weight of fallen trees.

2. *Compliance with N.J.A.C. Title 14:5-3.2 Electric Service Requirements*

a. Standard Voltage

Management maintains standard voltage levels at customer meters. Delivered secondary voltage cannot vary more than five percent above or below the standard voltage over a five-minute test period, to the extent not caused by events outside company control or by customer-apparatus operation violating utility rules. Unloaded voltages at services cannot vary more than 15 percent between phases. JCP&L uses load tap changing transformers (LTCs), line voltage regulators, capacitors, and step-up transformers to maintain distribution feeder voltage above the minimum acceptable level and below the maximum levels. Circuit conductors sometimes require upgrades (more capacity) to prevent unacceptable voltage drops on long, densely populated feeders, especially when those long circuits must also have the capacity to accept load transfers from adjacent feeders.

JCP&L system planners, using CYME system modeling software, conduct load flow and voltage duty calculations for new loads of greater than 300 kW connected to the system. FirstEnergy transmission planners also conduct sub-transmission and transmission system studies when new connected load exceeds 3,000 kW. Based on the studies, where existing capacity or feeder voltage control devices do not prove sufficient to maintain standard voltage to customers, JCP&L may transfer loads between phases or between circuits, step up the distribution voltage on long lines, or upgrade conductors and substation transformers to provide greater capacity.

b. Load Management

JCP&L manages circuit loads by several means. The distribution control centers (DCCs) monitor the circuit and substation loads and other conditions. System planners forecast peak load increases and take actions to prevent operating criteria violations. System Operations permits equipment to be loaded to engineering limits that allow acceptable loss of life, and the system design includes capacitor installations to reduce reactive current loads on the circuits and substations.

JCP&L normally operates its distribution circuits well within 100 percent of published ratings, but permit circuits loadings to 125 percent for extended periods, and up to 140 percent for two hours, when temporarily transferring loads. Those temporary overload situations undergo continuous monitoring until control center operators (DSOs) and distribution engineering and operations take actions to relieve the loading issue and return the system to normal configuration. JCP&L bases its emergency ratings on factory heat run testing or on loss-of-life studies, using industry-accepted transformer temperature versus transformer loss of life calculations.

In 2020, JCP&L operated, for short periods during load transfers, a few circuits and substation transformers at more than nominal 100 percent ratings. These temporary operations involved 24 of the 1,145 circuits and 28 of the 514 substation transformers. Loadings remained within the operating criteria. The DCCs monitor the status of equipment operating above ratings, using

substation inspectors to observe and record real-time transformer winding temperatures during emergencies and infrared thermographic inspection equipment to check for overheated connections on the circuits.

Management employs 4,920 capacitor banks to reduce loading and maintain voltage on the distribution system. Two kinds of power flow on electric systems: (a) *Real Power*, which does work and for which residential customers pay, and (b) *Reactive Power*, which does not do work, but which equipment like induction motors, air conditioners, and transformers require for proper functioning. Generating stations can provide a source of reactive power. However, the transmission and distribution of reactive power causes energy losses and voltage reduction along the way. Alternatively, this reactive power can be supplied by capacitors connected to the distribution system at locations close to the loads which use the reactive power, resulting in fewer overall energy losses. JCP&L installs capacitors both in substations and on feeders to reduce current at various locations on the system. Additionally, JCP&L also has installed large 34.5 kV reactive flow compensation assemblies at two transmission/distribution substations. These assemblies are made up of large numbers of capacitors and reactors and serve to automatically and quickly control sudden and large changes in reactive power flow on the sub-transmission and transmission systems.

c. Reliable Service

JCP&L's engineering organization seeks to meet or outperform targets set by the statute and the BPU. JCP&L addresses specific reliability issues by annually addressing the worst performing circuits, by working with customers experiencing multiple interruptions, by installing circuits with the capacity to be tied together, by conducting enhanced Zone 1 tree trimming on all circuits, by conducting enhanced Zone 2 tree trimming on selected circuits, and by installing mid-circuit reclosers, automatic circuit tie schemes, smart grids, and automatic reclosing electronic fuses. We addressed these activities in the *Reliability Programs and Smart Grid Activities* chapter. The 2019-2020 Reliability Plus projects initiated or accelerated some of these activities, as that chapter describes.

3. *Distribution System Configuration*

JCP&L has n-1 redundancy or distribution circuit tie capability (more than one source available to serve customers) on nearly all (1,150 of 1,171) distribution circuits. Many circuits have more than one circuit tie connection; about 2,500 circuit ties exist on the 1,150 n-1 circuits. The remaining 21 circuits serve in fringe areas where ties with other circuits are not readily available. Some circuits have automatic tie schemes, some have remote control tie schemes, and some have manual tie switches requiring intervention in the field by a troubleshooter.

By 2000, management had already installed tie switches on many circuits. In the early 2000s, when JCP&L came into the FirstEnergy group of electric utilities, JCP&L began replacing main-line fuses with mid-circuit reclosers where it determined that these reclosers were cost-effective for improving reliability. These mid-circuit reclosers allow line faults downstream of the reclosers to be cleared while continuing service to customers upstream from the mid-circuit recloser. Management continued installing tie switches and constructing or upgrading its circuits with larger conductors to allow the transfer of load between circuits.

Management later began replacing circuit tie switches with reclosers that automatically open and close in cooperation with each other to transfer loads from one circuit to another. These schemes are called “automatic circuit tie schemes.” If the Zone 1 portion of a circuit faults, the Zone 2 portion can automatically tie itself to another circuit. Zone 1 comprises the main-line circuit from the substation breaker to the first recloser. Zone 2 comprises the main-line portion from the recloser to the end of the circuit. Some circuits have more than one tie switch or tie recloser, depending on their complexity. Prior to 2014, JCP&L had installed 24 automatic circuit tie schemes and added three more schemes in 2014. As of the end of 2020, JCP&L increased that number dramatically, having installed 116 automatic circuit tie schemes. Of the 116 automatic circuit tie schemes installed, 82 also have SCADA control. JCP&L is in the process of installing SCADA control on the remaining 34 circuit tie schemes. JCP&L also installed even more sophisticated smart grids on two circuits supplied by the Morristown Substation and on one Ridge Substation circuit. All the circuits and distribution transformers involved with the automatic circuit tie schemes are rated for the additional transferred loads.

Many faults have only a momentary duration (*e.g.*, when caused by wind-blown branches contacting conductors), but the resulting blown fuses from even a fleeting contact cause customers on lateral feeders to experience sustained outages, and restoration depends on the arrival of troubleshooters at the location. To reduce customer outages on lateral circuits (branches from the main lines), JCP&L began installing advanced electronic fuse devices (Trip Saver II) in 2018 to protect main feeders from faults on the lateral circuits. The older, “one-shot” fuses blow for both sustained faults and momentary faults on the laterals, whereas the Trip Savers can open and reclose up to four times before dropping permanently open. These open-reclose sequences allow a temporary fault to clear. The 2019 -2020 Reliability Plus program included additions of 777 Trip Savers.

Management has specified that newly installed or replacement transformers in distribution substations have excess capacity so that they can handle loads transferred to that substation’s circuits from circuits supplied by other substations.

4. JCP&L MW Peak Loads

The next table shows that customer numbers have remained nearly static overall. Customer numbers, however, have increased in some areas, especially within the Central Region.

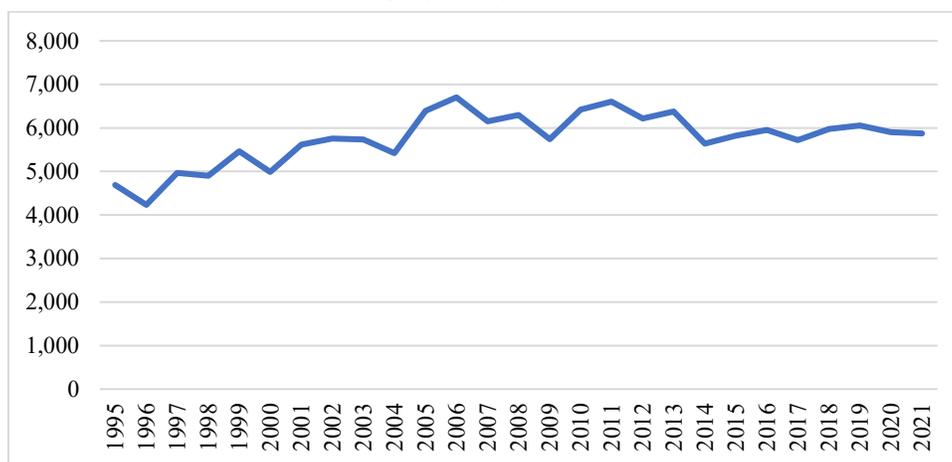
JCP&L Customers

Year	Northern Region	Central Region	Total
2010	459,805	636,598	1,096,403
2017	460,090	638,626	1,098,716
2021	464,921	660,310	1,125,231

The service territory’s pockets of growth include the Lakewood area. JCP&L’s system peak load has, however, decreased over the past 15 years. JCP&L peak loads occur during the summers, driven by air conditioning. Between 2014 and 2021, JCP&L’s annual peak load has been around 6,000 MW. The highest historical peak demands occurred in 2006, with 6,702 MW, and in 2011, with 6,604 MW. Since the 2014 and 2011 peaks, the highest loads experienced have ranged from

5,637 MW to 6,056 MW. The peak load so far in 2021 reached 5,872 MW. The next chart reflects no system load growth since 2013.

JCP&L Peak MW



5. Distributed Energy Resources

Other than a general lack of substantial new loads on the system in recent years, a primary driver for the decrease of the overall peak demand since 2013 has been the widespread installation of behind-the-meter and network-connected wholesale distributed generation. Between 4,000 and 5,000 of JCP&L customers install solar panels each year. The resulting current total of more than 40,000 net metered customers generate a peak of about 750 MWs from behind the meters. Additionally, JCP&L has about 360 MW of wholesale solar generation connected directly to the grid. Management indicated that because most of its system is not highly loaded, it has not yet experienced any system operations problems caused by the behind-the-meter and wholesale solar generation. JCP&L participates in periodic meetings with other New Jersey utilities to discuss common operational issues associated with distributed energy sources.

6. System Demand Forecasting

The FirstEnergy Load Forecasting organization uses a SAE (Statistically Adjusted End Use) model to forecast residential and commercial heating, cooling, and other energy usage. The program models changing energy intensities, appliance and equipment saturations, and economic drivers. Many factors are included, such as historical sales patterns, weather history, economic data, efficiency standards, numbers of customers, energy prices, and billed days to forecast future cycle sales. FirstEnergy Load Forecasting Engineers adjust the results of the model to account for the impact of behind-the-meter generation and for electric car saturations. To forecast industrial energy usage, these engineers input into the SAE model a combination of historical cycle sales, economic data, industrial expansion reports, projections of significant changes in monthly sales, and behind-the-meter generation. Load Forecasting also models the net energy usage change caused by the increased numbers of street and highway lights, and by the reduced energy usage of modern LED streetlights.

To forecast the annual peak load on JCP&L’s overall system, FirstEnergy uses the weather data and its energy forecast as drivers of retail demand, allowing the inclusion of economic data in the

model. The forecasted system demands employ probabilistic “normal” peak-setting temperatures, where there is a 50 percent chance that the peak-setting temperature will be higher and a 50 percent chance that the peak-setting temperature will be lower.

7. Distribution Capacity Planning Organization

JCP&L’s Operations Services Engineering organization conducts distribution system capacity planning and distributed generation system planning. The distributed generation group accepts solar applications from residential customers, reviews the effect of the behind-the-meter solar generation on the system, approves applications, and maintains a solar customer database. Distribution planning engineers review the effect on the system when solar installations exceed 300 kW. FirstEnergy planning reviews the effect on the transmission system for solar installation greater than 3,000 kW.

JCP&L’s Distribution Capacity Planning department has responsibility for producing distribution circuit and substation peak load (demand) forecasts. JCP&L Operations Services has 20 planning engineers and technicians, plus a supervisor. These resources include three distribution district planning engineers for the Central Region and three district planning engineers for the Northern Region, each responsible for one to three operating districts. The planning engineers model the systems in their districts using FirstEnergy-provided CYME software. The load flow software is used by all FirstEnergy companies. CYME is integrated with the Geographic Information System (GIS), and it displays all circuits graphically and identifies voltages, line loading, phase balance, capacitor locations, etc. It is available and used by all planning engineers. The district planning engineers assist each other and discuss and resolve system planning issues.

The six district system planning engineers have responsibility for conducting field audits to verify GIS data and mapping accuracy, including circuit configurations, phasing, and asset types and locations. Such factors prove especially important following major storm restoration work. Planning engineers review the peak circuit load data trends for accuracy, using separate SCADA/PI Historian data. Additionally, these planners work with area managers, district managers and line supervisors, customer support, and economic development groups to identify possible new loads, possible criteria violations, and a range of potential solutions for their districts. The district system planners have responsibility for GIS accuracy, for identifying future changes in loading, for identifying possible criteria violations, and for developing and presenting possible solutions to criteria violations in each of their districts.

FirstEnergy Service Company provides training to and assists all ten utilities with the CYME planning software, a standard distribution circuit analysis program. Two FirstEnergy planners work from New Jersey locations, supporting all ten FirstEnergy utilities with EPRI (Electric Power Research Institute) collaboration and with planning technology issues. JCP&L Engineering management meets with other FirstEnergy utilities four times a year, and it meets ad hoc with other New Jersey utilities to identify and mitigate system operations issues caused by distributed generation.

8. Load Information Sources

JCP&L Planning Engineers access loading data from multiple sources for distribution system demand forecasting. Substation inspectors record each month into the CASCADE equipment

maintenance system real-time and peak circuit current and phase balance readings, as well as transformer load tap changer (LTC) maximum raise/lower indicator positions. The CASCADE system feeds into the LFDMS load flow analysis program. Planning engineers review the peak circuit load data trends for accuracy, by comparing CASCADE data to separate SCADA/PI Historian data. Planning Engineers use the LFDMS data to track discrete load changes caused by new loads, from permanent load transfers, or from temporary load transfers caused by equipment outages required for repairs or for maintenance. The Planning Engineers develop reports for load transfers and new loads.

9. Distribution Demand Forecasting

Management has used the same demand forecasting method for many years. System loadings have remained level and are expected to remain so in the near future. System planning therefore concentrates on conducting circuit-based planning, and sometimes on area-based planning, when new circuits and substation changes are involved. Primarily, the circuits with increasing loads serve new housing developments, especially in Lakewood and the Atlantic coast areas. JCP&L planning horizons are appropriately short, from one or two years for circuits, and from two to four years for substations.

Planning engineers use the circuit and substation demand growth data obtained from the LFDMS system, as gathered by the monthly substation inspections and the PI Historian data, along with:

- Historical load data
- SCADA load profiles
- The knowledge of DCC operations, local planning engineers, customer support, area managers, and line managers and supervisors of possible criteria violations
- Economic development groups, such as the New Jersey Builder’s Association
- Predicted new business data from the New Business Group.

Planning engineers enter the expected load changes into the CYME circuit modeling program to identify possible criteria violations for circuits and substations. They also use the CYME to help identify possible solutions for criteria violations, such as load transfers and installing step up transformers.

Planning Engineers integrate a weather factor for those circuits with forecasted increases in loads. To account for the possibility of unusually hot weather for several days leading to a peak load day, the planners adjust the increase in the calculated forecast peak load, based on the last 5 years’ peak load days’ weather, for an 80 percent chance that the weather conditions will not cause the actual peak load to be higher than the weather-adjusted forecasted peak load (termed “80/20” weather normalization). However, even if the actual peak load is higher than the adjusted forecast load, JCP&L circuits are designed and constructed to withstand excess loading for short time periods.

10. Peak Load Forecasting Accuracy

Planning engineers maintain a New Load Report to monitor the accuracy of their circuit peak load forecasts and to follow up when necessary. We reviewed the 2017 and 2018 forecasts for years 2019 and 2020, which included 129 circuits with expected and actual new loads for 2019 and 2020. We found that some peak loads had not occurred as expected, because of delays and load transfers

to other circuits. Nevertheless, most actual peak loads came close to or the same as the forecasted loads. Actual 2020 peak load exceeded the 2018 forecast (by 20 percent) for only one circuit - South Lakewood Circuit 67490. Management explained that the loads from smaller incremental increases from single-family home developments in the Lakewood area have been increasing faster in 2020 than previously forecast. To reduce the loading, management had transferred load to another circuit in 2021, and it plans to construct a line extension and effect another load transfer prior to summer 2022.

11. Developing Solutions to Criteria Violations

System planning functions include development of cost-effective solutions for preventing situations where design and operating criteria are violated. JCP&L district planners, sometimes with assistance of senior district planners or the supervisor, assess cases where their studies show that circuit or substation components cannot meet peak loads while operating within their established ratings. They outline candidate solutions, and work with field leadership and engineering groups to select preferred alternative solutions, and prepare recommendations for approval, prioritization, and eventual plan and budget inclusion. Management considers low-cost solutions, then high-cost solutions in roughly the following order:

- Changing transformer no-load taps
- Transferring load among feeders or substations
- Balancing loads
- Installing step-up transformers
- Improving power factor to increase voltage by installing capacitors or voltage regulators
- Install cooling fans to increase transformer capacity
- Replace voltage regulators
- Upgrade substation egress cables
- Transfer load to another feeder
- Reconductor feeder to increase capacity
- Construct a new circuit
- Convert feeder voltage
- Replace transformer
- Add a transformer
- Install new modular substation.

12. Large Customer Connection Process

When a prospective customer requests a new connection of at least 300 kW, distribution planning is involved, and if the new connection is greater than 3,000 kW, the FirstEnergy transmission planning also becomes involved. JCP&L personnel and the customer (usually a housing subdivision developer) meet to review the scope of the project, and JCP&L collects the cost to conduct the load flow and voltage studies. Planners then conduct the studies and develop the design and cost estimates for the customer's project requirements. Upon concluding an agreement for the construction cost, JCP&L collects the amount of the project cost from the customer. This includes costs such as installing larger conductors, and new circuits and substations.

Management holds the funds until the project becomes a capital investment, and JCP&L meets the customer needs. The customer's funds are returned after a predetermined period when the

customer is connected and consistently paying for the service under the appropriate Tariff. The holding of funds prevents a loss to JCP&L if the customer fails to connect or to continually use the service, after construction is started. Sometimes costs are prorated. If JCP&L installs a 10 MVA substation transformer (criterion minimum), but the customer only requires 5 MVA of load, the customer is only required to pay upfront for one-half the cost of the project.

13. Capital Budgeting Process

A utility's capital budgeting process should be based on implementing least cost projects which successfully comply with regulations or design and operating criteria, and to improve reliability for lowest cost. The project scope and estimated costs used for prioritizing a project in the portfolio should be reasonably close to the completed project actual scope and cost.

JCP&L follows FirstEnergy's corporate capital portfolio process for each capital budget category. All ten operating companies follow the same process. JCP&L's annual reliability capital portfolio development process includes an annual engineering and operations staff review of historical outage data, suggested solutions to improve distribution reliability, estimated reliability impacts of the proposed solutions, and conceptual cost estimates of each project by the distribution design staff. Engineering then ranks and prioritizes the projects based on cost/benefit analyses using estimated customer minutes of interruptions avoided per dollar invested. FirstEnergy's substation engineering and design department conduct a similar process for substation related design scopes and estimates.

Distribution load growth capital categories include distribution projects required to satisfy operating criteria conflicts, to provide for planned town and county roadway projects, to satisfy regulatory forestry requirements, and to satisfy expected new business needs. A JCP&L and New Jersey Department of Transportation (NJDOT) agreement allows the NJDOT to hire an approved contractor to complete JCP&L-designed line work, consistent with JCP&L's specifications to support road widening projects.

The capital planning budget categories include:

- *Forestry* – JCP&L Forestry's portfolio is based on satisfying mandatory annual tree trimming requirements. (Note: Vegetation management is all O&M beginning in 2021)
- *System Planning* – JCP&L's system planning projects portfolio is based on best solutions to address operating criteria violations.
- *Fix-it-Now and New Business* – JCP&L reserves a portion of each annual capital portfolio to cover expected and unexpected emergent capital work with scopes under \$50,000. The "fix-it-now" blanket budget covers emergent repair issues, and a new business blanket covers unpredicted orders for new business connections. JCP&L's New Business capital portfolio is based on requests from developers, from growth data provided by the New Jersey Builders Association, and from local knowledge gathered by External Affairs management. New Business planning is volatile and subject to market pressures. Sometimes planned large new business projects don't occur or are delayed for years. JCP&L management and engineering approve the work orders charged to the blankets, which include both O&M and Capital charges.

JCP&L distribution system capital portfolio planning begins from the bottom-up - - proceeding from district engineers, to engineering review, to JCP&L management review and approval, and finally to FirstEnergy Portfolio review and approval. Suggestions for distribution planning and reliability projects are initially identified by February of each year by district planning and reliability engineers, district managers and supervisors. Presentations of proposed initial designs are prepared along with estimated costs (often based on similar projects) and benefits. Each spring the engineers present their proposed projects to the JCP&L engineering team and leadership for in-depth review and vetting. After the initial review the engineers modify project scopes, designers work out more detailed project designs, and planning engineers determine internal resource and material requirements and costs, based on the CREWS project planning program and practical experience. Expected external costs are also included, such as hiring flagging contractors for work along busy roadways. By April, the fine-tuned projects are reviewed and prioritized again for review by the Director of Operations Services.

By the fall of each year, the engineering staff presents graphical charts and diagrams of the proposed capital projects, including priorities and justifications, to JCP&L senior management – president and vice presidents - who may require additional background information and justification. JCP&L senior management provides input during the capital prioritizing process before capital projects are submitted to FirstEnergy for final approval.

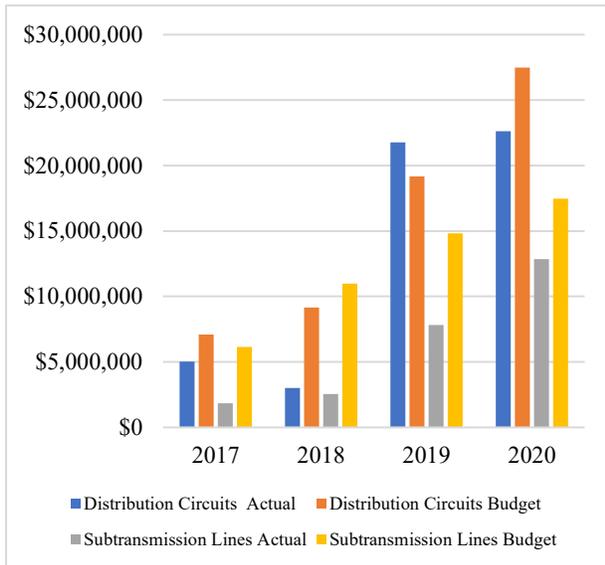
The JCP&L President, assisted by engineering, presents the distribution capital projects to the FirstEnergy Capital Portfolio Group, who review each capital project’s justification and costs. The Capital Portfolio Group, after questions are satisfied, approve acceptance of JCP&L capital projects for the following year or subsequent years. This same process is followed by all FirstEnergy utilities. Since 2017, all of JCP&L’s proposed capital projects submitted to FirstEnergy’s portfolio team have been approved.

FirstEnergy’s Transmission and Substation engineering organization follows a parallel process to approval, except that transmission and sub-transmission lines and transmission substation capital projects portfolios are developed, designed, and estimated (using a construction software program) by FirstEnergy engineering groups. Distribution substation capital project portfolios are developed, designed, justified, and estimated, by collaborative teams drawn from the JCP&L Operations Support (Substations) and FirstEnergy substations engineering organizations.

14. Capital Portfolio Management

The following charts show that JCP&L’s annual capital spending for its distribution circuits and FirstEnergy’s annual capital spending on substations have run close to the annual budgeted amounts since 2017. However, because FirstEnergy does not adjust budgets when projects are delayed, it appears to have been annually underspending its capital budgets for JCP&L’s transmission lines and sub-transmission line construction projects.

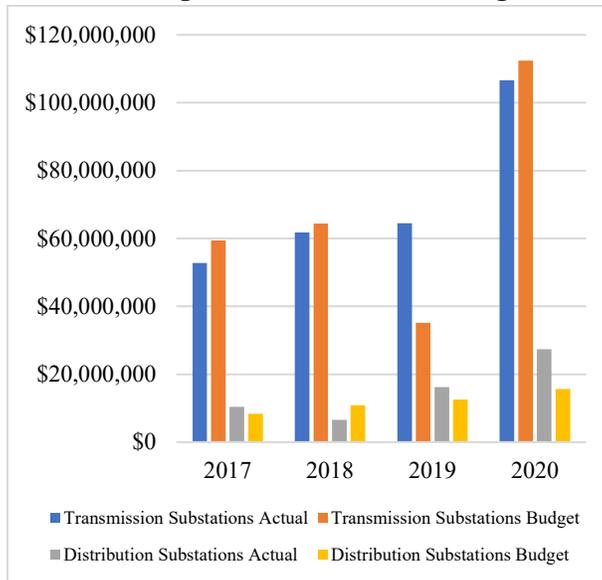
**Distribution and Sub-Transmission Lines
Capital Construction Budgets vs. Spending**



**Transmission Lines Capital Construction
Budgets vs. Spending**



T&D Substation Capital Construction Budget vs. Spending



The FirstEnergy Portfolio Management organization manages the overall capital spending budget and spending for the JCP&L transmission system, including the transmission and sub-transmission lines and substations, and other components such as cyber and physical security systems, and operations systems, etc. The Portfolio Management Organization has responsibility for managing the annual JCP&L transmission system capital spending and it is accountable for ensuring that the capital spending is best used within the limits of the annual overall JCP&L transmission system capital budget. It manages the funding of 50 to 200 capital construction projects each year.

The overall annual JCP&L transmission system capital budget is based on the totals of the estimated annual cost of the combined proposed transmission system projects planned to

commence, be worked, or be completed for that year. The specific transmission and sub-transmission lines construction budgets for the projects that could ideally commence during the budget year are included as place markers in the transmission lines budget. Sometimes budgeted funds are not spent because of permitting, siting, equipment delivery and other delays.

Because of project delays, specific project budgets sometimes find themselves repeated in more than one year's capital budget. The portfolio organization does not cancel approved projects, but the engineering organizations may decide to change the scope of a proposed project or include a project within another project. Unspent funds can be moved from one portfolio category to another. The controlling capital spending limit is the overall JCP&L transmission system budget. The current total JCP&L transmission system budget and spending is about \$200 million.

The portfolio organization working with the project management organization decides where unspent capital funds originally budgeted for transmission and sub-transmission lines are needed. Portfolio management does not typically include contingencies for unplanned projects within the budgets. Portfolio management, engineering, and project management work together to ensure that NERC required capital transmission projects are funded and expedited, and that delayed capital projects are re-budgeted for following years.

The Portfolio Management organization monitors capital project spending monthly to ensure compliance with the overall annual JCP&L transmission system budget. When Portfolio management uses unspent funds from the transmission budget for other JCP&L transmission spending, it does not change budgeted amounts. Not adjusting budgets introduces the appearance of discrepancies in reporting of transmission and sub-transmission capital construction budget and actual spending amounts.

When Project Management requests funding for a change in scope of an in-progress project, additional capital funding for that project must be justified by project management and approved by portfolio management. Portfolio management reviews project costs and completion dates. When project spending and/or completion dates substantially exceed the budgeted cost estimate and completion date, portfolio management works with the responsible engineering and project management organizations to identify the causes and to mitigate the cause of underestimating costs for future projects.

15. Managing Capital Projects

Less complicated distribution projects of less than \$100,000 generally get managed by district managers and supervisors. Otherwise, the JCP&L engineering manager assigns one of the two project managers to work with district management, system operations, protection, supply chain and other organizations to coordinate, manage, and track the projects to completion. Before commencing any project, an engineering supervisor determines that the project design is accurate, that all related switching and outages issues have been considered, and the engineer and/or the project manager conducts a project pre-construction briefing with the crews. Scope changes in design along the way get reported, and justified change orders approved by district managers, supervisors, or project managers. Corrective maintenance work identified during a project, but not related to the project scope, is completed and charged to a "fix-it-now" blanket. When spending is charged to a "blanket account," each charge is itemized, described, and accounted for.

Management uses its two internal distribution line traveling construction crews for smaller projects, when they are available. These crews are prepared to change location on short notice, to work anywhere and during evenings and normal off-days if required. JCP&L often uses line contractors for large projects, such as the Infrastructure Investment Program in 2019 and 2020.

Although management does not use KPIs to verify capital project performance, it tracks the actual versus the planned resource usage and project costs using its Primavera project software program. JCP&L's Work Management dashboard allows real time monitoring by the Director of Operations Services and others for project scope creep and to identify costs assigned to incorrect accounts. The allocation of project charges to capital and O&M accounts is determined by FirstEnergy accounting practices.

FirstEnergy contracts out major substation projects, and those large-scale jobs are managed by FirstEnergy project managers.

C. Conclusions

1. JCP&L's distribution system design provides substantial intrinsic reliability, with almost the entire system constructed to n-1 redundancy standards with distribution circuit tie capability.

Nearly all JCP&L's distribution system has been designed and constructed for n-1 reliability with distribution circuit tie capability. Thus, customers do not experience extended outages for the loss of a single system component. JCP&L's planning criteria require n-1 designs, and distribution circuits are engineered with the reserve capacity to accept loads from other circuits and with circuit tie switch and recloser schemes so that loads from one circuit can be transferred between circuits. JCP&L widely uses electronic reclosing devices rather than one-shot fuses for protecting its lateral circuits, allowing some transient faults like brushing tree contacts to clear without causing extended outages.

2. JCP&L's design criteria meet or exceed the requirements of both the NESC standards and the N.J.A.C. requirements.

JCP&L constructs its system to meet NESC Grades B and C standards, and it monitors its system and develops solutions for violations of N.J.A.C. statute operating requirements, including providing stable, standard voltages at the customer's meter, detecting sustained load growth and preventing loads from causing equipment failure, providing reliability by design, and providing efficiencies in operations by balancing reactive loads to maintain a near-unity power factor (and providing for minimal reactive current flow).

3. Management operates its distribution system to appropriately manage circuit and substation loads.

JCP&L manages circuit loads by several means. The distribution control centers monitor the circuit and substation loads and other operating conditions. System planners forecast circuit and substation peak load increases and they initiate actions to prevent operating criteria violations. Distribution system operators load equipment to limits that allow acceptable loss of equipment life

over time, and the circuits and substations include capacitors installed to minimize reactive current loads on the circuits and substations.

4. FirstEnergy’s load forecasting organization uses an appropriate probabilistic and statistically adjusted forecast method for determining JCP&L annual system energy and overall system demand forecasts.

The FirstEnergy Load Forecasting organization uses a SAE (Statistically Adjusted End Use) model to forecast residential and commercial heating, cooling, and other significant categories of customer energy usage. The model accounts for changing energy intensities, appliance and equipment saturations, and economic drivers. Many factors are included, such as historical cycle sales, weather history, economic data, efficiency standards, numbers of customers, energy prices, and billed days to forecast future cycle sales. FirstEnergy Load Forecasting uses the weather and its energy forecast as inputs for the system retail demand forecasts, allowing economic data to be included in the model. The forecasted system demands are based on probabilistically “normal” peak-setting temperatures.

5. JCP&L’s distribution system planning process includes a comprehensive, data-driven, bottom-up process that provides for regular, and clear identification of electric supply gaps, needs, potential solutions, costs, and system performance.

JCP&L’s system planning organization includes district system planners, each responsible for one to three of JCP&L districts. These district planners “own” their areas, are familiar with local conditions, monitor system loading issues, and gather data for identifying criteria violations and providing initial solutions.

The data used for forecasting its peak loads is taken from appropriate sources. JCP&L Planning Engineers access loading data from multiple sources for distribution system demand forecasting. Real-time and peak circuit current and phase balance readings, as well as transformer load tap changer positions, are recorded each month, The CASCADE system in turn feeds into the LFDMS load flow analysis program. Planning Engineers use the LFDMS data to track discrete load changes caused by new loads, or from permanent load transfers, or temporary load transfers caused by equipment outages for repairs or maintenance.

Distribution Capacity Planning has responsibility for producing distribution circuit and substation peak load (demand) forecasts. The planning engineers model the systems in their districts using FirstEnergy-provided CYME software which is integrated with the GIS.

6. Management uses an appropriate method for predicting load increases on a circuit or in an area caused by new growth, for forecasting weather-adjusted peak loads caused by the predicted load growth, and for identifying where the new demand levels will result in design criteria violations.

Although load growth and demand in JCP&L regions has been very modest for the past several years, the service territory does have some areas of substantial load growth and demand. JCP&L system planners obtain new growth and demand data from monthly demand records, historical data, district management, the New Business group, and the other sources. Planning adjusts the forecast demand with a weather factor and JCP&L planning engineers run load flow studies to

detect any criteria violations when at least 300 kW is planned to be added to a circuit. FirstEnergy runs studies for the sub-transmission and transmission system when at least 3,000 kW is added to a circuit.

7. JCP&L’s circuit peak load forecasts have proven reasonably accurate.

Liberty reviewed JCP&L’s 2017 and 2018 circuit peak load forecasts for circuits with new loads expected to materialize in 2019 and 2020. The utility’s circuit peak load forecasts have been reasonably accurate and consistent with utility good practice. Only one circuit, in the fast-growing Lakewood area, substantially exceeded the 2018 peak load forecast for 2020. Those peak loading issues were mitigated by transferring part of the new load to another circuit.

8. Management makes considered decisions about expenditures to address New Jersey facility operations, to optimize New Jersey system performance, and to prudently control New Jersey customer costs.

We found that management uses appropriate methods for developing, vetting, and approving growth-related capital project portfolio budgets. Typically, district planning engineers develop various solutions for criteria violations which have been identified, and they present preliminary project proposal scopes, designs, costs, and justifications to the engineering organization. The group evaluates the proposed projects for optimum practicality, then designers develop detailed designs including materials and resources requirements and estimated costs using historical cost information and design software.

The detailed project scopes, designs, costs, and justifications are then reviewed by the engineering organization and the Director of Operations Services before being presented for executive approval. Planning engineers then provide detailed presentations indicating project costs and benefits to the JCP&L VP of Operations and the JCP&L President. The JCP&L President then presents the distribution capital projects and portfolios to his peers on the FirstEnergy Capital Portfolio Group. This group includes JCP&L capital projects in the next capital portfolio. This same process is followed by all FirstEnergy utilities.

9. Management’s annual capital spending for distribution system construction has been appropriate compared to budgets.

The overall annual JCP&L transmission system capital budget is based on the totals of the estimated annual cost of the combined proposed transmission system projects planned to commence, be worked, or be completed for that year. The specific transmission and sub-transmission lines construction budgets for the projects that could ideally commence during the budget year are included as place markers in the transmission lines budget. However, budgeted transmission lines project funds are sometimes not spent during the year because major capital transmission and sub-transmission lines projects are sometimes delayed because of permitting, siting, equipment delivery, and other issues.

Because of project delays, specific project budgets are sometimes repeated in more than one year’s capital budget. The portfolio organization does not cancel approved projects, but the engineering organizations may decide to change the scope of a proposed project or include a project within another project. It uses unspent funds from one budget bucket, such as transmission lines, for other

transmission system capital spending needs. The controlling capital spending limit is the overall JCP&L transmission system budget. Reportedly, the current total JCP&L transmission system budget and spending is about \$200 million.

The portfolio organization working with the project management organization decides where the unspent capital funds budgeted for transmission and sub-transmission lines are needed for other transmission system projects other than for lines - especially for unbudgeted emergent transmission projects. Although delayed projects might affect reliability, portfolio management indicated that using unspent funds from the transmission and sub-transmission lines budgets for other transmission system projects does not affect transmission and sub-transmission system reliability.

D. Recommendations

Liberty has no recommendations in the System Planning and Load Management area.

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Chapter IV: Asset Management

A. Background

1. Chapter Scope

A utility must fully execute well-designed inspection and maintenance programs to ensure that system conditions support safe and reliable operation. Significant or recurring gaps in required activities eventually produce degradation in service. Management should employ a thorough asset management approach, use accurate and comprehensive data to support decisions, apply clear performance objectives, and adopt appropriate cycles for recurring activities. Deferring inspections and maintenance deprives management of clear and important opportunities to correct defects before they have direct service consequence. Management should also have a formal life cycle approach of monitoring the condition of its assets and intensifying maintenance or replacing equipment to minimize the reliability impact of equipment failures. Engineering and field resources should be skilled and remain sufficient to efficiently perform planned activities at scheduled times.

Equipment age bears on deterioration of reliability, making effective inspection and preventive maintenance programs essential. JCP&L, like most northeast utilities, operates substantially an aged electric distribution system. Nineteen percent of JCP&L's distribution poles and 42 percent of distribution substation transformers and circuit breakers are more than 60 years old. Therefore, to intervene before equipment fails and impacts reliability, a utility with aged equipment must implement more intense proactive inspection and maintenance programs than a utility with relatively recently installed equipment.

Chapter II *Operations Organization* described the organizations responsible for inspections and maintenance, the work management process, and work planning and scheduling. This chapter presents the results of our examination of:

- FirstEnergy Service Company and JCP&L asset management strategy and Life Cycle management
- JCP&L New Jersey assets
- Equipment age
- Causes of equipment-caused customer minutes of interruption (CMI)
- FirstEnergy Service Company and JCP&L inspection and maintenance programs
- Distribution, sub-transmission, transmission, and substation corrective maintenance (CM) completions
- Substation equipment preventive maintenance (PM).

Chapter V, *Vegetation Management*, presents the results of our detailed examination of vegetation management programs and activities.

2. Electric System Assets

Assessing JCP&L's asset management needs requires an understanding of the nature of them.

a. Transmission and Sub-Transmission System

The FirstEnergy Service Company Transmission organization has responsibility for transmission and sub-transmission maintenance. JCP&L has one 500 kV line about 18 miles long, 66 circuits of 230 kV lines about 609 miles long, and 11 circuits of 115 kV lines about 161 miles long. It maintains a little more than 1,773 miles of overhead 34.5 kV sub-transmission lines, and almost 34 miles of underground 34.5 kV lines. The sub-transmission lines are typically looped, except for several serving fringe areas.

The 500 kV, 230 kV, and 115 kV transmission systems provide the sources for the 34.5 kV sub-transmission system, which in turn is the primary source for about 90 percent of the Northern Region and the Central Region distribution systems. To maintain supply diversity and prevent single-source-of-multiple-failures scenarios, all sub-transmission to distribution substations have two transmission sources, except for about ten substations whose service areas border on other utility service territories and are radially fed. Some sub-transmission lines run besides public roads, some have double-circuit lines configuration, and some have distribution lines attached to the same poles. The lines in the public road right of way face exposure to car-pole accidents, and the off-roadway lines present generally more difficult access needs (sometimes requiring helicopters). To improve reliability, management now builds all new 34.5 kV circuits using the same, hardier specification applicable to JCP&L’s 115 kV lines, including taller, stronger poles. The next table shows the numbers and mileage of the FirstEnergy/JCP&L transmission and sub-transmission circuits in New Jersey. The 34.5 kV sub-transmission system circuits are numerous and lengthy.

Transmission/Sub-Transmission Circuits

Voltage	Miles		Circuits
	Overhead	Underground	
<i>Transmission</i>			
500 kV	18	0	1
230 kV	609	0.12	66
115 kV	160.5	0	11
<i>Sub-Transmission</i>			
34.5 kV	1,773	34	242

Management operates and maintains 41 transmission substations (2-500kV, 33-230 kV, and 5-115 kV), and 252 distribution substations in New Jersey. Some of the transmission substations exist to convert voltages between transmission systems, but most transmission substations provide the supply interface between the transmission system and the 34.5 kV sub-transmission system. Some transmission substations provide the direct source for the 19.9 kV, 12.47 kV, 4.16 kV, and the 4800-volt delta distribution systems. However, the large majority of the distribution substations take supply from the sub-transmission, 34.5 kV system.

b. Distribution Circuits

JCP&L’s distribution system includes some older 4.16 kV and 4800-volt delta circuits and newer 12.47 kV, and 19.9 kV distribution circuits. The 19.9 kV distribution circuits consist of 34.5 kV 3-phase circuits in a grounded wye configuration. Management refers to the single-phase voltage of 19.9 kV in naming those circuits to differentiate them from the circuits forming the 34.5 kV

sub-transmission system. Although aged and with less load capacity than the 12.47 kV circuits, management reports that the characteristics of the lower voltage, short-length 4.16 kV and 4800-volt delta circuits make them less susceptible to tree-caused faults. Management has installed 4.16 kV to 12.47 kV step up transformers on several circuits to prevent or mitigate load and voltage criteria violations. Management otherwise does not plan to upgrade its 4.16 kV and 4800-volt facilities. The next table illustrates the numbers of and mileage of overhead and underground circuits supplying JCP&L customers. About 25 percent of the distribution system consists of aged 4.16 kV and 4800-volt delta circuits. URD facilities account for most of the underground distribution circuits.

Distribution Circuits

Voltage	Overhead Miles	Underground Miles*	Circuits
19 kV (34.5)	237	324	11
12.47 kV	8,654	6,906	680
4.16 kV	1,098	247	286
4800-volt delta	2,071	87	205
LV Network	-	11.51	5

* Underground Distribution miles includes URD

Management has since 2004 constructed its circuits to operate normally with excess capacity. This approach provides greater operational flexibility, allowing circuits to be tied together to permit load transfers in the event of faulted line sections or to isolate a section to perform maintenance.

c. Distribution Poles and Cables

JCP&L owns 331,479 distribution poles, 36,268 sub-transmission poles, and 2,331 transmission poles. Telephone companies own about another 200,000 poles that support JCP&L equipment.

Management has historically used both open bare wire and spacer cable (a.k.a. Hendrix cable) for overhead construction. Overhead bare wire and spacer cable failures are the top contributors to equipment caused outages. Jacketed spacer cable affords some protection to minor brush and limb contact but has a strong messenger cable that sometimes causes several poles and crossarms to break when a tree falls across a span. Much past construction used spacer cable, but management now uses spacer cable only where it cannot obtain proper tree clearances, even with enhanced trimming. JCP&L has about 2,830 miles of spacer cable on its system. Management did not have a record of the ages for most of its spacer cable.

Management reports 7,564 miles of underground, mostly URD, cable. JCP&L still operates substantial amounts of legacy 1970s and 1980s vintage concentric-neutral cross-linked polyethylene (plastic) insulated URD cables - - cable types and vintages considered insufficiently reliable because their electric integrity so frequently degrades over time. The aluminum external concentric neutral conductor on these cables tends to erode in moist ground, and the plastic insulation fails when water enters the compromised cable insulation system. More modern EPR rubber-insulated and XLPE cable, with an internal neutral conductor, is the current cable standard and it is not susceptible to those failure modes.

URD cable faults produce a large share of equipment-caused customer minutes of interruption (CMI) each year. JCP&L provides n-1 reliability (although delayed) service for customers within housing developments with 25 units or more units by installing underground primary circuits that it can tie together, expediting restoration after isolating a faulted cable section. However, it takes troubleshooters time to respond, isolate the faulted segment and re-energize the remaining segments. Legacy URD circuits were direct buried; however, management has recently required that developers install conduits in advance of JCP&L cable installation within them. Management also has implemented an overhead version of residential loop feed design on the Barrier Islands. This “backlot loop” system uses an overhead pole and wire design allowing for expedited isolation of faulted wire sections and quicker restoration of customers from another supply circuit.

Management’s usual URD cable replacement practice calls for replacing cable sections only after they have experienced a total of three faults or when customers specifically complain about cable performance. Management addressed 429 URD cable failures in 2020. If a second section in a supply loop fails before management has repaired or replaced the first faulted section, line workers run a parallel cable on top of the ground to restore customers in the loop temporarily. Management tags and tracks each faulted URD section in its OMS, and requires that maintenance resources repair or replace faulted URD cable sections within 90 days of the cable failure. Each URD segment failure should only affect a small number of customers when it experiences a fault. Despite this expectation, underground cable failures comprised the fifth largest contributor to equipment caused CMI (2.7 million) in 2020.

d. Distribution System Devices

Supervisory Control and Data Acquisition provides DCC operators with substation and circuit operating conditions. Nearly all JCP&L substations and circuits are SCADA monitored and controlled.

Management has installed many mid-circuit automatic circuit reclosers designed to limit sustained outages to a maximum of about 500 customers. Many circuits have multiple tie reclosers that detect when a circuit has de-energized and locked out because of a fault, and automatically restore a portion of the affected customers by tying the unaffected circuit sections to another circuit. Management also has installed comprehensive SCADA equipment at substations and on many reclosers, allowing distribution operators to monitor and control the distribution substations, breakers and reclosers remotely. The distribution system employs 3,254 electronic and 670 hydraulic reclosers.

Good utility practice calls for fusing lateral circuits where they branch off main circuits. However, traditional fuses require manual replacement after just a single operation, often by a troubleshooter. Lengthy customer outages can result when such a fuse blows for even a temporary, as opposed to a sustained, fault. Devices that can distinguish between temporary and sustained faults are in fairly common industry use and management has been replacing many lateral fuses with TripSaver II electronic reclosing devices. These devices lock out for sustained faults, while restoring service after brief interruptions from temporary faults that clear themselves. TripSaver II devices thus reduce the number of customer minutes of interruption and often eliminate the need to dispatch a troubleshooter to outages caused by temporary faults (e.g., tree branch contacts). JCP&L has installed 777 TripSaver II devices.

Management employs capacitors to maintain circuit loads at near unity power factor. Capacitor banks provide necessary reactive power to induction motor loads, thus reducing the reactive power load on the distribution and transmission system and serving to maintain standard voltage levels. JCP&L has 4,920 capacitor banks on its distribution system.

Long distribution circuits prove susceptible to normal but significant voltage drop between the supplying substation and customer loads at the end of the line. Management installs voltage regulators to maintain distribution circuit voltages on long circuits to within required levels. JCP&L has 997 pole-mounted voltage regulators. JCP&L also has load tap changers, which serve a similar function to voltage regulators, on its substation transformers.

e. Other Networks

Low voltage (LV) networks serve parts of Morristown, N.J., and include 47 sets of transformers and secondary protectors and about 11.5 miles of ducted cable. Most of these transformers and protectors are 30 to 40 years old, and several have failed each year. Management designs these networks with redundancy (to an n-1 criterion), which avoids outages under single equipment failures. JCP&L can obtain replacement transformers and protectors from a local supplier.

f. Transformers and Substation Equipment

Substation transformers step transmission and sub-transmission voltages down to distribution voltages. JCP&L operates 932 substation transformers. Circuit breakers isolate substation bus and circuit faults. Management provides coordination between the relays that control the breakers and the mid-circuit reclosers, lateral fuses and Trip Savers addressed above. The system employs 1,204 distribution circuit breakers. Since 2007, management has applied adaptive relaying to its breakers. Dispatchers, using SCADA, can change the sensitivity of the breakers in substations between modes. The normal, “fuse sacrifice mode” allows clearance of a downstream fault by a legacy fuse (if not yet replaced by a Trip Saver). The “fuse save mode” has the substation breaker respond to momentary interruptions from wind and lightning during storms. This mode allows the substation breaker to sense a fault on the system beyond the fuse location and rapidly deenergize and then reenergize the entire circuit in the hope that the lightning, wind, or tree branch induced fault has passed. This protection mode introduces more fleeting momentary outages but minimizes sustained downstream outages by preventing downstream fuses from blowing.

The JCP&L system also includes 75,072 pad mount transformers serving customers supplied by URD direct buried or ducted cables.

Our examination considered whether management:

- Operates under an appropriate asset management philosophy that applies specific goals and targets and incorporates actual electric system performance results into the development and prioritization of inspection and maintenance programs
- Adopts and regularly reviews and adjusts (as necessary) comprehensive and effective routine inspection, maintenance, and vegetation management programs
- Conducts inspection, maintenance, and vegetation management activities in accord with those programs

- Performance indicators should give senior management a clear and prompt picture of how well and timely operations and maintenance (O&M) work is being completed and the impact that work is having in achieving electric system reliability goals.

B. Findings

1. Inspection and Maintenance Budgeting and Spending

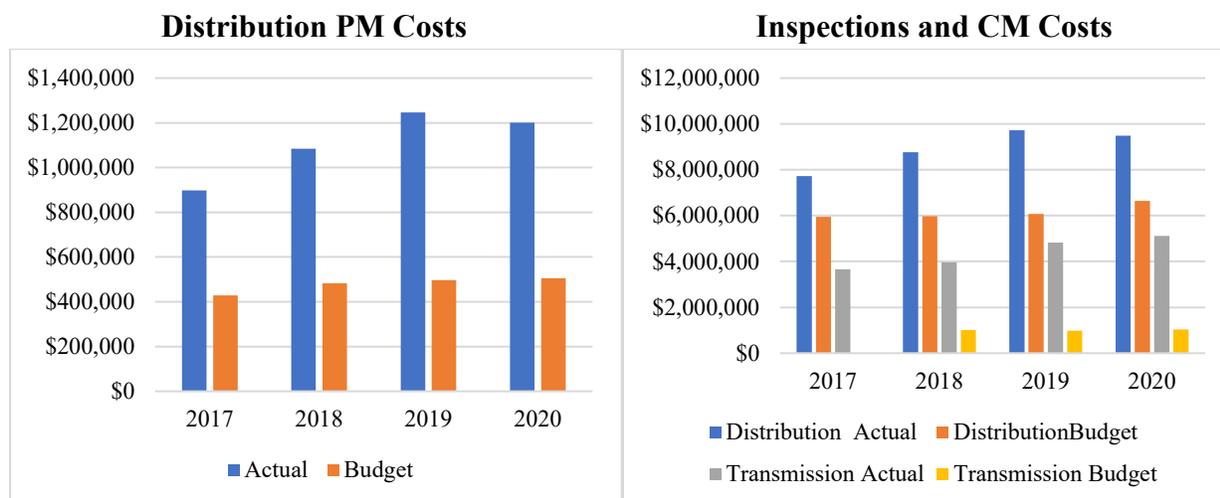
Management determines O&M budgets, including maintenance budgets, at the same time it does capital budgets. While actual O&M spending increased each year, annual budgets have not been consistent with spending for maintenance work. Management bases annual budgets for O&M blankets on the previous year’s budget, and not on the previous year’s spending. Management develops annual operating budgets to include “blanket accounts” to cover expected and unexpected emergent operating and capital work. The “fix-it-now” blanket budget covers emergent repair issues, and a “new business” blanket covers unexpected orders for new business connections. Management itemizes each charge to the blankets and can track them. The accounting organization, rather than the operations organization, makes decisions whether charges reflect O&M or capital expenditures. The Company operations spending has been increasing since 2017, as illustrated by this table. Management indicated that the increase in spending was caused by unexpected line equipment replacement work and ensuring that all maintenance work was timely completed.

T&D Operation Expenses
(in millions)

System	2017	2018	2019	2020	2021 Budget*
Distribution	\$129.3	\$139.9	\$147.1	\$155.9	\$170.8
Transmission	\$23.6	\$27.6	\$26.7	\$35.2	\$32.6
Total	\$152.9	\$167.5	\$173.8	\$191.1	\$203.4

* 2021 Budget includes planned Energy Efficiency spending of \$23.4 million

Distribution and transmission inspection and maintenance spending increased from 2017 to 2020, with spending substantially in excess of budgeted amounts. These results raise questions as to how valuable the budgeting process is to management and what importance management and these organizations place on meeting budgets. Management indicated that it spends O&M for maintenance as required to complete its regular inspection and maintenance programs, even if completion of those programs results in overspending. Management repurposes excess O&M funding from other accounts, consistent with overall O&M budget limitations, when shortfalls develop and management seems satisfied to work within the total O&M budget amount rather than be concerned when it overspends in individual categories.



2. Asset Management Approach, Strategy, and Life Cycle Management

a. Asset Management Philosophy

Management describes its asset management philosophy as employing “a comprehensive set of engineering, operating, inspection, maintenance, and administrative process standards and practices that optimize the value of asset investment, while maintaining reliability and safety.” Management reports that it does this by conducting:

- Periodic inspections to identify conditions that are unsafe, or that jeopardize system reliability
- Timely correction of those conditions
- Periodic maintenance to mitigate deterioration caused by age or operating conditions
- Periodic testing to identify abnormal conditions that cannot be identified by visual inspection or maintenance activities
- Analysis of deterioration trends using intensified inspections and, in some cases, additional testing
- Analyses to determine when a specific equipment life cycle is at an end and equipment should be replaced based on engineering evaluation of equipment condition, maintenance, and operating history, potential reliability consequences of failure, and whether loading is an issue.

JCP&L follows FirstEnergy’s distribution and substation equipment inspection and maintenance practices and cycles. FirstEnergy assists JCP&L with analyzing inspection and testing data and in ensuring compliance with N.J.A.C. inspection and maintenance reporting requirements. Although FirstEnergy provides baseline maintenance specifications for operating company work, JCP&L can modify typical inspection, maintenance, and testing cycles when determined necessary to monitor and investigate specific cases of deterioration.

JCP&L applies industry-accepted Reliability-Centered-Maintenance (RCM) processes. These processes seek to ensure that equipment and systems will continue to perform as required in the operating context that guides their use. The processes also seek to identify optimum safe minimum levels of maintenance, cost, reliability performance, equipment availability, and appropriate levels

of risk involved in managing assets. Applicable processes include analysis for each asset type and equipment use, causes of critical failure modes, consequences of allowing assets to run to failure, and the costs and benefits of post-failure supplemental maintenance, repair, or replacement versus intervention to prevent asset failure. Management uses these processes to develop what it determines to be optimum maintenance strategies based on equipment condition, importance, and failure consequences.

Management uses structured, cyclical inspection and analysis programs to identify when more intense maintenance is required, and to determine when assets should be upgraded or replaced ahead of failure. A strength of the reliability-centered-maintenance process lies in less emphasis on conservative time-based maintenance and instead relying on less-expensive non-intrusive inspections and on engineering experience and knowledge of environmental and operating conditions to determine a plan for maintenance and replacement actions.

We evaluated the fixed-interval (adjustable when justified) inspections and the preventive maintenance activities undertaken to promote proper operation of each type of line and substation asset. Management applies accepted utility practices, manufacturer’s recommendations, and the experience and knowledge of its and FirstEnergy Service Company’s equipment specialists. These activities comprise the minimum required to allow equipment already in adequate condition to continue to operate reliably.

Inspection and Maintenance Programs comply with the intent of N.J.A.C. requirements for lines inspections and maintenance and with its own schedules. N.J.A.C. Title 14:5-8.6, Inspection and Maintenance Programs, requires that:

JCP&L shall have “inspection and maintenance programs for its distribution facilities, as appropriate to furnish safe, proper, and adequate service. These programs shall be based on factors, such as applicable industry codes, national electric industry practices, manufacturer’s recommendation, sound engineering judgment, and past experience; be focused in significant part on mitigating those interruption causes with the greatest impact on reliability, such as those related to equipment, vegetation, and animals; and utilize tree trimming, physical plant inspection, maintenance and protective measures and equipment to assist in prevention and management of interruption when appropriate.

b. Life Cycle Management

FirstEnergy initiated its “Energizing the Future” (EtF) end-of-life process in 2018 and revised it in 2020. This process includes guidelines for FirstEnergy’s Transmission Planning and Protection organization to determine when transmission lines and substation equipment have reached the end of operational life, and to determine when investments for replacement transmission equipment are needed. The EtF guidelines include comprehensive lists of conditions, risks, and consequence considerations for each type of transmission lines and substations equipment. Evaluations of the transmission equipment and the prioritizations to replace equipment are determined by FirstEnergy’s transmission planning and protection engineers.

JCP&L makes its distribution equipment replacement determinations using case-by-case data-driven condition and criticality issues. Its strategy determines when to replace equipment using a combination of regular condition assessments and reliability evaluations. Equipment replacement

occurs when it is unsafe, does not perform its function, presents a risk to system integrity that affects reliability, or the cost of on-going maintenance exceeds the cost of replacing the equipment. Management may decide to allow equipment to run to failure if it has n-1 redundancy.

JCP&L's highest priority feeder and CEMI programs include replacement of specifically identified aged, failure-prone line equipment. Management has implemented ad hoc programs in the past to replace defective spacer cables components and porcelain cutout switches, but it does not employ any current programs to proactively focus on replacing aged failure-prone equipment system-wide. We have concern about this approach, most particularly regarding the condition of aged aerial spacer conductors and open bare wire conductors. Failures of this equipment have comprised the largest contributors to equipment-caused customer minutes of interruption since 2017. JCP&L did not make equipment failures a focus of its recent, \$97 million Reliability Plus – Infrastructure Investment Program. That project's primary intent was to reduce tree-related outages and to improve automatic sectionalizing and restoration of circuits.

3. Tracking and Analysis

Management maintains a record of distribution circuit visual and infrared (thermographic) inspections and of the condition exceptions identified during those inspections, using its Distribution Lines Inspections (DLI) record-keeping system. Management uses this system to:

- Monitor and trend distribution lines performance trends
- Track critical equipment failures
- Identify and develop early detection technologies
- Improve PM activities
- Accurately and consistently collect and trend data to support investigations and causal analyses of critical equipment problems.

Like its use of the DLI system for distribution equipment inspections and maintenance, management provides an even more comprehensive integration of its Transmission Asset Mapping Interface (TAMI) system, its Cascade system, and its Asset Health Center (AHC) system to:

- Collect transmission and substation equipment condition data and to identify trends
- Minimize critical equipment failures between scheduled maintenance intervals
- Track corrective maintenance activities
- Track equipment failures that do occur and develop strategies to prevent future failures
- Collect and trend data for investigation and causal analyses of critical equipment failures
- Implement monitoring technologies and methods to better detect equipment deterioration
- Ensure that management is effectively implementing PM techniques and strategies to manage its aged equipment base.

4. Equipment Age

Equipment age bears on deterioration, making effective inspection and preventive maintenance programs essential. JCP&L, like nearly all North American utilities, operates a substantially aged electric distribution system, as the next table illustrates. Nineteen percent of distribution poles and 42 percent of distribution substation transformers and circuit breakers are more than 60 years old. The pole ages raise particular concern; FirstEnergy's Wood Pole Inspection and Treatment Program Procedure includes guidance setting average wood-pole ranges between 40 and 50 years.

The next table illustrates the advanced age of a large portion of JCP&L pole plant and substation transformer and circuit breaker populations.

JCP&L Plant Count and Ages

System	Units	> 40 Yrs	> 60 Yrs	> 70 Yrs
Distribution Pole Plant	331,479	58%	19%	9%
Sub-transmission Pole Plant	36,268	21%	3%	<1%
Transmission Pole Plant	2,331	59%	2%	<2%
Distribution Substation Transformers	576	74%	42%	12%
Transmission Substation Transformers	103	35%	16%	7%
Distribution Circuit Breakers	1,753	76%	42%	8%
Transmission Circuit Breakers	1,063	33%	18%	5%

Management has maintained only partial records of installation dates for the 12,060 miles of overhead open bare wire and spacer cable and 7,564 miles of underground cables that combine to form its 1,171 distribution (mostly URD) circuits. However, even the incomplete records show at least a small percentage of the cable plant as more than 60 years old.

5. Blue Sky and Minor Storm Customer Minutes of Interruptions

Maintaining aged line and substation equipment and minimizing outage-causing equipment failures proves challenging for all electric distribution companies. Management must balance maintenance with replacement costs. Efforts to prevent outages or to shorten them must be balanced to provide acceptable reliability at a manageable cost. Chapter VII, *Reliability Programs and Smart Grid Activities*, includes our observations that JCP&L’s customer outage duration performance falls at or slightly below average when compared with many other utilities in the USA. That chapter also showed that equipment caused outages comprise the greatest contributor to customer minutes of interruption (CMI) for JCP&L, Tree contacts also cause many customer minutes of interruption, as explained in Chapter V, *Vegetation Management*.

6. Inspection and Corrective Maintenance Spending

Management spent about \$9.5 million for inspections and corrective maintenance for the distribution system and about \$5 million for the transmission system in 2020. As indicated by this table, inspection and Corrective Maintenance (CM) costs have increased about 23 percent for distribution and about 38 percent for transmission since 2017.

Inspections and Corrective Maintenance Spending

Year	Distribution	Transmission
2017	\$7,731,270	\$3,663,394
2018	\$8,767,380	\$3,957,414
2019	\$9,720,860	\$4,828,620
2020	\$9,487,694	\$5,112,223

7. Distribution Inspections and Corrective Maintenance

JCP&L timely completed all scheduled distribution equipment inspections and tests required by its programs for each year between 2017 and 2020. This table indicates only the completion rates for 2020, but serves to typify experience from earlier years in sub-transmission inspection completion performance. The FirstEnergy Service Company Transmission Services group took over the sub-transmission wood pole inspection program in 2020, resulting in a temporary increase in the number of poles inspected in the first year of their involvement.

Distribution and Sub-Transmission Inspections Completed in 2020

Task	Planned	Completed	Percent
Distribution and Sub-Circuit Inspections	304	304	100%
Distribution and Sub-Transmission Circuit Thermography	359	357	99.4%
Capacitors	4,920	4,920	100%
Reclosers	1,664	1,664	100%
Distribution Wood Pole Ground Line Inspections	65,138	65,138	100%
Sub-Transmission Wood Pole Ground Line Inspections*	3,000	4,967	166%
Network Protection Operation Tests	10	10	100%
Network Protector Inspections	11	11	100%
Network Transformer Oil Tests	22	22	100%
Company Vault Inspections	80	80	100%
Manholes without Transformer Inspections	35	35	100%
Pad Mount Transformer Inspections	23,215	23,215	100%

8. Distribution Circuit Inspections

In addition to 10-year wood pole groundline inspections, management inspects 20 percent of its distribution circuits (5-year cycles), including laterals, each year. It completes the identified corrective maintenance tasks (CMs), in priority order, within the following year. Inspectors work from a list of inspection items including issues with overhead conductors, poles, vegetation clearance, hardware condition, guying and grounding integrity, and the condition of pole-mounted equipment such as transformers, fuses and cutouts, lightning arrestors, and switched devices. Additionally, a substation mechanic, certified as a thermographer, conducts thermographic infrared inspections of the distribution system on a four-year cycle. Thermography is used to proactively and non-intrusively identify poorly made and prone-to-failure electrical connections by their heat signature. Line workers inspect all of the 4,920 capacitor banks on the system each spring. All 1,664 distribution circuit reclosers are also inspected annually. Defective devices are repaired or are replaced.

When an abnormal distribution circuit condition is identified, circuit inspectors and engineering personnel evaluate whether corrective maintenance (CM) should be undertaken immediately or if maintenance can be addressed through scheduled work in the coming year, based on equipment criticality and any risk to public safety. For 2017 to 2020, the lines district shops completed essentially all distribution CM tasks assigned them by the end of the following year.

Distribution CMs and Completions

Year	Distribution CMs Opened	Distribution CMs Completed	Percent Completed Within Following Year
2017	4,521	4,516	99.9%
2018	5,824	5,820	99.9%
2019	4,979	4,977	99.9%
2020	4,587	4,587	100%

Management has a formal prioritization method for issues identified by the distribution system thermographic inspections described above. Thermographic infrared inspections of overhead components identify overheated (poorly made or prone-to-failure) connections. This table shows the CM tasks generated by thermographic inspections by priorities, and associated completions for 2020. Inspection and completion results are similar for 2017-2019. Management has been timely completing all thermographic CMs.

2020 Distribution Thermographic CMs and Completions

Priority	Time Limit	Opened	Completed	Completion Rate
Priority 1	30 days	42	42	100%
Priority 2	90 days	21	21	100%
Priority 3	180 days	35	35	100%
Priority 4	365 days	87	87	100%

9. Sub-Transmission Inspections

JCP&L employs two sub-transmission inspectors who annually inspect 20 percent of JCP&L’s sub-transmission system each year. Management conducts the distribution and sub-transmission systems inspection programs at the same time. However, it administers them separately, because the costs associated with sub-transmission inspection and corrective maintenance activities are accounted for as transmission costs. FirstEnergy uses three levels of corrective maintenance priorities for its sub-transmission lines and equipment. Priority 1 CMs indicate issues which present the risk of imminent failure; management addresses these in seven days or less. Management schedules and repairs Priority 2 CMs, situations posing some threat of failure if not corrected, in 90 days or less. Management repairs Priority 3 CMs, issues not currently posing a direct risk but that could develop into a risk, within one year; it monitors the status of each and will bundle them with other scheduled maintenance for efficiency. In 2017, 2018, and 2019 management planned and completed 311, 306, and 45 Priority 2 CMs, respectively. This table shows the Priority 2 CMs planned and completed for 2020. No Priority 3 CMs were reported.

2020 Sub-Transmission CMs and Completions

Priority	Time Limit	Opened	Completed	Completion Rate
Priority 1	7 days	-	-	-
Priority 2	90 days	41	41	100%
Priority 3	365 days	-	-	-

10. Distribution and Sub-Transmission Wood Pole Inspection

JCP&L’s 10-year wood pole inspection program identifies poles with compromised structural integrity and provides another comprehensive circuit-level inspection of distribution facilities to supplement the five-year circuit inspection program. This “life cycle” program determines when the safe useful life of a wood pole has ended.

Ground line pole inspections identify poles not meeting NESC strength requirements. As wood poles age, they may split or experience fungal decay creating internal voids that reduce pole strength. Pole deterioration rates depend on pole material, original preservative treatment, climate, and soil conditions. On 10-year cycles, JCP&L’s pole inspection contractor inspects each distribution pole and conducts a hammer sounding integrity test on those over 10 years old. Where a sounding test indicates that voids may exist in a pole and for all poles older than 35 years, the contractor excavates the circumference of the pole below the groundline, bores holes, and measures the severity of any voids discovered. Any wood pole determined by the contractor to have less than acceptable strength becomes listed for reinforcement or replacement, depending on the severity of deterioration. Management replaces wood poles with active internal or external decay. Unlike many other utilities, however, management does not inject life-extending fungicide into distribution poles. Management cited as a reason clean-up and environmental concerns from vehicle strikes causing fungicide spills from treated roadside poles. Transmission poles are treated with fungicide when appropriate.

JCP&L owns and maintains 331,479 wood distribution poles. The distribution wood pole ground line inspection program classifies poles needing attention into two categories. Classification as “Priority 1” (with less than minimum NESC strength) calls for replacement within one year. The second classification is termed “Priority” (approaching minimum NESC strength). JCP&L Engineering reviews all Priority poles on a case-by-case basis for replacement, reinforcement or monitoring.

This table indicates the distribution poles inspected for 2017-2020 and then replaced or reinforced, based on the wood pole groundline inspection program

Distribution Wood Poles Replaced

Year	Number of Poles Inspected	Priority 1 Poles Identified	Priority 1 Poles Reinforced or Replaced	Priority Poles Identified	Priority Poles Replaced or Reinforced
2017	36,568	35	35	1,187	355
2018	27,877	14	14	1,794	566
2019	54,558	52	52	3,378	1,260
2020	65,138	98	98	4,020	1,800

In 2019, management moved from conducting distribution pole inspections on a circuit basis to a geographic area basis. This shift roughly doubled the numbers of distribution poles normally inspected per year (previously averaging about 33,000). The change has produced a significant increase in the rate of discovery of Priority poles requiring corrective action. Operations is re-evaluating the results of each pole inspection and establishing a work plan focusing on risk to safety and customer outages. This second round of evaluations will produce scheduling for the increased number of poles in need of reinforcement or replacement.

Moving now from distribution to sub-transmission poles, the FirstEnergy Service Company Transmission Maintenance group took over responsibility for managing JCP&L’s sub-transmission pole inspection program in 2020, using the same inspection, boring, and treatment procedures applied to transmission poles. Prior to 2020, JCP&L did not apply treatment to sub-transmission or distribution poles.

JCP&L has 36,268 sub-transmission poles. As of 2020, the transmission groundline program uses three priorities to indicate importance and urgency of corrective actions, rather than the two distribution priorities. Classification as Priority 1 calls for transmission and sub-transmission pole replacement within 7 days of identification. Priority 2 and 3 poles require replacement or reinforcement 90 days and 1 year following identification.

The next table shows the sub-transmission Priority 1 poles replaced between 2017 and 2019 under the Distribution Wood Pole Groundline program. FirstEnergy’s assumption of the sub-transmission wood pole ground line inspection program under the transmission program in 2020 produced a large number of Priority 2 and 3 poles. The pole inspections occurred during the fourth quarter of 2020. Management reported that all Priority 2 poles identified in late 2020 have already been replaced in 2021, with scheduling of replacement or mitigation for the remaining Priority 3 poles later in 2021.

Sub-Transmission (34.5 kV) Wood Poles Replaced

Year	Priority 1	Priority 2	Priority 3	Replaced or Reinforced
2017	1			1
2018	13			13
2019	21			21
2020		7	246	0

11. Transmission Circuit Inspections

FirstEnergy conducts routine helicopter inspections of its transmission systems on 6-month cycles, conducts comprehensive helicopter inspections every 4 years, and conducts corona and infrared inspections every 4 years. It also conducts ad hoc helicopter, drone, foot patrol, and climbing inspections, as required. Company documents indicate that all these activities are completed on a timely basis.

FirstEnergy uses three levels of corrective maintenance priorities for its transmission lines and equipment. It schedules and repairs, in 7 days or less, Priority 1 CMs that present the risk of imminent failure. It schedules and repairs, in 90 days or less, Priority 2 CMs are situations which pose some threat of failure if not corrected. It schedules and repairs these Priority 3 CMs within one year. Priority 3 CMs comprise those that do not pose a direct risk but could develop into a risk. Management monitors the status of Priority 3 CMs and bundles them with other scheduled maintenance for efficiency.

12. Transmission Wood Pole Inspection and Replacement

FirstEnergy’s transmission wood pole inspection program identifies wood poles requiring replacement or reinforcement because of excessive loss of pole strength, to treat the poles to arrest or slow internal decay, and to apply external preservatives to extend pole life. The FirstEnergy Transmission Maintenance organization schedules, manages, and documents transmission wood pole inspections and treatments, tracking each inspection in an Access database. They track Priority 1, 2, and 3 poles requiring corrective action in the Transmission Line Maintenance GIS database.

FirstEnergy’s contractor conducts wood pole ground line inspections on all transmission poles on a 10-year cycle. Inspections include an overall pole inspection, hammer sounding for voids, excavating soil 18 inches below the groundline around the pole circumference, boring holes above and below the ground line, and - if internal voids are identified - measuring the thickness of the remaining pole shell. Finally, the contractor injects a fungicide into the pole and applies a preservative to the pole surface above and below the groundline if wet soil conditions prevail. The contractor determines the as-found pole strength based on remaining shell thickness and pole size. The inspection results including pole strength are reported to FirstEnergy transmission engineering, who categorizes the pole as acceptable, or if not, as Priority 1, 2, or 3 for reinforcement or replacement. FirstEnergy re-samples 2 percent of the contractor-inspected poles for verification of inspection quality and contract compliance.

FirstEnergy inspected all transmission poles in New Jersey in 2015 and all reinforcements and completed replacements initiated by those inspections by the end of 2017. As a result, no transmission poles were inspected or identified for reinforcement or replacement during the 2017 to 2020 period.

13. Underground and Pad Mount Transformer and LV Network Inspections

Distribution technicians (from the Engineering Organization) inspect 20 percent of the underground system each year, including switches and terminations and 75,072 pad mount transformers. Most pad mount transformer corrective maintenance (CMs) tasks are caused by corrosion, missing locks, and damage from snowplows and mowing equipment. Management completes 100 percent of its scheduled pad mount inspections each year, and in 2020 scheduled and completed 665 pad mount transformer CMs on time.

Underground crews inspect the ducted cables, vaults, manholes, underground network transformers and network protectors for the LV Network. Operations Support underground crews and relay technicians conduct inspections, protector operational tests, and oil tests on the network equipment including cables, conduits, transformers, protectors, vaults, and manholes. The relay technicians conduct network protector (voltage-controlled circuit breaker) operational tests every six months by simulating a de-energized primary supply circuit. An underground crew inspects the vaults every six months, and samples each transformer’s insulating oil for quality tests every two years. Management inspects cable manholes that do not contain transformers every five years. This is consistent with FirstEnergy’s “Underground Ducted Network System” inspection and testing specifications. Underground crews conduct network repairs, when necessary, except in the rare instance that internal resources are not sufficient and, in those cases, management uses qualified contractor specialists or repair shops.

Management applies six levels of corrective maintenance priorities for LV Networks. Priority 1.1 “Immediate Risk” CMs risk require correction within 24 hours, Priority 1.2 “Critical” CMs within 30 days or less, and Priority 1.3 “Serious” CMs within 180 days. Priority 1.3 “Medium” CMs require action within 1 year. JCP&L also designates some orders as 2.1 “Low” and 2.2 “Work Queue” meaning no safety or reliability risks and requiring correction within one year or with other maintenance activities. The next table shows LV CM completions for the years 2017 to 2020. The two open items from 2019, since completed, were delayed by access issues involving a transformer replacement.

LV CM Completions 2017 - 2020

Year	# Open	# Closed	Completion Rates
2017	6	6	100
2018	4	4	100
2019	6	4	67
2020	1	1	100

14. Substation Inspections and Preventive Maintenance

Substation maintenance consists of a complex set of periodic non-intrusive and intrusive inspections, preventive maintenance, corrective maintenance, and oil, electrical, and mechanical testing. The identification of emergent or trending deterioration observed through operating issues or periodic inspections leads to ad hoc testing and sometimes more invasive inspections to verify or correct conditions. Deteriorated substation equipment may be monitored, repaired, replaced, or actually run to failure, whichever proves the most cost-effective solution after considering criticality and failure consequences.

a. Substation Equipment Inspections, CMs, and Completions

Substation mechanics inspect each of the 326 T&D substations each month. Twice each year, during a spring month and a fall month, more intense inspections include detailed inspections of transformers, circuit breakers, and all circuit egress cables (from substation to riser pole). The inspectors remove bird and animal nests and other debris from transformer radiators, and they operate the transformer fans and oil pumps. Substation mechanics annually draw oil samples from transformers and from load tap changers for quality tests, moisture tests, and dissolved gas analyses to verify insulating oil quality and transformer condition. Management conducts infrared thermographic inspections of all bus and equipment electrical connections on annual cycles. Relay technicians conduct relay scheme verification tests on either 5-year cycles or 10-year cycles, depending on whether the relays are providing protection for the transmission system or the distribution system.

The next table shows that management completed all scheduled T&D substation equipment inspections and operational tests in 2020. Documentation provided indicate similar completion levels since 2017.

T&D Substation Inspections Completed in 2020

Task	Planned	Completed	Percent of Tasks Required by Program
Monthly Substation Inspections	3,912	3,912	100%
Transformer Inspections	939	939	100%
Circuit Breaker Inspections	1,204	1,204	100%
Non-PJM Relay Schemes	541	541	100%
PJM Relay Schemes	183	183	100%
Infrared Inspections	326	326	100%
Battery Inspections	342	342	100%
Substation Underground Inspections	594	594	100%

FE/JCP&L has four levels of corrective maintenance priorities for its substation equipment. Priority 1.1 “Immediate Risk” CMs risk require correction within 24 hours, Priority 1.2 “Critical” CMs risk within 30 days, Priority 1.3 “Serious” CMs within 180 days, and Priority 1.4 “Medium” CMs within one year. Management at times defers some CMs without associated safety or reliability risks and schedules them with other preventive maintenance work for efficiency reasons. Pending CM completion, substation inspectors monitor conditions for deteriorating equipment performance to determine if work requires expediting. Based on documents provided, CM on-time performance has improved since the 2017 to 2019 period. The next table illustrates substation CM completion rates for 2020.

Substation CMs Completed in 2020

Priority	Time Limit	Opened	Completed Within Time Frame	Completed Outside Time Frame	Completion Rate	Deferred
Priority 1.1	24 hours	8	7	1	100%	0
Priority 1.2	30 days	161	87	69	96.9%	5
Priority 1.3	180 days	781	634	74	90.7%	73
Priority 1.4	365 days	1,619	1,341	55	86.2%	93

b. Substation Equipment Preventive Maintenance and Completions

FirstEnergy Service Company Substation Engineering provides inclusive and comprehensive sets of maintenance procedures for all FirstEnergy operating company equipment types. It appears that FirstEnergy’s maintenance procedures have resulted from extensive research with manufacturers, electric utility industry organizations, and the combined experience and knowledge of FirstEnergy’s substation equipment experts.

The substation transformer program appropriately includes dissolved gas in oil analyses, insulation power factor testing, winding turns ratio testing, and winding resistance testing. Its circuit breaker program includes power factor testing, oil analyses, timing testing, moisture testing, and high potential and contact resistance testing. The FirstEnergy Service Company “Beta Lab” conducts all oil testing and equipment forensic analyses.

The maintenance procedures for substation transformers and circuit breakers are classified as Class C - online inspections and tests, Class B - operation tests that may be either online or offline, and Class A – offline testing. For circuit breakers, scheduled Class C maintenance is typically conducted every 2 years, scheduled Class B maintenance every 6 years, and scheduled Class A circuit breaker inspections and tests are conducted either based on the results of these other inspections and tests, or on duty cycles - - the numbers of operations performed by the equipment since the last inspection and maintenance. Circuit breaker maintenance activities are triggered by different cycles and numbers of operations, based on a breaker’s type and manufacturer.

For transformers, Class A electrical tests are scheduled every 5 to 12 years, depending on size and criticality. Whenever the results of Class B or Class C inspections and tests or observed operating issues indicate the possibility of incipient problems, FirstEnergy’s substation engineering staff may intervene and schedule Class A transformer or circuit breaker tests.

The next table outlines the time-based Class C, Class B, and Class A maintenance and.

T&D Substation Transformer Tests and Maintenance

PM Class	Examples of Tests	Examples of Maintenance	Transmission Cycle	Distribution Cycle
Class C On-Line	Nitrogen and oil quality and dissolved gas tests	Inspections of oil levels, nitrogen pressure, temperatures, pumps, fans, clean coolers	Annual	Annual
Class B On-Line or Off-Line	Nitrogen and oil quality and dissolved gas tests	Class C, plus check calibration and functions of temperature alarms	4 to 5-year	4 to 5 years
Class A Off-Line	Power-Factor, winding turns ratios, core ground, and winding resistance testing	Operational tests and internal inspection of load tap changer (LTC), if applicable	5 years	12 years except 8 years with type U bushings

Management reported that it had not deferred any of its scheduled substation preventive maintenance tasks since 2017.

C. Conclusions

1. Management’s asset management philosophy of optimizing the value of assets while maintaining reliability and safety comports with good utility practices.

FirstEnergy Service Company and JCP&L comply with their approach by conducting, and timely completing, appropriate inspections, and maintenance on the transmission and distribution lines and substations. Management uses analyses to determine when a specific equipment life cycle is over and equipment should be replaced based on engineering evaluation of equipment condition,

maintenance, and operating history, potential reliability consequences of failure, and whether loading is an issue.

2. FirstEnergy and JCP&L inspection and reliability centered maintenance programs and practices are appropriate for maintaining the current level of equipment caused SAIFI and CAIDI and for meeting the BPU required reliability levels.

Inspection and reliability centered maintenance programs and practices comport with NESC, the intent of the N.J.A.C. regulations, and good utility practice. FirstEnergy conducts routine helicopter inspections of its transmission systems on six-month cycles, it conducts comprehensive helicopter inspections every four years, and conducts corona and infrared inspections every four years. It also conducts ad hoc helicopter, drone, foot patrol, and climbing inspections, as required. It conducts transmission and sub-transmission wood pole groundline inspections and treatment on 10-year cycles. It conducts infrared inspections of the sub-transmission lines on 4-year cycles and circuit patrols on 5-year cycles.

JCP&L conducts inspections of the distribution lines and mounted equipment on 5-year cycles, and infrared inspections on 4-year cycles. It conducts wood pole groundline inspections on 10-year cycles.

FirstEnergy and JCP&L use a reliability centered maintenance approach for substation equipment. Management maximizes inspections and testing and conducts intrusive and expensive internal inspection and maintenance only when determined necessary. JCP&L conducts monthly routine substations and more intensive substation inspections twice a year, paying attention to transformers, circuit breakers, and batteries. It conducts infrared inspections on substation equipment every year. It conducts non-intrusive predictive transformer oil testing every year and it periodically conducts intensive transformer and circuit breaker tests, the timing of those tests based on equipment criticality and on equipment expert experience and knowledge. It conducts intrusive internal maintenance on equipment only when inspection and test results, or numbers of operations indicate the need to do so.

As reported in Chapter II, *Operations Organization*, JCP&L has sufficiently staffed its field organizations, using work management technologies, to provide management regularly with the status of all scheduled work, including inspection and maintenance tasks. This combination has allowed management to comply with all program schedules. When analyses of equipment conditions become necessary, JCP&L has access to FirstEnergy Service Company's equipment experts.

3. The line and substation districts and FirstEnergy Service Company's Transmission Maintenance organization has, at least since 2017, been completing all inspections and maintenance tasks consistent with programs and priorities.

Liberty found that management have been completing transmission and distribution circuit, equipment, substation equipment inspections and wood pole groundline inspections in a manner consistent with program timelines. JCP&L had been completing all corrective maintenance work according to prioritized scheduling guidelines. The only exception is that management has deferred some non-critical substation CMs to be included with scheduled preventive maintenance work.

Management had been completing transmission, distribution, and substation preventive maintenance (PMs) consistent with the programs, without deferring PMs.

4. Practices for prioritizing its corrective maintenance work are appropriate for timely addressing CMs based on criticality, and since 2017 JCP&L has completed its CMs on time and according to priority.

Management has formal prioritization categories for its transmission, sub-transmission, low voltage networks, and substation CMs that assign completion deadlines based on criticality. However, management determines distribution circuit CM priorities on a case-by-case basis. The Lines Districts schedule the work associated with each CM based on the relative severity of the abnormal conditions and public safety concerns. Distribution CMs are either addressed immediately or are scheduled to be addressed before the end of the following year.

5. The FirstEnergy/JCP&L asset management life cycle process is appropriate; distribution and substation equipment replacement determinations use case-by-case data-driven review of operating conditions and criticality issues.

JCP&L’s strategy is to determine when to replace equipment using a combination of regular condition assessments and reliability evaluations. Equipment is replaced when it is unsafe, doesn’t perform its function, is a risk to system integrity and reliability, or the cost of on-going maintenance exceeds the cost of replacing the equipment. Management may decide to allow equipment to run to failure if its failure will not result in a sustained system or customer outage.

6. FirstEnergy and JCP&L timely complete inspection and maintenance work even though they consistently exceed their maintenance O&M budgets. (See Recommendation #1)

Funds required to complete all inspection and maintenance work have substantially exceeded the annual budgets specific to this work. Management supplements the funds by using funds allocated for other O&M activities. Management reported that it is limited only by the high-level O&M budget and not the maintenance budgets. However, it is good utility practice to determine O&M funding, based on experience from the previous year’s spending, and not by relying on the previous year’s inaccurate budgets.

The following table shows for each category of spending the actual amounts divided by budgeted amounts. Management could not provide a 2017 budget amount for the Transmission costs, citing a “planning oversight” which meant it did not budget internal labor costs for this category.

Inspection and Maintenance Actual vs. Budget Results

	Preventative Maintenance	Corrective Maintenance and Inspections	
	Distribution	Distribution	Transmission
2017	210%	130%	n/a
2018	225%	147%	394%
2019	251%	160%	491%
2020	237%	143%	497%
Average	231%	145%	461%

7. JCP&L lacks a holistic approach to address and mitigate the negative impact of system-wide aging equipment failures on reliability. (See Recommendation #2)

While JCP&L’s highest priority feeder and CEMI programs include the replacement of specifically identified aged, failure-prone line equipment, management does not employ any current programs to proactively and holistically focus on replacing aged failure-prone equipment system-wide.

D. Recommendations

1. Develop, track and be accountable to annual T&D maintenance budgets based on the spending actually required to comply with inspection and maintenance program requirements. (See Conclusion #6)

A realistic budget would better allow management to monitor the efficiency and cost effectiveness of the various maintenance programs and understand much more clearly the actual costs of maintenance vs. replacement options. Consistently overspending budget line items can inadvertently communicate a lack of commitment to financial rigor and cost control.

2. Develop a system-wide programmatic approach to mitigating the negative reliability impacts resulting from the failure of aging equipment. (See Conclusion #7)

Management has implemented ad hoc programs in the past to replace defective spacer cables components and porcelain cutout switches, but it does not employ any current programs to focus proactively on replacing aged failure-prone equipment system-wide. Lessons learned from the successful implementation of the highest priority feeder and CEMI programs should inform a system-wide approach that management should adopt for application to aging equipment in general.

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Chapter V: Vegetation Management

A. Background

Tree contact with overhead power lines comprises a primary cause of outages. The maintenance of adequate clearances between tree limbs and wires proves critical during the trimming cycles to preventing limb contact during all weather conditions. Management also must identify and remove or mitigate dead or dying on and off the right-of-way trees that pose a risk of falling into the power lines. Fallen trees prove a major cause of outages during major storm conditions. Many parts of its service area require JCP&L management to execute comprehensive and effective vegetation management programs designed to minimize tree contact and protect electric reliability.

In Chapter II, *Operations Organizations*, we addressed organizations responsible for the New Jersey transmission, sub-transmission, and distribution systems vegetation management programs.

The Reliability Programs and Smart Grid Activities chapter addresses our examination of reliability indices, including tree caused SAIFI and CAIDI. We have referred again to these reliability indices in this chapter just to reinforce and reiterate the need for the enhanced vegetation management programs and why they should be continued to improve tree caused SAIFI and CAIDI.

This chapter addresses the effects of vegetation management programs, the recently enhanced practice of removing overhanging limbs in distribution circuit Zones 1 and 2, and the increased emphasis on hazard tree removals. We also examined vegetation management spending.

Our examination considered whether management has:

- Regularly reviewed and adjusted, if necessary, the vegetation management programs to meet the reliability needs of JCP&L
- Conducted vegetation management in accord with the program requirements
- Met vegetation management budgets
- Monitored vegetation related reliability and adjusted plans and programs accordingly.

B. Findings

1. *Vegetation Management Spending*

JCP&L charged vegetation management costs (for trimming and tree removals) to a combination of capital and O&M accounts until 2021, charging costs to capital accounts, when specific tree operations supported capital construction, replacement, or expansion. JCP&L now charges all cycle-based vegetation management costs to O&M accounts.

A higher-than-expected number of tree removals and targeted reliability work has largely driven variances between budgeted and actual spending. The following table shows 2019 and 2020 expenditures of \$8.3 and \$8.0 million respectively for transmission vegetation management, and \$27.8 and \$28.1 million respectively for distribution and sub-transmission circuit vegetation management.

Transmission VM Costs (in millions)

Year	O&M Budget	O&M Actual	Capital Budget	Capital Actual	Explanation
2017	\$4.0	\$3.8	\$3.6	\$3.7	
2018	\$3.9	\$4.7	\$3.4	\$5.0	Unplanned priority tree removals and environmental costs
2019	\$5.4	\$4.7	\$3.0	\$3.6	Priority trees higher costs
2020	\$5.2	\$4.4	\$3.2	\$3.6	More priority trees and less ground clearance work

Distribution and Sub-Transmission VM Costs (in millions)

Year	O&M Budget	O&M Actual	Capital Budget	Capital Actual	Explanation
2017	\$11.9	\$11.9	\$12.3	\$12.0	
2018	\$10.8	\$11.1	\$14.4	\$14.5	
2019	\$12.3	\$12.0	\$12.8	\$15.8	More diseased Ash tree removals than planned
2020	\$11.4	\$14.1	\$13.8	\$14.0	Targeted Reliability Work

Hazard tree removal spending increased in 2019 but decreased in 2020, as the following table (which excludes 2019 and 2020 costs for Reliability Plus hazard tree removals in 2019 and 2020). The table separates Priority (transmission) and Hazard (distribution) Tree Removal Costs, both shown in millions of dollars.

Priority & Hazard Tree Removal Costs (in millions)

Year	Distribution	Transmission
2017	\$2.2	\$1.2
2018	\$5.1	\$2.2
2019	\$7.5	\$2.6
2020	\$4.4	\$2.5

2. Vegetation Management Programs

a. Legacy Distribution and Sub-transmission Vegetation Management Programs

JCP&L’s legacy Vegetation Management Program (VMP) is based on the BPU Vegetation Management (tree trimming) Standards N.J.A.C. 14.5-9.1, adapted in 2008 and revised in 2010 and 2015. JCP&L’s VMP requires compliance to applicable ANSI Z133.1, A-300, and OSHA Standards. NERC reliability requirements also drive the transmission program.

BPU Orders require no greater than four-year cycles for distribution rights of way vegetation management, complemented by spot trimming or treatment conducted as necessary to maintain clearances on restricted easements, in the presence of fast-growing vegetation species, and for other reasons. The program seeks to sustain sufficient operational clearances between the trim cycles. Management trims distribution and sub-transmission line trees and brush on four-year cycles. Routine trimming has provided up to 15 feet of horizontal clearance from the circuit

centerline and up to 15 feet of vertical clearance above conductors. Arborists determine actual trim distances in the field, based on specific tree species growth rates. Fast-growing maples, for example, require 15 feet, but slow growing pines require less trim distance to effectively achieve cycle goals. Contractors trim back to the main branches on the line side of trees, “training” them to resprout and grow away from the lines. Contractors also remove ground growth or brush on off roadway corridors to provide four-foot paths to poles. Management removes on-corridor and off-corridor hazard trees, particularly dying ash trees, as identified by the JCP&L foresters. Forestry contractors must secure permission to remove hazard trees from private property.

JCP&L foresters conduct mid-cycle inspections for vine growth encroachment and clearance violations. Mid-cycle trimming directed by the foresters considers reliability issues based on their experience.

b. 2016 Enhanced Distribution Zone 1 Circuit Trimming Program

In compliance to N.J.A.C. 14:5-9.8 (b)1, management began in 2016 to include removal during cycle trimming of overhang limbs within each distribution circuit’s Zone 1, up to the maximum height of aerial lift truck reach (75 feet). Zone 1 includes the three-phase main line from the substation breaker to the first downstream main line protective device. Management has continued Zone 1 overhang trimming on all circuits.

c. Docket No. EO18070728 - Reliability Plus Infrastructure Investment Programs

The BPU approved this program on May 8, 2019. This program’s tree-related action involved removal of overhanging limbs on Zone 2 for some selected circuits. Management addressed Zone 2 overhanging limbs on 221 circuits during the 2019 and 2020 program period. Zone 2 includes the lines between the first line protective device and the end of the mainline three phase circuits (but not lateral circuits). Management has continued to maintain the Zone 2 trimming on these selected circuits during the current four-year cycle. JCP&L submits semiannual reports for 4 years indicating the reliability impacts of the Zone 2 trimming on the 221 circuits.

Management is still in the process of evaluating the effectiveness of the Zone 2 overhanging limb removal program, analyzing the SAIDI, SAIFI and CAIDI impacts of tree-related outages on the 221 selected circuits before and after the implementation of enhanced overhang trimming.

d. Docket No. ER20020146 Vegetation Management Circuit Performance Program

Management initiated in 2021 a Vegetation Management Circuit Performance Program (VMCP). First, for each of 1,187 JCP&L circuits, management will report semi-annually all tree-related outages by weather condition (blue sky, minor weather days, and major events). The program places a focus on the worst-performing 12 percent of circuits as measured by their SAIDI performance over four years. A circuit on the 12 percent list during any two years of a four-year cycle undergoes special attention in evaluating its SAIDI drivers (*e.g.*, overhanging limbs and off-corridor trees. Management then will apply focused improvement methods, such as enhanced overhang trimming, and off-corridor tree mitigation to these poorest-performing circuits. The program calls for the monitoring of these circuits on a quarterly basis until the circuits’ SAIDI performance shows sustained improvement for at least two consecutive quarters.

e. Sub-Transmission Vegetation Management

FirstEnergy is responsible for the costs of sub-transmission (34.5kV) tree trimming, brush cutting, and hazard tree removal, but the JCP&L Forestry Organization, largely through contractors it oversees, perform planning, management, and execution of the work required. For sub-transmission circuits, including sub-transmission poles with distribution circuits, the contractors trim up to 15 feet for roadway circuits. Off-road circuits get trimmed to 20 feet, however; these circuits comprise more than half the sub-transmission circuit miles in the Northern Region. Management provides greater off-road clearance distance, given access limitations, sometimes requiring the use of helicopters.

f. Transmission Vegetation Management (TVM)

The FirstEnergy Vegetation Management Organization has total responsibility for transmission system vegetation management. FirstEnergy conducts transmission vegetation management operations on at most four-year cycles, as required by the BPU. The established methods comply with NERC results-based Vegetation Management Standard FAC-003. This standard prohibits encroachments into transmission minimum vegetation clearance distances (MVCDs). FirstEnergy manages this compliance by conducting annual transmission line inspections and preparing annual work plans that include controlling incompatible vegetation through the use of manual, mechanical, arboricultural, and chemical methods. FirstEnergy seeks to sustain on each right of way compatible vegetation that does not interfere with safe and efficient operation of the system. Management requires that transmission vegetation work comply with ANSI Z133.1 and A-300 Standards and OSHA requirements.

Management’s approach requires vegetation trims, cuts, and removals that produce a clearance of at least ■ feet from the nearest conductor for 115kV lines and ■ feet for 230kV lines. Management takes mitigation actions when inspections identify vegetation within ■ feet for 115kV and ■ feet or less for 230kV.

g. Substation Vegetation Management

The JCP&L Facilities Organization manages brush spraying contractors that removes or sprays vegetation within substation confines. Management deploys a qualified contractor tree crew for tree encroachments into substation fencing.

h. Hazard Trees

N.J.A.C 14:5-1.2 defines a “Hazard Tree” as an on or off the right- of-way, structurally unsound tree that could strike electric supply lines when falling. “Priority Trees” include those dead, diseased, declining, structurally compromised, severely leaning, or significantly encroaching into the vegetation clearing zone. A “Structurally Unsound” categorization distinguishes hazard trees from priority trees. All hazard trees are priority trees, but not all priority trees are hazard trees.

On transmission rights of way, when transmission arborists identify priority trees, or those trees that could contact a transmission line under adverse weather conditions regardless of their health, FirstEnergy removes or mitigates the conditions caused by the tree. Management does not plan and budget hazard tree removals for distribution and sub-transmission, but removes trees determined to be hazardous on a case-by-case basis whenever they are encountered by foresters.

Sometimes permissions to remove these trees are denied by owners, shade tree organizations, or municipal governments for a variety of reasons.

3. Liberty Field Visits

Field inspections we conducted in July 2021 observed vegetation activities performed on several Highest Priority Circuits and IIP circuits undergoing or ready for trimming in 2021 and 2022. We observed conformity of trimming clearances with four-year cycle trim specifications. We also observed five vegetation management contractor crews at work on two circuits. Contractor supervisors were certified utility arborists. Crews removed overhang limbs up to 75 feet (limited by aerial lift truck height) and provided at least four-year standard trim clearances ranging from about 4 to 15 feet, depending on tree species.

JCP&L foresters conduct weekly audits of contractor’s work and crews must provide remedial trimming in circumstances when JCP&L’s forester does not confirm satisfactory clearances. In addition to primary conductor clearances, contractors clear four feet for open wire secondary and service conductors and remove limbs in contact with secondary and service triplex conductors.

4. Tree-Caused Incident Contributions to SAIFI and SAIDI

The next table shows that JCP&L tree influenced SAIFI and SAIDI performance (excluding major storms) has not improved since 2017, indicating the need for continued management attention to and evaluation of the causes of this major source of reliability diminishment.

System Tree Caused Outages, SAIFI, and SAIDI

Year	Outages	SAIFI	SAIDI
2017	2,384	0.36	173
2018	2,677	0.39	177
2019	2,295	0.36	190
2020	2,604	0.37	197

The next two tables show that tree-caused outages in the more densely tree populated Northern Region run at twice or three times the rate experienced in the Central Region.

Northern Region Tree-Cause Outages

Year	Excluding Major Storms			Including Major Storms		
	Outages	SAIFI	CAIDI	Outages	SAIFI	CAIDI
2017	1,730	0.24	187	2,175	0.31	212
2018	1,875	0.25	195	5,021	0.89	1,599
2019	1,549	0.21	188	3,489	0.54	440
2020	1,883	0.27	213	3,455	0.58	1,304

Central Region Tree-Caused Outages

Year	Excluding Major Storms			Including Major Storms		
	Outages	SAIFI	CAIDI	Outages	SAIFI	CAIDI
2017	654	0.12	152	807	0.14	142
2018	802	0.15	155	1,607	0.30	395
2019	746	0.15	192	1,416	0.30	576
2020	721	0.10	167	2,100	0.39	1,227

The next table indicates that off right-of-way trees produced most tree-cause outages during August 2020 Storm Isaias. However, about 16 percent of them involved trees within the rights-of-way. Management tracks formally on and off right-of-way tree-caused outages, as indicated by the next table, which provides data for Storm Isaias.

Storm Isaias Tree-Caused Outages

Cause	Outages
Trees Into Secondary Service	340
Trees Off ROW – Limbs	235
Trees Off ROW – Tree	1,070
Trees On ROW	324
Total	1,969

5. Vegetation Management Work Completion

JCP&L’s 1,171 distribution circuits traverse 12,067 miles of overhead line corridors. Management plans about 3,000 miles of tree trimming work each year, following the four-year cyclical program. Records indicate that it completed all planned distribution vegetation management work each year since 2017.

The 242 sub-transmission (34.5kV) circuits run along 1,773 miles of overhead line corridors. JCP&L planned about 450 miles in 2017 and 2018, about 535 miles in 2019, and about 375 miles in 2020. Management completed work on the entire sub-transmission system within the four-year cycle. Records indicate that it completed all planned sub-transmission vegetation management work each year since 2017.

The 78 transmission (115, 230, and 500kV) circuits total 788 miles of lines and traverse 428 miles of corridors. FirstEnergy maintains all 428 miles of transmission corridors in New Jersey. FirstEnergy planned about 116 miles of transmission trimming in 2017, 105 miles in 2018, 97 miles in 2019, and about 109 miles in 2020, completing work on the entire system in four years.

Records indicate that it completed all planned transmission vegetation management work each year since 2017.

Priority tree removals on the transmission system and hazard tree removals on the sub-transmission and distribution system increased in 2018 and 2019 but fell in 2020. Management does not annually plan for distribution hazard tree removals but removes those individually selected by a forester based on specific tree conditions and surrounding circumstances. FirstEnergy nominally conducts annual planning for transmission priority tree removals, but each year removed 50 percent to 100 percent more trees than included in its annual 2017-2020 plans.

Hazard and Priority Tree Removals

System	2017	2018	2019	2020
Distribution	6,974	13,035	23,885	21,131
Sub-transmission	2,485	4,814	5,961	4,414
Transmission	3,345	3,542	3,737	2,673

Management has conducted outreach addressing for stakeholders the risk to electric system reliability. Eight municipalities denied the removal of a total of 34 hazard trees in 2020.

C. Conclusions

1. Management enhanced its vegetation management programs to provide more acceptable reliability by adding Zone 1, and later Zone 2, removal of overhanging branches to its cycle trims.

JCP&L’s distribution system vegetation management program includes four parts. The pre-2016 program included four-year trim cycles on all distribution circuits, including the lateral circuits, with up to 15 feet of tree clearance. This approach comports with the usual utility vegetation management practices. However, to improve tree-related reliability and meet BPU requirements management began to remove overhanging limbs on the Zone 1 of the main line circuits in 2016. To further improve tree-related reliability, when management conducted its Reliability Plus – IIP program in 2019 and 2020, it dedicated about \$43 million to remove overhanging limbs on the Zone 2 of the 221 circuits, and to enhance its hazard tree removal program.

In 2021, management implemented the Vegetation Management Circuit Performance Program (VMCP). First, for each of 1,187 JCP&L circuits, management will report semi-annually all tree-related outages by weather condition (blue sky, minor weather days, and major events). The program places a focus on the worst-performing 12 percent of circuits as measured by their SAIDI performance over four years. A circuit on the 12 percent list during any two years of a four-year cycle undergoes special attention in evaluating its SAIDI drivers (e.g., overhanging limbs and off-corridor trees.) Management then will apply focused improvement methods, such as enhanced overhang trimming, and off-corridor tree mitigation to these poorest-performing circuits. The program calls for the monitoring of these circuits on a quarterly basis until the circuits’ SAIDI performance shows sustained improvement for at least two consecutive quarters.

2. Management has been conducting vegetation management in accord with program requirements.

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3. Vegetation management spending has slightly exceeded budgets.

A higher-than-expected number of tree removals and targeted reliability work has largely driven variances between budgeted and actual spending. 2019 and 2020 expenditures were \$8.3 and \$8.0 million respectively for transmission vegetation management, and \$27.8 and \$28.1 million respectively for distribution and sub-transmission circuit vegetation management. Distribution hazard tree removal spending increased to \$7.5 million in 2019 from \$5.1 million in 2018, then decreased in 2020 to \$4.4 million.

4. Management has expended significant effort and expense on enhanced vegetation management practices, including the overhang removal work associated with the 2019-2020 IIP program, but reliability results from those efforts remain unclear. (See Recommendation #1)

The Central Region's tree related SAIFI and CAIDI improved by year end 2020, but Northern's SAIFI and CAIDI had worsened. YTD April 2021 data proved inconclusive - most tree related outages in the Mid-Atlantic occur later in the year. We have not had the opportunity to evaluate closely newly developed annualized data and SAIFI and SAIDI calculations to assess the impact of Zone 2 overhang removals affecting the 277 pilot feeders.

These new data, although preliminarily appearing to substantiate the effectiveness of the Zone 2 work, were shared with Liberty for the first time during a 9/10/21 management interview and require additional scrutiny.

D. Recommendations

1. Demonstrate that enhanced Zone 2 vegetation work conducted as part of IIP Reliability Plus was as effective in reducing SAIFI and CAIDI as predicted. (See Conclusion #4)

The impact on CAIDI and SAIFI performance in the Northern and Central Regions and for JCP&L as a whole from the IIP Reliability Plus Zone 2 overhang removal initiative involving 277 distribution feeders remains surprisingly unclear. JCP&L should clarify and submit those results for review, using the latest available data. Further, JCP&L should prepare and provide an analysis comparing those results to the costs of the enhanced vegetation efforts and to the expected CAIDI and SAIFI improvements which formed the bases for approval of the initiative. JCP&L needs to demonstrate that enhanced Zone 2 vegetation work was as effective in reducing SAIFI and CAIDI as predicted or explain why it was not.

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Chapter VI: Contractors

A. Background

This chapter describes our review of JCP&L’s solicitation, evaluation, vetting, procurement, retention, and management of contractors to perform electric facilities work. That work includes construction, maintenance, operations, and outage restoration and related activities. We also examined JCP&L’s philosophy and strategies in supplementing organic utility employee resources with similarly trained and qualified contractor resources and how workload is assigned and balanced between those labor pools.

In general utility practice, contractor labor often offers a cost-effective supplement to internal forces, because it offers specialized skills or more efficient work practices. Often, prevailing wage scales do not offer material economic difference between company and contractor personnel. Even so, fluctuations in work levels can make contractors an economical means of shaving work peaks, permitting management to staff internally at levels sufficient to complete baseload work, using contractors at peaks that do not last through the year or work season.

Whether contractors form part of the baseline workforce, providing occasionally needed skills, or serving as “peak shavers,” utilities generally find that using a mix of contractors and employee resources produces effectiveness and efficiency, especially in field-construction and maintenance work. Management does, however, need to ensure that contractors adhere to company safety practices and engineering, maintenance, construction and equipment specifications and standards. Utilities need to manage their contractors, just as they manage their own personnel, to ensure that they receive expected work quality, quantity, and timeliness.

Effective contractor management requires that company supervisors of contractors have and use well-defined responsibilities and processes and the supporting tools and technology that makes their oversight and monitoring more accurate, timely and effective in securing the value from contractor work.

Contractor use has expanded in the North American electric utility industry in recent years, extending to a broad range of operations areas. Contractor use often increased as utilities have dealt with employee attrition and incumbency changes and downsizing. The industry has long recognized the challenges of a graying work force. In those cases, contractors perform functions that the company no longer has the resources to handle as effectively or as efficiently. Effectively balancing employee and contractor use for particular workloads should include the elements that typify any make-versus-buy decision. It should also apply sound methods and standards for ensuring competitive procurement of contractor services. Selecting contractors should weigh quality and service provisions along with cost considerations.

Evaluations of contractors should consider company and peer utility actual experience with them. Management should also regularly review its policy of using contractors versus company employees to ensure that it actually secures benefits projected from contractor use. Effective management also entails regular review of the use of employees when contractor alternatives are available. Economic analyses used to aid the decision process should take a long-range view that

includes the cycle time required to support the recruitment and training of employees necessary to perform the service and maintain the capability in-house.

We evaluated management’s effectiveness in:

- Basing the nature and extent of contractor use on a sound resource optimization strategy that results from regular and risk-informed assessments of resource needs for operations and the comparison of contractor and internal resource capabilities and capacities.
- Evaluating contractor use using sound analysis of alternatives, considering economy, skill levels required, and performance quality.
- Using an appropriate sharing between the utility and the contractor of opportunities and risk, consistent with the operational and financial objectives to be secured by the contract.
- Using a process that demonstrates partnering relationships (instead of bidding projects continually) in achieving safe, timely, quality, and cost-effective performance.
- Considers the costs and benefits associated with having construction and maintenance contractor resources – those who are deployed every day and additional off-system resources who might quickly be brought to bear - available to respond timely to emergency events (line storms).
- Using a contractor selection process that ensures comparative safety and quality and competitively priced services.
- Establishing and executing protocols appropriate to measuring, tracking, and ensuring complete, timely, high-quality, and cost-effective contractor performance.

New Jersey law requires anyone digging to call 811 - New Jersey One Call (NJOC) at least three full business days prior to beginning work to request a mark-out of any underground facilities. Professional excavators can also request mark-outs via the ITIC tool on the NJOC website. NJOC operates as a state-regulated, non-profit organization comprised of public utilities and municipalities in the State and functions as a one-call notification system to notify owners of underground facilities before a proposed excavation. NJOC handles both routine and emergency requests. The NJOC program, in operation for over 30 years, has helped utilities avoid service interruptions that would result from excavation damage.

The New Jersey Board of Public Utilities (BPU) has responsibility for oversight and compliance enforcement of the “One Call Law” signed into law in October 1994. Since passage of the law, the BPU has established mark-out standards, encouraged outreach and education, and pursued enforcement actions for any in violation of the law.

Utilities can use contractors effectively to provide a supplement to company resources short-term (*e.g.*, for seasonal peak workloads), or, as with markouts, to secure specialized skills and services economically. Utilities must effectively manage these and other contractor resources to ensure compliance with management standards and procedures. They must also ensure that underground locating contractors comply with New Jersey One Call Law.

Effective management requires that company supervisors of contractors consistently operate under well-defined responsibilities and processes, using sufficient supporting tools, to make their oversight fully effective in securing expected quality, value, and safety.

We focus in this section on the use of contractors in the system to accomplish underground locating or mark-outs, as requested through the NJOC system.

We also examined the responsibilities and methods for inspection of line work performed by contractors. N.J.A.C. 14:3-2.2 requires that:

To the extent necessary to assure compliance with safe practices, any construction work performed by contractors shall be inspected by a qualified representative of the utility before being placed in active service.

The statute, as well as good utility practice underscore the need for appropriate methods, including procedures, resources, practices, activities, and record keeping sufficient to ensure work quality, completeness, and best costs. Concise and complete reports should identify the results of clear and regularly performed evaluations of contractor performance, including safety practices, compliance to construction standards, and on-time completions. A comprehensive program for conducting effective inspections should underlie performance reporting and analysis.

We examined how management prepares contractors for projects, monitors their safety and work practices and construction effectiveness, conformance, and completion, and how it ensures that completed projects meet all requirements before placement into active service. We also requested archived documentation of past contractor performances to confirm that effective JCP&L contract management practices.

B. Findings

1. JCP&L Contracting Strategy and Resource Balancing

The current steady-state construction and maintenance contracting approach at JCP&L, with very few exceptions, focuses singly on peak shaving of time-constrained workload that exceeds the capacity of internal resources to accomplish it. Utilities typically assign customer sensitive new business extensions, facility relocations from road work, other public works projects, and time-sensitive reliability or regulatory commitment-driven work to line construction and maintenance contractors after already fully committing internal crews to other work and where time constraints prove rigid.

Management has not applied relative economics of deploying contractors versus company personnel as a driving factor in these resource management decisions. In effect, it simply first assigns internal resources to all planned workload until reaching their capacity; then it assigns the workload remaining to contractors. Much work of the type assigned to contractors (*e.g.*, new business and other customer-driven work and government-sponsored relocations and modifications, is billable to a third party) making economic differences between the use of company or contractor crews (if any) subject to pre-negotiations with the third party who pays their costs.

The following table shows the number of contractor and employee full-time equivalents that installed, repaired, and replaced electric overhead, underground, secondary and service lines and equipment from 2017 through June 2021. These totals include 2019 work on the Reliability Plus program.

Contractor Mix

FTEs	2017	2018	2019	2020	June 2021
JCP&L	379	363	344	310	291
Contractor	43	25	91	98	70
Total	422	388	435	408	361
JCP&L % of Total	89.8%	93.6%	79.1%	76.0%	80.6%

Given the nearly exclusive peak-shaving focus of JCP&L’s contracting approach, the numbers of contractor resources engaged in electric system work varied in proportion with workload, producing significant increases in 2019 and 2020, as JCP&L performed large workloads associated with IIP – Reliability Plus initiatives.

We found limited exceptions to this peak-shaving-only approach occurred, applied on the basis of situation-specific contractor capabilities and economics. For instance, JCP&L contracts all traffic management and flagging operations, all asbestos remediation activities, and all subsurface directional boring for conduit and cable installation to third parties. Management outsourced all vegetation management field activities - - tree trimming, tree removal, brush removal and herbicide application - - to contractors under trimming mileage-based, herbicide area-based, and removal unit-based contracts. For each of these exception cases, management concluded after analysis that contractors could more effectively and economically perform this small range of functions, using specialized training, personnel, and equipment.

Relative risks and the potential for reducing them do not play a role in selection, scoping and deployment of contractors; they do not appear to form management’s decision process regarding when to use contractors and on which workload segments. JCP&L Operations Services Director’s Office, Regional Operations Services, and Engineering Services management having direct responsibility for monitoring and validating contractor-executed work in the field consider company and contractor resources essentially equivalent and interchangeable for the completion of work orders.

2. Contracting Models

Competitive lump-sum bidding represents the preferred method of comparing available contractor resources and awarding contracts, when schedules and other project constraints allow. Management generally use a number of factors when pre-qualifying contractor companies, including safety record, pricing, environmental compliance record, diversity, payment terms, and directly applicable experience. JCP&L uses construction drawings, bills of materials and detailed work order documents from its Crew Work Request System (CREWS) to provide the pre-qualified competing vendors bidders with the materials needed to submit proposals. Management generally awards contracts to similarly qualified contractors on a best evaluated cost basis.

JCP&L Operations Services Director’s Office, Regional Operations Services, and Engineering Services management directly responsible for contractor adherence to schedule, standards, terms and conditions expressed familiarity with the capabilities and performance characteristics of the contractors deployed on the system and confidence that all work gets performed in a satisfactory

manner, with proper and prompt remediation when post-completion inspections identify non-compliances. Management responsible for contractor oversight reports inspection of 100 percent of contractor-performed work in the field, either during work execution or post-completion. Management identifies and resolves departures from designs and standards, and quality or quantity disparities.

At times, the schedule, scope, or complexity of work chosen for assignment to contractors has favored the use of Time and Equipment (T&E) terms and conditions. In those cases, management compensated contractors for their work by applying pre-negotiated labor, equipment, and overhead rates to the number of resources and time spent in completion of the assigned work. JCP&L leadership engaged in contractor field oversight for each work order assigned (as measured in workdays or half-workdays according to scope) and set broad job-duration expectations. Contractor-submitted timesheets documented the work. Management also field inspected all contractor work orders performed on a T&E basis.

3. Contractor Solicitation and Selection

FirstEnergy Service Company (FESC) provides supply chain services for all the FirstEnergy operating companies, including JCP&L. These services include solicitation and administration of bids and contract awards. At the request of the sponsoring JCP&L business unit, Supply Chain buyers initiate bidding events and the FirstEnergy Supply Chain procurement organization has responsibility for the conduct of the bidding process and the issuance of purchase orders to the successful offeror. As outlined below, subject matter experts and leadership from the business units participate in the technical evaluation of each bid, with their concurrence with supply chain's decisions preceding contract or purchase order execution.

Management applied to competitive solicitations a process guided by FirstEnergy procedure SCPR-SRC001, "Enterprise Sourcing of Materials and Services" (Revision 9, dated January 4, 2010), soliciting multiple offers for consideration. Supply Chain and the JCP&L operating organization collaborate for each sourcing event to develop supplier qualifications requirements and form the bases for evaluating the responsive offers. JCP&L and Supply Chain cooperate in the evaluation of the bidder responses, considering a broad range of factors, typically including safety record, pricing, environmental issues, schedule, delivery dates, market indexes, diversity of contractor/subcontractors, payment terms and contractor's experience and capability. Technical Review performed by the JCP&L organization requesting the work evaluates the vendor proposals. Management assigns proposal reviewers on the bases of their knowledge, skill, experience, and capability associated with the contract's scope. Supply Chain buyers then issue the purchase order to the selected contractor.

We found no formal processes or procedures addressing how to observe, inspect, measure, manage or document the quality, volume or efficiency of the work performed by contractors in the field after they are hired and deployed. However, the processes used by FirstEnergy and JCP&L to solicit, compare, and select from among competing contractors using the data provided in each competitive bidding process conforms to good industry practice.

Management does not collect performance data for work on the JCP&L system, but we found that it does appropriately consider key qualification records and differentiators provided during

competitive bidding. These factors include matters such as historical safety and environmental performance, supplier and subcontractor diversity, and the contractor’s demonstrated ability to effectively identify and mitigate the risks inherent to utility construction, maintenance, and operations.

4. Contractor Performance Management and Analysis

JCP&L field or engineering supervisory personnel inspect essentially all construction and maintenance work performed by contractors for quality and quantity of work performed and for standards adherence. However, no formal process or procedure guides the scope or performance of those inspections. JCP&L management does not have a method to track and report key aspects of contractor performance on overhead line projects, underground projects, and secondary and service drop projects; *e.g.*, on-time and on-budget completion, for contractor work.

The next table shows that JCP&L incurred more than \$83 million in combined capital and O&M contractor cumulative spending from 2016 to present. It did so without the benefit of any JCP&L or FirstEnergy operational or financial key performance indicators (KPIs) tied to contractor performance management.

Contractor Spending Summary

	2016	2017	2018	2019	2020	April 2021
Base Capital	\$9,946,341	\$8,323,501	\$5,515,820	\$16,557,398	\$15,767,217	\$5,020,386
Base O&M	\$871,503	\$2,765,444	\$1,075,582	\$2,299,220	\$3,160,710	\$1,086,326
<i>Base Spend Subtotal</i>	<i>\$10,817,845</i>	<i>\$11,088,946</i>	<i>\$6,591,402</i>	<i>\$18,856,618</i>	<i>\$18,927,927</i>	<i>\$6,106,712</i>
IIP Capital				\$4,208,151	\$5,801,538	
IIP O&M				\$569,280	\$798,068	
<i>IIP Subtotal</i>	<i>\$0</i>	<i>\$0</i>	<i>\$0</i>	<i>\$4,777,431</i>	<i>\$6,599,606</i>	<i>\$0</i>
Total	\$10,817,845	\$11,088,946	\$6,591,402	\$23,634,049	\$25,527,533	\$6,106,712

Management applied no standard inspection or observation forms or checklists to document contractor work performed. Management performed no analyses to track individual contractor productivity or quality over time or to compare and differentiate the productivity and quality delivered by a specific contractor versus competing contractors or versus internal JCP&L construction and maintenance resources. Management assigns a project manager or a line supervisor to manage contractor crews and ensure work completion; *i.e.*, the same process used for management of its internal crews.

KPIs related to contractor effectiveness or efficiency are not collected or analyzed and the only permanent record of a contractor’s work associated with a particular project or work order is an electronic flag in CREWS that the work order in question was completed by a contractor, the initials of the inspecting field supervisor and the date that the order was verified completed by that supervisor.

Given the lack of a formal contractor performance measurement and documentation process, JCP&L does not currently have the ability to compare quantitatively the relative quality, efficiency or cost effectiveness of one electric construction or maintenance contractor vs. another. Nor does management have the ability to objectively quantify or compare the economic efficiency of those contractors to similarly tasked JCP&L company crews.

5. *Underground Locating*

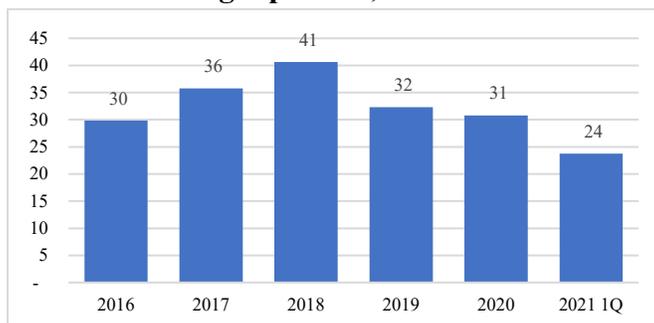
JCP&L’s locating contractor has responsibility for all mark outs within its service territory. The current locating contractor has provided underground locating services in JCP&L’s North and Central regions since March 2017, when management stopped using its predecessor, based on its concerns about performance quality. The locating contractor provides underground locating services for other FirstEnergy distribution companies. The current locating contract runs through December 31, 2023. Execution of this contract followed a formal request for proposal process conducted by FirstEnergy’s Supply Chain organization. Bid evaluation criteria addressed prior performance, bid price, and safety risks. The contract provides for a flat rate per locate.

The number of mark-out requests grew by 18 percent from 2016 to 2019. Requests for mark-outs fell somewhat in 2020, likely affected by reduced work during the pandemic. Damages per 100,000 requests have remained low, peaking in 2018, as the next table shows.

JCP&L Locate Requests

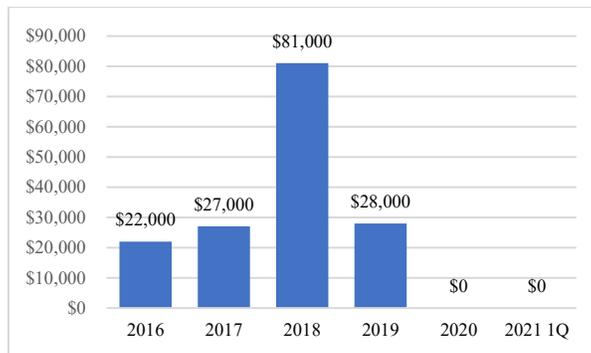
Item	2016	2017	2018	2019	2020	2021 1Q
Requests for Mark Out	241,009	240,387	273,160	284,557	259,589	50,507
Damaged Facilities	72	86	111	92	80	12
Damaged per 100,000 Requests	30	36	41	32	31	24
Settlements Related to NOPVs	\$22,000	\$27,000	\$81,000	\$28,000	\$0	\$0

Damages per 100,000 Locates



In four of the last six years, JCP&L has paid settlements to resolve Notices of Probable Violation (NOPVs) related to alleged violations of the BPU’s Underground Facilities regulations. Underground locating vendors reimburse JCP&L for settlements paid. Settlements in 2018 ran more than three times higher than those of other recent years, as the next chart illustrates. Management required no settlements in 2020 or through the first quarter 2021.

Notice of Probable Violations Settlements

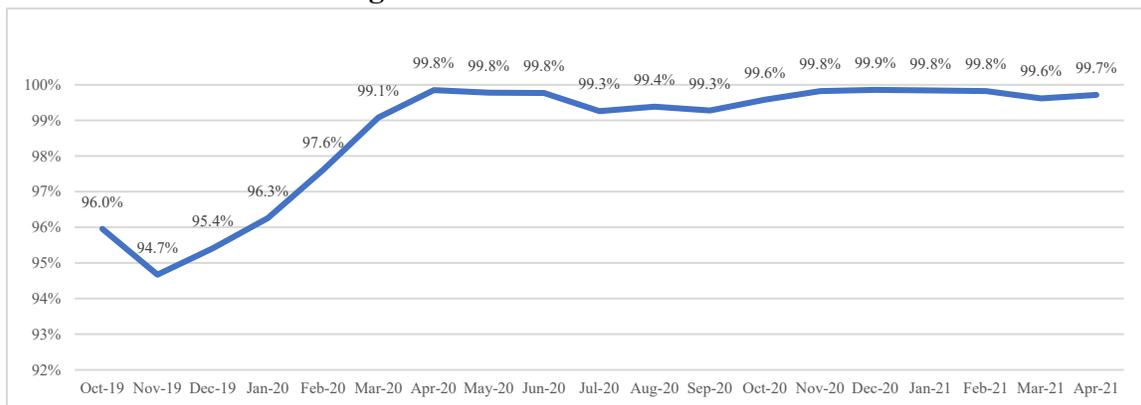


Management implemented a new ticket management application in 2019; it established the ability to monitor, track, and report on-time performance. The Joint Use & Cable Locating organization tracks NJOC mark-out requests and outstanding tickets daily. JCP&L’s Engineering Services group monitors contractor invoicing and payment, tracks NJOC mark-out requests, submits damage reports, and deals with BPU inquiries. A separate Claims organization handles those associated with underground locating.

An October 2019 continuous improvement plan established with the locating contractor has produced daily tracking of contractor performance and monthly scorecards that track on-time performance, NOPVs, and contractor and property owner complaints.

The next chart summarizes the current locating contractor’s on-time performance from October 2019 through April 2021. The measurement uses the number of regular tickets completed within 72 hours and emergency tickets responded to within 2 hours. Late tickets get returned to the locating contractor for review and identification of corrective actions needed to meet on-time goals. JCP&L operations, locating contractor, and FirstEnergy Joint Use & Cable Locating management meet bi-monthly to review performance and metrics.

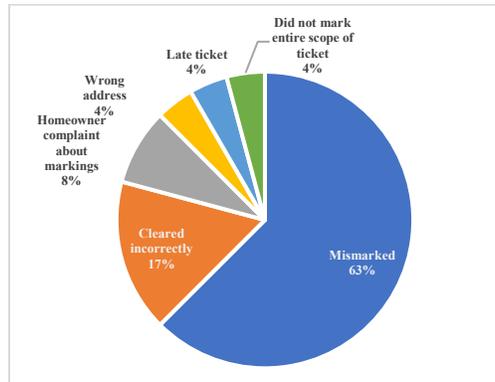
Locating Contractor Percent On-Time Tickets



Management also tracks complaints received from excavators and property-owners relating to underground locating tickets completed by the locating contractor. From October 2019 through

April 2021, excavators made only 24 complaints. The next chart shows incorrect or mismarked facilities as primary areas of concern.

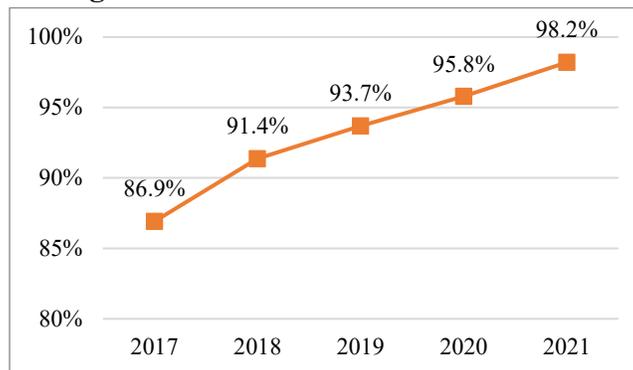
Excavator Complaints – Root Cause Summary



Since June 2017, management has conducted random field audits of locating contractor mark-outs, to check for proper completion of the work. Three Circuit Reliability Coordinators (CRCs) working in JCP&L’s Regional Engineering group have responsibility for conducting the field audits for randomly selected mark-out request tickets within the service territory. Management targets approximately 40 locations for review each week.

On average, the Coordinators conducted 1,900 mark-out audits from 2017 to 2020, with more than 500 conducted from January through mid-May 2021. Passing rates for these audits have climbed steadily under the new locating contractor brought onboard in 2017.

Locating Contractor Mark-out Audits - Pass Rates



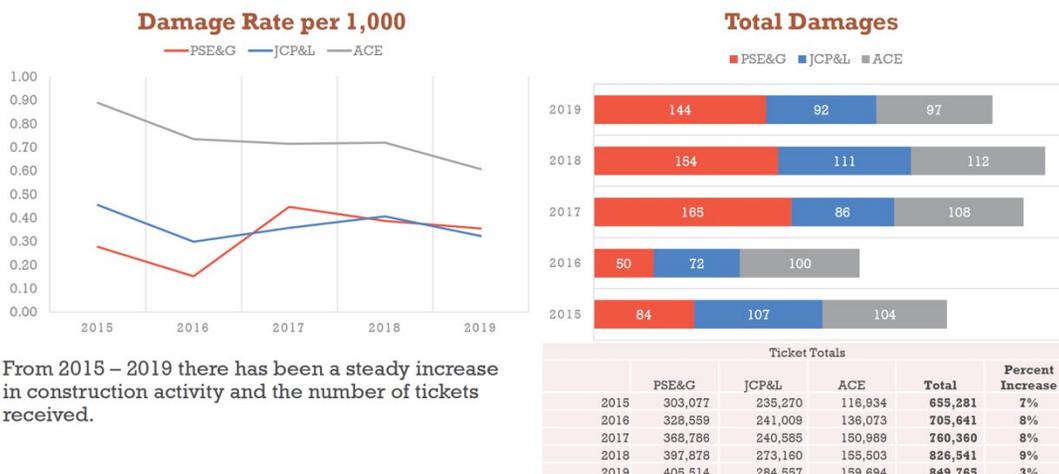
Management has taken corrective measures to address all field audit fails, generally asking the contractor to make necessary corrections on site at the time of the audit. Third-party damages have declined since 2018 and contractor quality has improved steadily since 2017.

JCP&L participates in the NJ Common Ground Alliance (NJCGA). Each Spring the NJCGA hosts events to provide training and education to increase awareness among interested stakeholders, excavators, and contractors. NJOC also hosts quarterly outreach events to spread awareness and promote 811 and NJOC. Management also participates in peer-to-peer benchmarking sponsored by the NJCGA. The following charts, prepared by NJCGA, provides benchmarked trending of

damage rates for the three largest New Jersey electric utilities. JCP&L shows improvement over the five-year period, with the lowest damage rate among the utilities in 2019.

NJCGA Damage Rate Benchmarking

ELECTRIC DAMAGES 2015-2019



The next table shows that JCP&L’s underground locating operation and maintenance costs have remained steady since 2017.

Underground Locating Costs (table is confidential)

Year	Total O&M	Locates (annually)	\$/Locate
2016			
2017			
2018			
2019			
2020			
2021 1Q			

6. Overseeing and Assessing Contractor Performance

Currently JCP&L has four electric lines contractors, comprising 14 lines crews, working on its electric system. FirstEnergy engineering manages and coordinates transmission and sub-transmission line and substation mechanics for routine projects, but also contracts out major substation projects, managed by FirstEnergy project managers.

Supervisors and managers have responsibility for ensuring contractor correction of gaps, variances, and other discrepancies before approving the completed work for payment processing and before recording the completed project in the Company’s CREWS software program. For large projects, such as those executed in 2019 and 2020 as parts of the Reliability Plus IIP Program,

project managers used their own processes to track open discrepancies, schedule corrections, and record closed discrepancies.

For significant distribution lines projects, those generally over \$100,000, JCP&L management assigns an internal project manager to work with district management, system operations, protection, supply chain and other stakeholders to coordinate, manage, and track the projects to completion. The four-person JCP&L project management organization manages significant underground and overhead distribution system contractor-performed projects. These project managers had responsibility for the contracted portions of the \$97 million Reliability Plus – Infrastructure Improvement Program implemented in 2019 and 2020.

JCP&L contracts experienced and qualified former line employees to inspect the work of contractors tasked with relocating JCP&L facilities in conjunction with New Jersey Department of Transportation (NJDOT) highway projects. The NJDOT procures, manages, and pays for these contractors directly. When their work is completed the JCP&L facilities are inspected for compliance and certified as ready for service by the designated representatives, and the utility takes ownership of the relocated facilities.

Management assigns a lines supervisor or manager for routine contractor-performed electric lines work, usually for projects of less than \$100,000. The Company has 55 Operations supervisors, managers, and general managers qualified to provide real-time and post-completion oversight, inspections, and monitoring of contractor field work on electric facilities. Before commencing any project, an engineering supervisor determines the completeness and accuracy of the project design and all related switching and outage plans.

Operations supervisors and managers conduct pre-construction project reviews and job briefings with line contractors to review project scope, and to provide copies of construction drawings, standards, permits and work orders. Subsequent site visits and meetings review work progress and inspect completed work for safety and compliance. When the completed work is accepted, and the facilities are put into service, the project is marked in the CREWS software program as completed.

Management does not formally record contractor performance, in terms of deficiencies, on-time completions, or cost vs. budget performances. No KPIs address success in securing effective and efficient contractor performance. JCP&L depends wholly on its project managers and line supervisors to use their own processes and record keeping, ensuring the quality of contractor-performed work.

For significant and complicated projects, such as those comprising the Reliability Plus IIP, JCP&L uses a software program for tracking issues of non-compliance with construction standards. The program dashboard indicated the circuit, the pole, address, dispatch area, the issue of non-compliance, the corrective actions associated with closed issues, and the schedule for addressing open issues. However, this tracking process focuses only on non-compliances and follow up corrective actions and not specifically on any other contractor performance metrics. Management does not archive these tracking records.

C. Conclusions

1. Management staffs internal field workforce to rely predominantly on internal field resources to perform electric sub-transmission and distribution construction, maintenance, and operations work, supplemented by a relatively small contractor force.

Informed by workload management, management has periodically increased or decreased supplemental contractor resource to meet workload demands, especially for time-constrained workload like utility reconfigurations associated with public works projects, and special resource-intensive reliability improvement initiatives (e.g., the IIP – Reliability Plus programs of 2019 and 2020).

2. The criteria and processes used by management to solicit, vet, pre-qualify, and select electric system construction and maintenance contractors conform to good utility practice.

JCP&L established and maintains a ready resource pool of trained, qualified, and equipped contractors that it can quickly and efficiently deploy to peak-shave company crew workload. The workload assigned to contract resources typically consists of time-constrained planned work, often associated with new business extensions or utility work associated with government funded public works projects, such as road widenings. Once onboard, contractors also supplement JCP&L's, emergency and storm restoration operations capabilities.

Supported by Supply Chain, JCP&L personnel make a practice of competitive bidding to select contractors, using processes that provide for comparison and analysis of bids under established criteria. The use of pre-qualification establishes base capabilities of the bidders; supporting the use of best price as a primary selection criterion.

3. JCP&L's inspection of essentially all contractor work during field operations or immediately following completion by knowledgeable and experienced field and engineering leadership represented a sound practice, but management did not support those inspections with a systematic record keeping process. (See Recommendation #1)

Non-conformances and quality problems may be timely identified and effectively remediated post-inspection by the contractors, but no record of either the non-conformances or the corrective actions is maintained. There are no standard inspection or observation forms or checklists – either electronic or paper - - to document the quantity or quality of contractor work performed.

4. JCP&L lacks a formal contractor performance management process. (See Recommendation #2)

The absence of a process and a detailed system of record to document, quantify and objectively compare work performed by contractors to objective standards and to the work of other resources, precludes the ability to make data-driven resource allocation decisions – between different contractors or between contractors and company employees.

5. Potential changes in relative execution risks (and the potential for risk reduction opportunities) are not included in JCP&L's resource allocation decisions between

available contractors or between contractors and company personnel. (See Recommendation #3)

JCP&L leadership made it clear that relative risks associated with the use of contractor vs. company resources are not part of the selection, scoping and deployment of contractors and do not influence decisions about when to use contractors and on which segments of workload to use specific contractors.

6. JCP&L’s use of contractors strictly as a peak shaving resource and only when workload exceeds company labor capacity forgoes the potential of broader economic allocation of resources. (See Recommendation #2)

Just as the routine outsourcing of vegetation management and traffic management to contractors has widely been adopted as best utility practice from both cost and quality perspectives, the identification of savings associated with other disciplines or sub-disciplines of utility construction, maintenance and operations are not possible without a formal process and technology to gather, record and analyze and compare company and contractor data.

7. Management has acted effectively to control third-party damages with respect to underground damage prevention/One Call.

Requests for mark outs increased by 18 percent from 2016 to 2019, while JCP&L’s damage rate remained low and improved since 2018. Settlements related to Notices of Probable Violations (NOPVs) have also declined since 2018. Benchmarking conducted through the New Jersey Common Ground Alliance of the State’s utilities shows one of the lowest damage rates in the state.

8. Management developed effective approaches to measure and control contractor performance and experienced effective results with respect to underground damage prevention/One Call.

As part of a continuous improvement plan established with the locating contractor in October 2019, management tracks contractor performance daily and reports contractor performance monthly in a scorecard. The locating contractor on-time ticket performance has improved since management began tracking in 2020, from 96 percent in October 2019 to 99.7 percent in April 2021.

JCP&L’s field audit quality assurance program, a best practice recommended by the Common Ground Alliance, also documents that passing rates for these audits have climbed steadily since the locating contractor was brought onboard in 2017.

The JCP&L field audits are providing a higher degree of contractor oversight, strengthening underground-locating and damage-prevention processes and performance. Third-party damages declined from 2018 levels with contractor quality improved steadily since 2017.

9. Management uses qualified personnel to inspect contractor work before energizing such work and placing it into service, but does not employ sufficient documentation, recordkeeping, or analysis of inspection data. (See Recommendation #1 and #2)

N.J.A.C. 14:3-2.2 requires “To the extent necessary to assure compliance with safe practices, any construction work performed by contractors shall be inspected by a qualified representative of the utility before being placed in active service.” Management complies with the regulation in a very

basic way by ensuring that all work is properly inspected before it is energized as part of the electric system. By keeping their compliance at such a fundamental level, though, JCP&L falls short of proven effective utility practice. Management's process does not permanently record any data associated with a contractor's cost effectiveness or contract performance history, nor does it include the analysis of that missing data in making sourcing decisions.

D. Recommendations

1. Develop a standard process to inspect, evaluate, document, and manage the quality and quantity of a contractor's performance when measured against the standards, terms and conditions of their contract with JCP&L. (See Conclusion #3 and #9)

Like all utilities, JCP&L must ensure that its contractors adhere to company safety practices and engineering and construction standards. In addition, JCP&L needs to manage contractors, just as they manage their own personnel, to ensure that they receive the quality and quantity of work that they expect and that customers fund. Contractor management entails ensuring that company supervisors of contractors possess well-defined responsibilities and processes, and supporting tools, to make their monitoring tasks more effective in securing the value that the company and customers deserve.

2. Develop a formal contractor performance management process and a system of record to capture performance data and enable comparative analyses of the quality, efficiency and cost effectiveness of competing contractor and company resources, and support data-driven resource allocation decisions. (See Conclusion #4, #6, and #9)

Contract and engineering and construction standard conformance history, project and work order schedule adherence, personnel safety and injury performance, utility infrastructure and private property damage history, unplanned forced outage frequency, municipal permit and processing adherence, and other quantitative and qualitative data should be collected, collated, stored in a performance management information system, and comparatively evaluated to drive sourcing decisions. A contractor's cost effectiveness and contract performance history should be compared with their own past performance, the performance and cost effectiveness of their competitors and the economics and performance of similarly qualified and equipped internal JCP&L crews when making sourcing decisions.

3. Integrate the analysis of relative execution risks and the potential of reducing risk into JCP&L resource allocation decisions. (See Conclusion #5)

JCP&L has been contracting significant blocks of their non-construction and maintenance electric utility operations workload for some time, including currently outsourcing all of their vegetation management and planned traffic control and roadside jobsite traffic protection responsibilities. Organic utility employees are not used for these functions. By implementing these sourcing decisions, management has transferred significant risk and liability from JCP&L's internal workforce to specialized, highly qualified and specially licensed contractors. Besides reassigning risk to these external entities, the outsourcing of vegetation management and traffic protection also has economic benefits since the labor pools staffing those two disciplines are not as highly compensated as JCP&L's internal electric operations workforce.

JCP&L should apply the same types of risk and economic analyses that guided their selection of vegetation management and jobsite traffic protection sourcing alternatives to other disciplines within their overall electric system operations workload.

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Chapter VII: Reliability Programs and Smart Grid Activities

A. Background

Providing high levels of reliability presents large challenges for electric utilities, like JCP&L, that operate aged equipment among dense tree populations. Programs for addressing the worst reliability-performing circuits, focusing on customers and devices experiencing multiple interruptions, and implementing a vegetation management program with cycles specifically designed for local tree species comprise important elements of good utility practices. The operating challenges of its service territory make it appropriate for JCP&L to focus strongly on reducing tree- and equipment-caused outages, and on making comparably expansive use of automatic sectionalizing and restoration.

The *Operations Organization* chapter describes JCP&L’s operations organization and its relationship with FirstEnergy Service Company, and examines the effectiveness of their relationship in the division of responsibilities, accountabilities, programs, methods, resources, support, and performance measurement as they act together to ensure adequate reliability for customers at efficient costs.

This chapter examines JCP&L’s methods for monitoring numbers, frequency and causes of outages and measures used to assess and report reliability. SAIDI (annual average duration of an interruption), CAIDI (average annual restoration time per customer interrupted), and SAIFI (number of annual outages experienced by the average customer) comprise central measures of reliability. We examined the reliability-focused initiatives and programs undertaken by JCP&L since 2017 and reviewed how JCP&L prioritized reliability spending based on the requirements of New Jersey regulations and Board Orders, their own internal goal setting, and what the industry generally considers good practice. We examined whether management regularly identifies, analyzes, and responds to outage magnitudes and causes as they strive for improvements in SAIFI, CAIDI, and SAIDI performance, system-wide, regionally, and locally. We also physically inspected sections of the three worst performing circuits in each of JCP&L’s Northern and Central Regions.

We explored JCP&L’s Smart Grid application and its use of its OMS and Plant Information technologies to monitor the electric system and to obtain and use real-time system data to expedite outage restorations. We also observed management’s implementation of other technological advances to enhance reliability, including automatic circuit-tie schemes, SCADA-controlled sectionalizing and restoration, programmable relaying, and the use of automatic reclosing devices to replace legacy one-shot fuses.

We evaluated management’s effectiveness in:

- Regularly examining, analyzing, and responding to gaps identified with respect to outage magnitudes and causes, and the resulting SAIDI, CAIDI and SAIFI indices
- Annually striving to maintain reliability within N.J.A.C. requirements, and in pursuit of its own SAIFI, SAIDI, and CAIDI minimum and target levels
- Using methods for determining the cost of each reliability initiative versus projected improvements in SAIFI, SAIDI, and CAIDI

- Installing additional automatic sectionalizing and restoration technologies, including Smart Grid and other technologies, to improve SAIFI, CAIDI, and SAIDI reliability indices.

B. Findings

JCP&L operates under reliability targets set by N.J.A.C. requirements and BPU orders, which it has complemented with higher, internally-set objectives. Management implements inspection and maintenance programs, vegetation management programs (routine cyclic tree trimming and enhanced limb overhang removal), and installs additional sectionalizing, reclosing, and load transfer schemes. The age of its distribution equipment and density of tree growth, especially in the Northern Region makes performing to targets challenging for management.

1. Compliance with Reporting Requirements

JCP&L's 2017 through 2020 Annual System Performance Reports addressed the requirements of N.J.A.C. 14:5-8.8. The reports included tables, charts, and graphs of prior year SAIFI and CAIDI for each of the two Regions and JCP&L as a whole. Reports showed data in relation to minimum required performance levels and rolling ten-year trends. The reports included descriptions of outage causes, inspection, maintenance, and vegetation management programs, hazard tree removals, the Highest Priority Circuit Program and lists of worst-performing circuits. The reports also included descriptions of JCP&L's power quality and stray voltage programs, technology initiatives to improve reliability including a 2017 Microgrid Feasibility effort, personnel training programs, and staffing levels.

In addition to these annual reports, JCP&L has since September 2013 provided Quarterly Circuit Outage Reports, as required by Board Orders in 2012 and 2013, and by N.J.A.C. 14:5-8.7. These quarterly reports detail attributes and quarterly reliability performance of each JCP&L circuit. Comprehensive in content, the quarterly reports include circuit identifications, circuit types, source substations, numbers of customers served, numbers of customers affected, outage start date and time, outage durations, and cause of each outage.

2. Reliability Performance and Goals

We generally reviewed SAIFI, CAIDI, and SAIDI measures that excluded major events, defined generally (but incorporating other circumstances) by N.J.A.C. 14:5-1.2. as sustained service interruptions affecting at least 10 percent of an area's customers. N.J.A.C. 14:5-8.10 required the establishment of Benchmark Reliability Levels, using the 2010 to 2014 average for each of the CAIDI and SAIFI indices. "Minimum" levels use the Benchmark Levels, plus one- and one-half standard deviations.

The next table summarizes 2020 CAIDI and SAIFI performance. The Central Region met both the BPU Minimum and JCP&L's lower Benchmark Reliability Level for CAIDI in 2020, but narrowly missed the internal, lower Benchmark Target Level for SAIFI. The Northern Region only met the BPU Minimum Level for CAIDI; it did not meet JCP&L's CAIDI Benchmark Level. The Northern Region 2020 SAIFI did not meet either the internal Benchmark or the BPU's Minimum Levels.

2020 JCP&L CAIDI and SAIFI Measures

Area	CAIDI			SAIFI		
	Benchmark	Minimum	Actual	Benchmark	Minimum	Actual
Northern	128	151	131.5	1.18	1.35	1.46
Central	101	110	98.6	1.01	1.22	1.02
System	<i>not applicable</i>		115.1	<i>not applicable</i>		1.20

Management does not employ these minimum CAIDI and SAIFI goals as part of the Key Performance Indicators (KPIs) it uses for compensation-incentive purposes. There it employs only system-wide SAIDI and Transmission Outage Frequency (TOF). The following tables show that reliability goals have not changed since 2017. They are not expected to change before 2023.

Northern Region CAIDI Performance

Year	Actual	Benchmark	Minimum
2017	125	128	151
2018	133	128	151
2019	126	128	151
2020	131	128	151

Central Region CAIDI Performance

Year	Actual	Benchmark	Minimum
2017	103	101	110
2018	110	101	110
2019	102	101	110
2020	99	101	110

Northern Region SAIFI Performance

Year	Actual	Benchmark	Minimum
2017	1.12	1.18	1.35
2018	1.29	1.18	1.35
2019	1.29	1.18	1.35
2020	1.46	1.18	1.35

Central Region SAIFI Performance

Year	Actual	Benchmark	Minimum
2017	0.98	1.01	1.22
2018	1.10	1.01	1.22
2019	1.14	1.01	1.22
2020	1.02	1.01	1.22

Overall SAIFI Targets - - Set by JCP&L

Year	Actual	Stretch	Target	Threshold
2017	1.04	1.04	1.20	1.48
2018	1.18	1.02	1.19	1.48
2019	1.20	1.01	1.19	1.48
2020	1.20	1.01	1.19	1.48

Overall CAIDI Targets - - Set by JCP&L

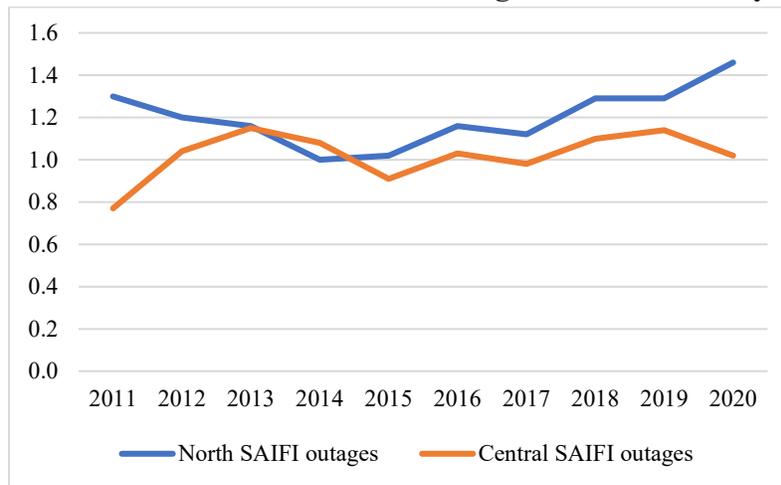
Year	Actual	Stretch	Target	Threshold
2017	113	99	116	119
2018	120	99	116	119
2019	113	99	116	119
2020	115	99	116	119

Overall SAIDI Targets - - Set by JCP&L

Year	Actual	Stretch	Target	Threshold
2017	118	103	139	176
2018	141	101	139	176
2019	136	100	138	176
2020	138	100	138	176
2021	-	100	138	176

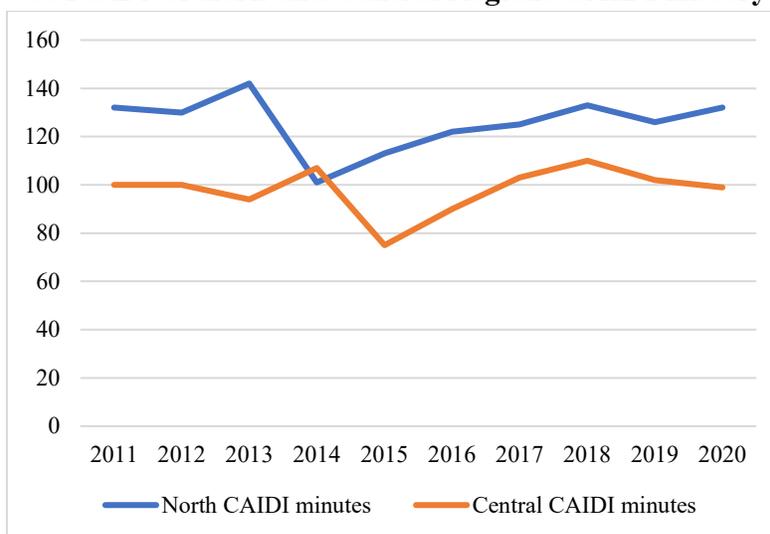
The graph below shows deterioration in JCP&L’s Northern Region SAIFI from 2017 through 2020. Central Region SAIFI performance moved in a negative direction, improved in 2020.

JCP&L Northern and Central Regions SAIFI History



This next graph shows that JCP&L’s Northern Region 2020 CAIDI minutes have increased slightly since 2017, while Central Region CAIDI performance improved (decreased) slightly from 2017 through 2020.

JCP&L Northern and Central Regions CAIDI History



JCP&L’s 2020 Annual System Performance Report, attributes 0.482 of Northern Region SAIFI and 0.308 of Central Region SAIFI to outages during “minor weather days.” Management defines a minor weather day as one during which a district experienced 0.25 inch of accumulated ice or freezing rain, four inches or more of snow fall within 24 hours, winds of 40 mph or more, or ten or more lightning strikes per hour. Management monitors these conditions using weather service data. However, we found the value of minor weather day data questionable; management deems all outages during a minor weather day as a “minor weather day outage,” independent of any actual connection with weather conditions. For example, one annual system report included large outages apparently caused by bird and animal interference as well as large sub-transmission outages of unknown cause in their report of “minor weather day outages.”

We compared JCP&L system-wide CAIDI to that of utilities submitting data in the annual IEEE nationwide surveys for 2017 through 2020. JCP&L’s CAIDI performance has typically fallen near the median, in the second quartile of reporting utilities. In 2018, however, JCP&L’s CAIDI fell to the third quartile, as the next table summarizes. The surveys are conducted in following year, making 2020 data not yet available. We compared JCP&L’s 2020 CAIDI to the last year (2019) for which IEEE Utilities Group data is available.

JCP&L and IEEE Utilities Group CAIDI

(table is confidential)

IEEE		JCP&L		IEEE	JCP&L	IEEE	JCP&L
2019 Quartile	2019 CAIDI	2020 CAIDI	2019 CAIDI	2018 CAIDI	2018 CAIDI	2017 CAIDI	2017 CAIDI
1 st	21-97			62-94		46-93	
2 nd	98-116	115	114	95-108		94-110	109
3 rd	117-133			109-132	118	111-136	
4 th	134-340			133-247		137-325	

Historically JCP&L has not been as good when compared with that of the IEEE group. JCP&L performance has placed generally in the third quartile, with the exception dropping it to the bottom quartile, in 2019.

JCP&L and IEEE Utilities Group SAIFI
(table is confidential)

IEEE		JCP&L		IEEE	JCP&L	IEEE	JCP&L
2019 Quartile	2019 SAIFI	2020 SAIFI	2019 SAIFI	2018 SAIFI	2018 SAIFI	2017 SAIFI	2017 SAIFI
1 st	0.35-0.88			0.3-0.9		0.33-.82	
2 nd	0.89-1.11			0.9-1.1		0.83-1.07	
3 rd	1.12-1.38	1.20		1.1-1.4	1.34	1.08-1.47	1.18
4 th	1.39-6.50		1.57	1.4-2.5		1.48-2.44	

3. Transmission, Sub-transmission, and Substation Reliability

JCP&L provides transmission, sub-transmission, substation, and distribution system contributions in the SAIFI, SAIDI, and CAIDI results its overall Annual Performance Reports present. N.J.A.C. 14:5-8.8 does not require separate reporting, but management chooses to include it.

The percentage contributions to numbers and of minutes of customer interruption by the distribution system has decreased since 2017. The next table summarizes the percentages these systems contribute to the system’s total Customer Interruptions and Customer Minutes of Interruption. Substation contribution to interruptions has decreased - - markedly in 2020. Transmission system contribution to interruption numbers and minutes has remained minimal, but sub-transmission’s contributions have increased by more than 2.5 times since 2017.

Transmission, Sub-transmission, Substation Interruptions

Year	Transmission		Sub-Transmission		Substations		Distribution	
	CI	CMI	CI	CMI	CI	CMI	CI	CMI
2017	0.4%	0.1%	8.9%	4.2%	10.4%	8.6%	80.4%	87.2%
2018	0.3%	0.1%	10.8%	5.3%	10.3%	8.6%	78.5%	86.1%
2019	2.4%	0.3%	12.6%	5.1%	9.4%	7.2%	75.6%	87.3%
2020	0.3%	0.0%	16.3%	8.3%	7.1%	4.5%	76.2%	87.2%

To improve transmission and sub-transmission reliability, FirstEnergy plans to rebuild facilities at the [REDACTED], upgrading transmission line relaying. Management also plans to replace legacy transmission and sub-transmission circuit breakers in the 2026 timeframe. FirstEnergy has begun a multi-year program of installing auto-reclosing on its 34.5 kV circuit breakers. Reclosing allows temporary faults on the 34.5 kV system to clear before automatically reclosing, introducing more momentary interruptions but reducing SAIFI and CAIDI impacts by automatic restoration after temporary faults. FirstEnergy also plans to conduct LIDAR inspections on its 34.5 kV system to support and improve vegetation management clearance and hazard tree identification. It already does so on the transmission system. It also has upgraded some motor-operated air-break switches, and plans to upgrade or replace switches in the future.

4. Distribution Outage Causes

Reliability engineering and operations management regularly monitor outage times and outage cause data and district reliability engineers investigate outage trends and evaluate possible mitigating actions. Where troubleshooters consistently use them when diagnosing outages, outage classifications provide a sound basis for informing the reliability engineering process about system needs. However, we found a significant number of outages being classified by restoration personnel as “unknown.” The next table shows nearly as many outages of “unknown” origin as there are outages attributed to “animal” interference. Better, more specific outage data, including accurate cause attribution, yield more effective corrective actions which in turn prevent future outages.

Unknown and Animal Caused JCP&L Outages

Year	Outages	SAIFI	CAIDI	Outages	SAIFI	CAIDI
<i>Causes Unknown</i>				<i>Caused by Animals</i>		
2017	1,359	0.25	68	1,708	0.18	102
2018	1,955	0.37	72	1,515	0.17	82
2019	1,525	0.46	59	1,470	0.19	95
2020	1,656	0.51	59	1,522	0.18	100

Distribution control center technicians review and scrub each OMS job after restoration completion to validate data, including the number of affected customer and the duration (including switching steps). Monthly reliability engineer and operations personnel reviews analyze all outages having more than 125,000 total customer minutes of interruption, in order to identify mitigating actions. The group reviews ten to twenty outages each month. Management has no formal program or requirement for investigating outages beyond those with 125,000 customer minutes of interruption, but reliability engineers perform ad hoc reviews of other outages (e.g., cases where customers (CEMI) or devices (DEMI) experience multiple interruptions).

a. Causes of SAIDI – System-Wide

SAIDI measures total duration of the average customer interruption; SAIFI measures how often the average customer experiences an interruption. CAIDI measures the average time to restore service following an interruption. The three measures have a close inter-relationship - - CAIDI equals SAIDI divided by SAIFI. Utilities recognize SAIDI minutes as often the best metric for comparing the overall effect of different outage causes on customers, and in targeting and prioritizing reliability enhancements. The 2020 JCP&L system SAIDI measure was 138 minutes, meaning that the average JCP&L customer experienced 138 minutes without power during that year.

The top nine outage cause codes contributing to SAIDI minutes have remained consistent yearly since 2016, except that equipment-caused outage contribution increased 29 minutes in 2017 to 42 in 2018, followed by a drop back to about 30 minutes in 2020. Tree-related outages have contributed the most to SAIDI each year except for 2018. Tree contribution has ranged between 2016’s 31 minutes to 2020’s 34 minutes. Unknown causes contributed 8 minutes in 2016, increasing to more than 14 minutes in 2020. Animals-caused interruptions accounted for about 10 minutes of SAIDI each year, while “Lines” contributed about 20 minutes each year. “Lightning”

caused outages increased from 2 minutes in 2016 to more than 4 minutes in 2020. “Forced Outages” comprise those purposefully taken by JCP&L to ensure system and personnel safety during maintenance work. These safety-related forced outages contributed just under 5 minutes to SAIDI in 2017, 9 in 2019, and 7 in 2020.

Excluding major storms, equipment-related events proved the largest contributor to 2020 JCP&L customer minutes of interruption (38 percent of them). Next came “Off-ROW trees” - - at about 18 percent total and a higher, 23 percent in Northern Region. “Other/unknown” causes accounted for about 20 percent of 2020 customer minutes of interruption. The inability to accurately attribute one fifth of annual outage durations to specific causes presents a significant barrier to ongoing efforts to improve JCP&Ls reliability.

2020 Customer Minutes of Interruptions

<i>1: Equipment</i> 981,718	<i>3: Other/Unknown</i> 539,750	<i>5: Vehicles</i> 155,528
<i>2: Trees</i> 637,428	<i>4: Animals</i> 192,836	<i>6: Lightning</i> 81,621
Total: 2,588,875		

The next table compares the impacts of trees from off the right of way and on the right of way, in terms of customer minutes of interruption. Minutes of interruption from tree-related incidents have actually increased.

2017 and 2020 Tree-Caused Minutes of Interruption

Year	Off-ROW Limb	Off-ROW Tree	On ROW Tree
2020	84,358	478,222	64,678
2017	115,627	458,621	29,832

b. Tree-Caused Outages by Region

Tree-caused outages in the Northern Region have doubled or tripled their Central Region counterparts, as the next table shows. Management began overhanging limb removals in Zone 1 in 2016 and added Zone 2 in its 2019-2020 Reliability Plus IIP. Management expects improvements in future reliability as overhanging limb removal continues.

Northern Region Tree-Cause Outages

Year	Excluding Major Storms			Including Major Storms		
	Outages	SAIFI	CAIDI	Outages	SAIFI	CAIDI
2017	1,730	0.24	187	2,175	0.31	212
2018	1,875	0.25	195	5,021	0.89	1,599
2019	1,549	0.21	188	3,489	0.54	440
2020	1,883	0.27	213	3,455	0.58	1,304

Central Region Tree-Caused Outages

Year	Excluding Major Storms			Including Major Storms		
	Outages	SAIFI	CAIDI	Outages	SAIFI	CAIDI
2017	654	0.12	152	807	0.14	142
2018	802	0.15	155	1,607	0.30	395
2019	746	0.15	192	1,416	0.30	576
2020	721	0.10	167	2,100	0.39	1,227

Off right of way trees can prove particularly troublesome during major storms, as the large numbers during Storm Isaias (see the next table) shows.

Storm Isaias Tree-Caused Outages

Cause	Outage Numbers
Trees into secondary service	340
Trees off ROW – limbs	235
Trees off ROW – tree	1,070
Trees on ROW	324
Total	1,969

c. Equipment Caused Outages

The next table summarizes the equipment-caused outage data from 2017 through 2020.

JCP&L System-Wide Equipment-Caused Outages

Year	Outages	SAIFI	CAIDI
2017	2,519	0.43	132
2018	3,429	0.57	144
2019	2,473	0.51	108
2020	2,335	0.44	142

“Overhead spacer cable” and “overhead bare conductors” have proven the two largest equipment-related causes of customer minutes of interruptions in 2017 through 2020. The next four in order were broken poles (car-pole accidents), defective cutout switches, direct buried primary underground cables (URD), and “None/Other OH,” as captured in the OMS. Management indicates that it examines recordings of “None/Other” as a cause during the outage data review and scrubbing process that follows field restoration. This review process can identify more specifically the equipment causing failure. When it does, corrections are entered into the OMS. Management reported to us that leadership continues to stress to restoration personnel the importance of providing the best possible outage cause data.

Management relies on its five-year distribution visual and thermographic inspection programs as the primary method for preventing and minimizing equipment and line failures and resulting outages. It identifies and repairs missing spacer brackets, deteriorating conductor splices, taps, tracking and cracked insulators, leaning poles, and other line component defects. Management also addresses deteriorated equipment identified during the execution of the distribution wood pole

program, the Highest Priority Circuits program, the CEMI program, and the devices experiencing multiple interruptions (DEMI) program.

Management in the past, implemented programs to reduce equipment caused outages. During the fourth quarter of 2015, management applied unused O&M funds to conduct an ad hoc inspection and repair program for deteriorated aerial spacer cable assemblies on worst performing circuits. A similar ad hoc program implemented at various times between 2013 and 2018 targeted failure-prone porcelain cutout switch components for replacement.

d. Animal Caused Outages

About 1,500 outages annually since 2017 have been attributed to animal contact. The numbers of Northern Region animal caused outages has proven somewhat higher than those in the Central Region - - a result consistent with more forested territory in the north. Management installs animal guards proactively on new reclosers, pole transformers, and substation breakers to reduce animal interference, and does so during maintenance for missing guards. Installing additional animal guards comprises a specified mitigation action for highest priority circuits. District reliability engineers conduct walking inspections of highest priority circuits and CEMI circuits to identify locations needing animal protection and other reliability enhancements. During field visits, we observed animal guards installed on substation breaker bushings.

System-Wide Animal-Caused Outages

Year	Outages	SAIFI	CAIDI
2017	1,708	0.18	102
2018	1,515	0.17	82
2019	1,470	0.19	95
2020	1,522	0.18	100

5. *Reliability and Resiliency Programs*

JCP&L considers its electric system inspection and maintenance programs, and vegetation management programs as “base reliability” programs. We examined some of those programs and activities in the *Asset Management* and *Vegetation Management* chapters. Management employs them to maintain reliability within BPU targets and to drive toward JCP&L’s more aggressive internal targets. Management has been conducting these programs since before 2017. The JCP&L reliability programs we address here, and which fall outside those inspection, maintenance, and vegetation management programs and activities we addressed in those other chapters include:

- Highest Priority Circuit
- Customers Experiencing Multiple Interruptions (CEMI)
- Devices Experiencing Multiple Interruptions (DEMI)
- Power Quality
- Automatic Circuit Tie Schemes and Smart Grid
- Adaptive Relaying Strategy
- Circuit Zone 1 removal of overhanging tree limbs.

a. Highest Priority Circuit Program

JCP&L has been identifying and working to enhance reliability to its worst performing circuits for many years. Management’s method for selecting its “highest priority circuits” since 2017 has entailed:

- Calculation of each circuit’s distribution caused SAIFI (number of outages in one year)
- Selection of the worst 20 percent performing circuits, based on SAIFI
- Ranking of those selected circuits based on distribution caused SAIDI (outage durations experienced by each feeder’s customers)
- Elimination of circuits with high SAIDI caused by an isolated major event, such as car-pole accidents
- Additional selection of worst 8 percent of the circuits when ranked by highest customer minutes of interruptions
- Overlay evaluation of those customers experiencing multiple interruption (CEMI) on the selected circuits.

Using each year’s list of “highest priority circuits” identified, district reliability engineers inspect the circuits, using Graphic Information System (GIS) and a map identifying CEMI issues, and then develop plans to mitigate outages. The reliability engineers meet regularly to review and update an understanding of the currently poorest performing circuits, and to develop plans for projects for the following year.

Typical causes of poor reliability for these targeted circuits include:

- Equipment failures, such as wire breaks and splice failures
- Tree and animal related outages
- Manufacturing and workmanship issues.

Typical mitigation work includes:

- Circuit load balancing
- Better coordination of the reclosers, fuses and TripSaver devices within the circuit’s protection scheme, or the addition of protective devices
- Performance of spot tree trimming and removals
- Reconfiguration of circuit elements to reduce exposure to wind and lightning.

In 2019, reliability engineers identified, and prepared mitigation plans for 45 highest priority circuits in the Northern Region and 51 circuits in the Central Region. Management completed work addressing issues with all 96 circuits in 2020, and issued orders for further mitigation work. Following completion of mitigation work on the highest priority circuits, reliability engineers monitor the performance of those circuits in aggregate for two years to verify reliability performance improvement in proportion to the corrective actions performed. If necessary, they order work for further mitigation.

b. Customers and Devices Experiencing Multiple Interruptions

JCP&L’s program for Customers Experiencing Multiple Interruptions (CEMI) systematically identifies and works to correct specific circumstances affecting customers who experience significantly more outages than the typical customer. The program also requires area managers to

directly communicate with affected customers about the actions being taken to improve their service.

The trigger for action occurs when a customer experiences 6 outages year to date, or 10 outages over a rolling 12-month period (excluding major storms). Management tracks data in its GIS system and reliability engineers review and update the data weekly. Reports are issued monthly, and reliability engineers are assigned to cases involving individuals or groups with common outage histories. The engineers identify the causes of the outages and develop mitigation plans, issuing work orders to implement the plans. Reliability engineers produce a monthly report, and provide the report to the area managers and/or the customer support representatives to support communications with those affected customers. The area manager and customer support personnel (for commercial and industrial), discuss the actions being taken with the affected customers and with community groups and leadership.

Reliability engineers also investigate the causes of devices experiencing four or more multiple interruptions (DEMI) within four rolling months.

c. Power Quality

Programs and activities address stray voltage, voltage maintenance, and voltage flicker. An occurrence of “stray voltage” can result from current flowing between an electrical neutral conductor and a nearby grounded device, caused by induction from another electrical source, inadequate grounding, broken or high impedance neutrals, load imbalance, high resistivity soil, or high harmonic content in load current (usually caused by capacitor placement). Stray voltage can damage electronics, or more importantly, cause discomfort or injury to humans and animals.

The DCC dispatches a troubleshooter to investigate customer notifications of a stray voltage issue. Troubleshooters investigate and resolve stray voltages in excess of 10 volts. If the troubleshooter cannot directly resolve the issue, the DCC creates a follow up order for follow-up by the engineering department, which works with the customer to determine the cause (JCP&L or the customer), and to help address that cause.

Troubleshooters investigate when a customer reports that their service voltage is too low or too high compared to the provisions of N.J.A.C. (+/- 5 percent). Management resolves voltage level issues by changing substation transformer load tap changer and line regulator settings, re-balancing loads on primary circuits, changing pole transformer sizes, increasing conductor sizes, replacing single phase with multi-phase sections, transferring loads to another feeder, or converting the feeder section to a higher voltage level.

JCP&L imposes on customers requirements that limit the introduction of voltage flicker effects from welders, arc furnaces, and large motors back onto the distribution system from customer installations. However, flicker can also result from poor electrical connections on either side of the customer’s meter. When a customer complains of voltage flicker, an area reliability engineer investigates the cause. JCP&L corrects the source of the flicker when examination shows utility equipment as the source. For customer-caused issues, JCP&L assists resolution by describing the issue to be addressed by the customer’s electrician.

JCP&L had been replacing manual circuit tie switches with automatic circuit tie schemes. The design of these schemes, in addition to the three smart grid schemes installed prior to 2015, intends to reduce the numbers of customers affected by sustained distribution line faults. These advanced devices provide narrower isolation of faults when they do occur and quickly restore service to customers on the unaffected sections of a circuit. While not preventing outages from happening in the first place, these installation schemes significantly reduce total customer minutes of interruption once a fault does occur. Management’s practice of designing circuits to allow extra capacity to accept load transfers enables this automatic circuit tie capability and allows the transferring of loads between circuits on most of the JCP&L’s distribution system. This approach comprises best utility practice.

JCP&L monitors and tracks power system industry technology and practice developments, and with FirstEnergy collaborates with the Electric Power Research Institute (EPRI) and the Edison Electric Institute (EEI) regarding:

- Advanced Distribution Management System (ADMS) deployment
- Distribution Automation (DA) experiences
- Distributed Energy Resource (DER) integrations
- Grid Modernization.

The U.S. Department of Energy (DOE) indicated that the advanced distribution management system (ADMS) that FirstEnergy is now testing as a replacement for its existing outage management system would provide an operating platform for smart grid technologies. Additional technologies being considered by JCP&L include advanced metering infrastructure (AMI), Distribution Automation, and Voltage and VAR optimization.

d. Smart Grids

With DOE-funded collaboration with EPRI, by 2015 JCP&L had installed 15 SCADA-controlled reclosers on two Morristown substation circuits and one Ridge substation circuit. It also replaced the electro-mechanical relays for those circuits with electronic programmable relays. This project divided the three circuits into fifteen separate line segments, each separated by a recloser controllable by system operators when necessary, and with each instrumented with current transformers and voltage sensors. Eight of these segments have reclosers programmed with software that detects and diagnoses a fault and automatically switches the corresponding reclosers to restore customers within two minutes of an outage.

JCP&L spent slightly more than \$3 million (DOE funded) between 2013 and 2015 to install these 15 SCADA-controlled in-line and tie reclosers, along with the accompanying automatic controls, and electronic substation relays. Management estimates that the automatic load transfer schemes on the Morristown and Ridge circuits have avoided almost 175,000 customer minutes of interruptions on average each year between 2017 and 2020.

As experience with the automation technology has grown, so has the effectiveness of the installations. Successful automated operations have increased since initial installation as the next table illustrates.

Smart Grid Operations

Year	Successful
2017	60%
2018	85%
2019	67%
2020	80%
2021	100%

e. Mid-Circuit Reclosers and Automatic Circuit Tie Schemes

Mid-circuit reclosers isolate Zone 2 (second half) of a circuit allowing Zone 1 (first half) to remain energized after a Zone 2 fault. The advantage of using mid-circuit reclosers rather than mid-circuit fuses comes from recloser attempts to re-energize after allowing for a time delay during which temporary faults (small tree limbs) may clear themselves. Outage responders must manually replace blown fuses. Where faults prove temporary, mid-circuit reclosers reduce Zone 2 lockouts and sustained outages, often significantly impacting reliability.

Automatic circuit tie schemes go a step further - - replacing manual circuit tie switches with reclosers that automatically close to tie circuit segments after sensing a sustained loss of voltage (allowing some time to pass to verify that the circuit recloser has indeed locked out). These circuit tie schemes transfer a circuit's Zone 2 (second half of main line circuit) to another circuit following a Zone 1 fault substation breaker lock out. This action prevents sustained outages for customers served by the circuit's Zone 2 during a Zone 1 fault. Each automatic circuit tie scheme involves two circuits and at least three reclosers.

Smart grids divide circuits into even smaller segments, serving to isolate even fewer customers affected by a fault on a segment. By contrast, automatic circuit tie schemes can isolate only larger segments, which leaves more customer outages remaining after completing isolation. Circuit tie schemes, however, do substantially improve reliability and at a cost significantly less than the installation of smart grid schemes.

JCP&L had installed 24 automatic circuit tie schemes before and added three in 2014. Later installations of 116 automatic circuit tie schemes (82 during 2020) alone increased that number substantially. Of those 116, 82 also have SCADA control. Management has underway installation of SCADA control on the remaining 34 circuit tie schemes.

f. Automatic Circuit Tie Scheme Justification and Prioritizing Process

Engineering prioritizes candidate circuits for automatic circuit tie scheme installation considering:

- The calculated reliability benefit to the circuit if an automatic recloser tie scheme had been in place, based on recent minutes of interruption experienced by customers on the circuits
- The numbers of customers that would benefit by the installation of a scheme, with a minimum of 500 customers for a circuit to be considered a candidate
- The number of critical customers supplied by the circuit (*e.g.*, hospitals, police stations, water and sewage pumping stations)
- The ability and capacity of existing proposed tie circuits to accept loads that would be switched without introducing planning or operating criteria violations.

g. Improvement from Automatic Circuit Reclosers

The next table provides estimated annual numbers of avoided minutes and numbers of customer interruption through installation of the automatic circuit tie schemes installed each year from 2017, including those installed under the Reliability Plus IIP.

Interruptions Avoided by Automatic Circuit Tie Schemes

Year	Avoided Annually	
	Estimated CMI	Estimated CI
2017	193,314	2,357
2018	344,056	4,196
2019	952,476	11,616
2020	878,352	10,712

h. Spending for Automatic Circuit Tie Schemes

Management spent more than a half million dollars each year in 2017 and 2018, and will likely do so in 2021. Under the Infrastructure Investment Program (IIP), management spent over 46.5 million in 2019 and in 2020.

Automatic Circuit Tie Scheme Expenditures

Cost	2017	2018	2019	2020	2021*
Capital	\$499,187	\$620,925	\$6,237,993	\$6,078,554	\$381,514
O&M	\$20,955	\$38,781	\$458,341	\$461,473	\$10,501
Total	\$520,142	\$659,705	\$6,696,334	\$6,540,027	\$392,016

*through May

i. Adaptive Relaying Strategy

Since 2007, management has been applying adaptive relaying to JPC&L breakers. Dispatchers, using SCADA, can change the sensitivity of the breakers in substations from normal “fuse sacrifice mode” to a “fuse save mode.” The normal mode allows a downstream fault to clear using a legacy fuse (if not yet replaced by a Trip Saver). This mode allows the substation breaker to sense a fault on the system beyond the fuse location and rapidly deenergize and then reenergize the entire circuit in the hope that the lightning, wind, or tree branch induced fault has passed. This protection mode introduces more momentary outages but minimizes sustained downstream outages. Management employs the second mode, used during storms, when wind and lightning cause frequent momentary interruptions.

6. *Reliability Plus - Infrastructure Investment Program*

JCP&L’s 2019-2020 Reliability Plus IIP included:

- Replacement of lateral circuit fuses with Trip Saver II reclosing devices
- Removal of overhanging tree limbs in Zone 2 of selected circuits (Described in Chapter V, *Vegetation Management*)
- Added flood protection to susceptible substations
- Replacement of switchgear in one substation
- Purchase and deployment of new mobile substation
- Replacement of obsolete electromechanical relays
- Installation of mid-circuit reclosers

- Installation of SCADA monitoring and control on reclosers
- Installation of distribution automation (loop schemes)
- Replacement of obsolete remote terminal telemetry units in substations.

The Board addressed these programs in Docket No. EO18070728. They sought to better system resilience during storms similar to those experienced before 2019. The May 8, 2019 Board order addressed JCP&L’s implementation of a “Reliability Plus” program including 10 incremental capital projects in three categories, with a total cost not to exceed about \$97 million. These project categories included:

- Overhead Circuit Reliability and Resiliency
- Substation Reliability Enhancement
- Distribution Automation.

Management implemented the Reliability Plus IIP between June 2019 and December 2020, making the expenditures shown below. Management’s total spend for the program of \$97,079,383 proved, very close to the originally approved amount.

Reliability Plus Infrastructure Program Expenditures

Circuit Reliability Project	Cost
Replace 777 lateral fuses with Trip Saver II devices - - provided automatic reclosing rather than 1-shot fuses for lateral circuits	\$11,962,406
Zone 2 Enhanced Vegetation Management on 222 circuits - - removed overhanging limbs to reduce tree-outages on second half of circuits	\$42,921,203

Substation Reliability Enhancement	Cost
Enhanced Flood Mitigation - - installed permanent flood walls with automatic flood gates at 2 substations, provided temporary containment at 17 substations, provided pumps and generators, and installed sensors and alarms for all 19 flood-prone substations	\$3,926,923
Replacement of 4 obsolete switchgears for improved reliability	\$6,022,381
Purchase of a mobile substation to provide faster restoration for some substations	\$2,405,147
Replacement of 50 obsolete protective relays with modern programmable relays with more functions and better reliability	\$6,386,683

Distribution Automation	Cost
Installation of 68 mid-circuit automatic circuit reclosers to reduce customer outages for Zone 2 faults	\$4,317,348
Installation of SCADA monitoring and control on 252 reclosers to provide DCC with remote control to reduce restoration times	\$11,886,350
Installation of 16 distribution loop schemes to improve reliability on barrier islands	\$2,402,867
Replacement of obsolete, limited function remote terminal units (RTU) at 6 substations to improve remote monitoring and DCC control	\$4,848,175

a. Overhead Circuit Reliability and Resiliency Program

This program has had two parts addressing: automatic restoration and reducing tree exposure. Trip Savers comprise self-contained electronic devices that reclose 90 seconds after first sensing and interrupting a fault. If successful, reclosing restores service after a transient fault has cleared itself from the line. Management’s reasoning was to protect economically as much of their overhead electric distribution system as possible with reclosing technology rather than one-shot fuses. Under the Reliability Plus IIP, engineering prioritized Trip Saver installations by the length of overhead wire within the zone of protection for the replaced fuse. Following the initial implementation effort, JCP&L continues to install Trip Savers case-by-case in areas experiencing many outages with unknown causes.

On January 1, 2016, JCP&L implemented Zone 1 overhang limb removals (up to a height of 75 feet above ground) into its vegetation management program. Zone 1 includes the 3-phase mainline circuit from the substation breaker to the main line fuse or the first line recloser. Under the Reliability Plus IIP, JCP&L expanded overhang removals to Zone 2 on 222 priority-selected circuits. Zone 2 included the 3-phase mainline circuit from the first mainline fuse or recloser to the end of the circuit.

b. Substation Reliability and Resiliency Enhancement

Hurricane Sandy caused flooding or made JCP&L aware of significant flood risk in 19 substations. In 2017, management developed a strategy to minimize damage and outages associated with future substation flooding. By 2020 JCP&L had completed:

- Establishing ties of at-risk substation circuits to non-at-risk substation circuits
- Installing permanent or temporary walls or barriers around at-risk substation equipment.
- Establishing real-time monitoring using video camera and flood sensors
- Installing diesel generators and high-capacity water pumps
- Accelerating the ability to deploy mobile substations.

Additional substation enhancements to improve sectionalizing and restoration included:

- Purchasing a 138/34.5 - 12.47 kV mobile substation to reduce transformer failure response time
- Replacing legacy ABB DPU style relays with modern multi-function programmable relays
- Replacing legacy underfrequency relays with modern programmable relays.

c. Distribution Automation

The Reliability Plus IIP included:

- Circuit Protection and Sectionalizing Project - - replacing of 69 sets of fuses with electronic relays and SCADA-controlled reclosers on many 4.8kV circuits to improve fault isolation and restoration
- SCADA Line Devices Installation Project - - replacing 258 legacy circuit reclosers with modern reclosers using programmable relays and SCADA communications to improve coordination and restoration
- Loop Schemes - - Targeting critical customers near circuit ties, installing distribution automation loop schemes with relay and SCADA-controlled reclosers

- Substation RTU Upgrade Project - - Installing additional voltage and load monitoring points, replacing Remote Terminal Units with upgraded equipment, and replacing copper-based communications infrastructure with fiber, cellular, or radio communications.

The work involving Backlot Loop Schemes resulted from lessons learned from Hurricane Sandy. Management applied a design particularly suited for serving newly rebuilt housing on the barrier islands. Previously, primary conductors ran on poles in the back lots, with pole transformers located behind the homes. These transformer locations were difficult to access in the aftermath of Sandy. When rebuilding overhead lines after the storm, management used taller, stronger poles and placed the transformers near the street, for easy access, feeding secondary cables behind the rebuilt homes to supply their meters. Each secondary cable can be fed from either end, establishing redundancy to address single failures on equipment serving those premises.

7. Reliability Projects Budgets and Spending

The next two tables show that JCP&L spent about \$36 million and \$34 million (capital and O&M) on the Base Reliability Programs in 2017 and 2018.

2017 Reliability Spending

Category	Actual	Budget	Variance
Base Capital	\$24.5	\$31	\$6.6
Base O&M	\$11.2	\$5.9	\$ (5.3)
Total	\$35.7	\$37.5	\$1.2

dollars in millions

The previous table shows that management underspent the capital budget and overspent the O&M budget for 2017. In 2018, management underspent the capital budget and overspent the O&M budget.

2018 Reliability Spending (rounded \$ millions)

Category	Actual	Budget	Variance
Base Capital	\$21	\$30	\$9
Base O&M	\$13	\$7.4	\$ (5.6)
Total	\$34	\$37.5	\$3.5

dollars in millions

The next two tables show that management spent \$46 million in 2019 and \$40 million in 2020 for the Base Reliability Programs. It spent \$33 million in 2019 and \$53.6 million on Reliability Plus IIP, or \$87 million (excluding overhead costs) for IIP Programs. JCP&L completed the Reliability Plus IIP capital projects in December 2020. The numbers exclude Overhead Costs.

2019 Reliability Spending (in millions)

Category	Actual	Budget	Variance
Base Capital	\$30	\$29.5	\$(0.4)
Base O&M	\$15.9	\$12	\$(3.9)
Base Spend Subtotal	\$45.8	\$41.5	\$(4.3)
 			
IIP Capital	\$31.9	\$28.5	\$(3.5)
IIP O&M	\$1	\$0	\$(1)
IIP Subtotal	\$33	\$28.5	\$(4.5)
Total	\$78.7	\$70	\$(9)

dollars in millions

In 2019, management overspent the Base Programs O&M budgets. It overspent the capital budget for the IIP Programs by about 12 percent.

2020 Reliability Spending (in millions)

Category	Actual	Budget	Variance
Base Capital	\$24	\$25.6	\$1.6
Base O&M	\$16	\$13.3	\$(2.9)
Base Spend Subtotal	\$40	\$38.9	\$(1.3)
 			
IIP Capital	\$52	\$55.4	\$3.4
IIP O&M	\$1.6	\$0	\$(1.6)
IIP Subtotal	\$53.6	\$55.4	\$1.8
Total	\$93.8	\$94.3	\$0.6

The 2020 spending for O&M and capital ran near budgeted levels for the Base Programs. JCP&L underspent on the capital budget for the Reliability Plus IIP by about the same as it overspent the O&M budget.

8. Justifying and Prioritizing Reliability Program Spend

We reviewed the capital reliability projects and portfolio development, justification, prioritization, and approval processes. JCP&L’s annual capital portfolio development process includes an annual engineering and operations staff review of historical outage data, identifications of opportunities to improve distribution reliability. The Engineering team proposes expansion, enhancement, and mitigation projects, which undergo estimation of projected reliability improvement compared to historical reliability performance. The distribution design staff scopes projects and prepares conceptual cost estimates of each. Engineering then ranks and prioritizes the reliability projects using cost/benefit analyses, based on estimated customer minutes of interruptions avoided per dollar invested. FirstEnergy’s substation engineering and design department conduct a similar process for distribution reliability project scopes and estimations.

Management followed the same process for identifying, designing, and prioritizing the projects included in the Reliability Plus IIP. However, for the IIP, to compare the value of an investment to reliability improvement, management used the US DOE’s Interruption Cost Estimate (ICE) calculator, which estimates the monetary value to customers of reliability improvements.

Our examination of the capital project review and approval process disclosed three-rounds of activity. First, the reliability engineers identify reliability issues, develop solutions and estimated costs, and present the proposed projects to the engineering group. The second round provides in-depth vetting and cost/benefit analysis by the engineering group and by JCP&L senior management. The third round involves presentation of a proposed portfolio to FirstEnergy senior vice presidents of utilities and utility operations. The JCP&L capital portfolio is ultimately subject to approval of FirstEnergy’s CEO and Board of Directors. FirstEnergy verifies the need for and scope of the proposed projects. This same process applies for sub-transmission, transmission, and substation capital projects, except that the FirstEnergy Service Company Transmission group performs them for all the facilities employed at its operating companies.

9. Circuit Inspections

We conducted a multi-day set of inspections of sections of three highest priority circuits in the Central and in the Northern Regions. We did not observe any systematic issues such as floating conductors and split cross arms and poles. We did observe a pole with excessive lean and one location where a spacer cable bracket had broken, dropping the electric conductors down to the telephone cables. These issues were quickly addressed by management.

C. Conclusions

1. Management regularly examines, analyzes, and responds to gaps identified with respect to outage magnitudes and causes, and the resulting SAIDI, CAIDI and SAIFI index impacts.

Management uses appropriate methods for identifying reliability needs. Reliability engineers regularly examine, analyze, and respond to gaps identified with respect to outage magnitudes and causes, and resulting SAIDI, CAIDI and SAIFI performance. Management and reliability engineers have awareness of real-time reliability issues, based on OMS outage data, and a reliability dashboard. The district reliability engineers investigate reliability issues, including addressing causes of customers experiencing multiple interruptions (CEMI) and devices experiencing multiple interruption (DEMI), they develop solutions and designs, and prepare work orders for correcting the reliability issues.

FirstEnergy updates a reliability dashboard and compares daily reliability metrics with targets for JCP&L and the other operating companies. The dashboard uses OMS data and is designed to indicate whether current reliability performance will likely meet the year-end targets. If not, reliability engineers and management consider how to reverse the negative reliability trend. The reliability engineers also track and systematically address issues to improve reliability for CEMI customers.

2. Despite improvement initiatives like Highest Priority Circuits, CEMI and DEMI programs, enhanced vegetation management practices, and applications of automatic

sectionalizing and restoration schemes, JCP&L’s reliability has not markedly improved since 2017. (See Recommendation #2)

JCP&L must meet BPU reliability targets, which are based on historical reliability indices for each Region. Management strives to maintain better annual reliability performance than statutory and Board requirements, and to achieve its own, more stringent SAIFI, SAIDI, and CAIDI goals. Management has employed enhanced reliability programs to augment traditional, routine inspection and maintenance and vegetation management, and highest priority (or worst performing) circuits programs. Despite the stated philosophy, however, JCP&L’s SAIFI and CAIDI reliability performance have not markedly improved since 2017.

The Central Region met both the BPU Minimum Reliability Level and the BPU’s more stringent Benchmark Reliability Level for CAIDI in 2020. The Central Region met the BPU Minimum Reliability Level but narrowly missed the BPU’s more stringent level Benchmark Reliability Level for SAIFI. The Northern Region met the BPU Minimum Reliability Level for CAIDI but did not meet the BPU’s CAIDI Benchmark Level in 2020. The Northern Region’s 2020 SAIFI did not meet either of the BPU’s levels.

3. Management uses appropriate methods for determining the cost of each reliability program or project versus estimated improvements in SAIFI, SAIDI, and CAIDI.

We found management’s methods for justifying and prioritizing reliability projects, such as Reliability Plus IIP, installing automatic circuit tie schemes, and installing Trip Saver electronic fuses appropriate. Reliability engineers monitor reliability data and propose improvements to management. The JCP&L prioritization process weighs cost versus reliability benefits. Management’s process for project identification, portfolio development, justification, prioritization, and approval processes are also appropriate.

Rather than installing additional Smart Grid schemes, management focuses on reducing the numbers of customers affected by an outage by using less expensive, but effective, automatic circuit tie schemes, mid-circuit reclosers, and electronic lateral fuses.

JCP&L’s annual capital portfolio development process includes an annual engineering and operations staff review of historical outage data, engineering team proposals of mitigating projects, and the relative costs and benefits of each project. FirstEnergy Service Company’s substation engineering and design department conduct a similar process for distribution reliability project scopes and estimations.

4. Management has appropriately applied advanced technology that improves reliability and efficiency.

Smart Grid implementations have been limited to three circuits, but JCP&L has been installing other effective automatic and SCADA controlled sectionalizing and restoration technologies on many circuits to improve SAIFI, CAIDI, and SAIDI reliability performance. DOE-funded collaboration with EPRI led to three Smart Grid circuits by 2015 - - involving two Morristown substation circuits and one Ridge substation circuit. Management estimates that the new configuration has avoided almost 175,000 customer minutes of interruptions per year since 2017.

Management also estimates that the 116 automatic circuit tie schemes installed through the end of 2020 avoided almost 900,000 interruption minutes and 11,000 interruptions in 2020.

Despite the success of the Smart Grid implementation pilot, management determined that automatic circuit tie scheme technology proves more cost effective, albeit less sophisticated than Smart Grid schemes. By the end of 2020, JCP&L had installed 116 automatic circuit tie schemes (82 during 2020 alone). Of the 116 automatic circuit tie schemes installed, most with SCADA control, and the rest to follow. JCP&L now has mid-circuit reclosers on nearly all distribution circuits. Under the Reliability Plus IIP, JCP&L also installed 777 Trip Saver electronic automatic reclosing devices, replacing fuses between main and lateral circuits.

5. Management has appropriately identified automatic sectionalizing and restoration technology trends and developments and has applied technologies for improving efficiency and reliability, based on costs vs. benefits.

Management has been applying advanced technologies in several areas. It has applied Smart Grids, automatic circuit tie schemes including Smart tie reclosers, mid-circuit reclosers, and electronic fuses on the JCP&L distribution system. It has nearly 100 percent SCADA control and monitoring of its circuits and substations. Its GIS system is up to date and accurate with the distribution line plant and plant locations. Management uses electronic technology for daily tracking of system reliability and for communications between the system operators and troubleshooters. Year 2022 will bring an up-to-date OMS system that integrates the SCADA and GIS with the OMS and EMS. Additional technologies being considered by JCP&L include advanced metering infrastructure, Distribution Automation, and Voltage and VAR optimization.

6. Management’s base reliability programs and activities comport with good utility practice.

Management’s base reliability programs include the Highest Priority Circuit program, the Customers Experiencing Multiple Interruptions (CEMI) program, the Power Quality program, using automatic circuit tie schemes, using adaptive relaying, and removing overhanging limbs on Zone 1 sections of circuits. These programs are consistent with good practice, as followed by similar utilities.

JCP&L has been identifying and working to enhance reliability to its worst performing circuits for many years. It uses appropriate data, prioritization, and methods to improve performance of such circuits.

7. The number of outages identified as “other/unknown” is excessive, resulting in an inability to focus solutions to mitigate a large percentage of outage numbers and minutes. (See Recommendation #1)

About 20 percent of the customer minutes interrupted occurring in 2020 were attributed by troubleshooters to “other/unknown” causes. Not identifying the causes of so many outages prevents reliability engineering from adequately addressing and preventing them. The SAIFI attributed to “unknown” causes has doubled since 2017.

8. The sub-transmission system’s contributions to JCP&L’s customer interruptions (CI) has been increasing since 2017 - - obscuring improvements in distribution system

reliability performance from Reliability Plus IIP efforts in 2020 and 2021. (See Recommendation #2)

The percentage contributions to total annual customer interruptions (CI) from the sub-transmission system has doubled since 2017, while the contributions to CI from the distribution system has decreased since 2017 and is anticipated to decrease even more in the wake of the Reliability Plus IIP improvements.

9. Management lacks a needed formal program to specifically focus on reducing aerial spacer and open wire caused outages. (See Recommendation #3)

Distribution lines equipment issues caused the largest (38 percent) outage consequences, in terms of customer minutes interrupted in 2020. Overhead spacer cable and overhead bare conductors comprised the two chief contributors to equipment-related outages from 2017 through 2020. Management has indirectly addressed equipment failures causing outages through its Highest Priority Circuit, CEMI, and DEMI reliability programs. However, management has discontinued the ad hoc program it used in 2015 to target reducing aerial cable caused outages specifically. Moreover, the Reliability Plus IIP did not include an equipment failure mitigation component despite the significant negative impact of those failures on customer minutes of interruption.

D. Recommendations

1. Implement formal process to improve field diagnoses of outage causes by troubleshooters and improve accuracy in capturing causes in the outage management system by troubleshooters and DCC personnel. (See Conclusion #7)

About 20 percent of the customer minutes of interruptions occurring in 2020 became attributed by troubleshooters or characterized by DCC personnel as “other/unknown.” Not identifying the causes of so many outages prevents reliability engineering from adequately addressing the causes of those outages and prescribing mitigations. The SAIFI contribution of “unknown” causes has doubled since 2017. Leadership indicated in interviews that more accurate capture of outage causes is continually stressed with operations personnel; nevertheless, significant improvement is necessary.

2. Expedite analyses to validate that sub-transmission improvement projects planned for 2022-2026 adequately improve SAIFI and CAIDI performance. (See Conclusion #2 and 8)

Management needs to reverse the 2017 through 2020 deterioration in sub-transmission reliability. The sub-transmission system’s contribution to numbers and minutes of customer interruptions has increased each year since 2017. In 2020, the sub-transmission system contributed about 16 percent of the customer interruptions by number. The FirstEnergy Service Company Transmission group, which has responsibility for these facilities in New Jersey, plans to rebuild the transmission and sub-transmission facilities at the Morristown Substation, to upgrade transmission line relaying and to replace various legacy transmission and sub-transmission circuit breakers during through 2026. FirstEnergy has begun installing auto-reclosing on its 34.5 kV circuit breakers and plans to continue those and other upgrades during the next several years. FirstEnergy also plans to conduct LIDAR inspections on its 34.5 kV system to support and improve vegetation management clearance and hazard tree identification, as it does for its transmission system.

We found this attention to sub-transmission reliability encouraging, but information and data available to us is not sufficient to produce confidence that these activities will prove sufficient or timely enough to reduce the decline in sub-transmission reliability at an effective pace.

3. Systematically address the reduction of outages attributed to aerial cable and open bare wire failures. *(See Conclusion #9)*

Aerial spacer cable and open bare wire failures are responsible for most of the equipment caused outages on the distribution system. Management has partially addressed these and other equipment failures in the past as part of the Worst Performing Feeder or DEMI improvement efforts. Going forward, however, the adoption and execution of a systematic approach to reducing the significant impact of aerial spacer cable and open bare wire component failures on reliability is in order.

During the fourth quarter of 2015, management identified excess O&M funds and it determined that a program would be cost effective for inspecting, following a detailed checklist, and repairing deteriorated aerial spacer cable assemblies on the worst performing circuits. Lessons learned from this 2015 initiative could inform another programmatic and focused approach.

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Chapter VIII: Cyber Security and System Vulnerability

A. Background

The electric power industry continues to offer a primary target of cyberattacks, with reports of phishing attacks, malware, and viruses as means for getting access to critical utility infrastructure. Computer network security, while essential, cannot alone prevent cyberattacks and data breaches. Determined cybercriminals can target other digital devices, including the operating technology that allow management to control electrical systems. A reported 2015 malware incident in Ukraine reportedly blacked out more than a hundred cities. Hacking of systems that contain sensitive customer information have become commonplace enough to caution all large-scale businesses about the need for measures to protect sensitive customer information.

Threat assessment, identification of vulnerabilities, and the planning and execution of mitigation measures to prevent cyberattacks that threaten customer information as well as service continuity are all critical measures. Cyber security comprises an area where the nature and likelihood of threats change and advance rapidly. The increased digitalization of electric infrastructure (through advancing use of SCADA, for example) can create new exposures to attack. Increased deployment of Smart Grid technology and microgrids will require even more attention to avenues of attack. Therefore, dedicated attention and resources are required and cooperation among companies can prove a valuable source of assistance in threat identification and mitigation, and in event response planning.

The Energy Policy Act of 2005 gives the Federal Energy Regulatory Commission (FERC) authority to oversee bulk power system reliability, including the adoption of cybersecurity standards. The North American Electric Reliability Corporation (NERC), certified by the FERC as the U.S. Electric Reliability Organization, has developed Critical Infrastructure Protection cyber security reliability standards. The FERC approved those standards in January 2008 (in Order No. 706), also directing NERC to develop significant modifications addressing specific concerns. Increasing application of Smart Grid technology has also produced concern at the Congressional and other levels about system vulnerability, giving impetus to the passage 2007 Energy Independence and Security Act provisions giving the FERC and the National Institute of Standards and Technology (NIST) responsibilities for coordinating development and adoption of smart grid guidelines and standards.

On July 16, 2016, the FERC directed NERC (Order No. 829) to develop a “new supply chain risk management standard that addresses risks to information systems and related bulk electric system assets.” The ruling calls for a Critical Infrastructure Protection Reliability Standard that requires entities to develop and implement plans for “security controls for supply chain management for industrial control system hardware, software, and services associated with bulk electric system operations.” A goal of the standard is to mitigate the risk that cybersecurity incidents will affect reliable operation of the bulk power system.

The BPU adopted in 2016 new cybersecurity requirements for the state’s utilities (in Docket No. AO16030196). The requirements were developed by Commission staff with input from the State’s utilities, the Federal Bureau of Investigation (FBI) and the New Jersey Office of Homeland

Security and Preparedness (NJOHSP). The BPU Order addressed utility adoption and use of a Cyber Security Program that defines and implements organizational oversight, accountabilities, and responsibilities for cyber risk management activities, and that establishes policies, plans, processes, and procedures for identifying and mitigating risk to critical systems to acceptable levels. Utility Cyber Security Programs must meet minimum requirements for:

- Cyber Risk Management
- Situational Awareness
- Incident Reporting
- Response and Recovery
- Security Awareness and Training.

The assets covered in the order include those involved in industrial control systems (ICS) and those that contain Personally Identifiable Information (PII). Incident reporting occurs through the New Jersey Cybersecurity and Communications Integration Cell (NJCICC). NJCICC's role is to promote cybersecurity information sharing, threat analysis, and incident reporting.

Our examination of FirstEnergy's cybersecurity focused on the existence of established procedures, and on a review of actual cybersecurity breaches to measure its success. Our examination included:

- Governance
- Cybersecurity approach
- Risk assessment/Previous Audits
- Promoting cybersecurity risk awareness
- Staffing
- Cooperation with government agencies
- Status of complying with BPU cybersecurity order.

Cybersecurity for JCP&L and all other FirstEnergy affiliates occurs at the enterprise level, exercised centrally at FirstEnergy Service Company on behalf of FirstEnergy's operating companies. The role of cybersecurity is to evolve with the types and amounts of cybersecurity threats to which the organization is exposed.

B. Findings

1. Governance

Corporate-level accountability, responsibility, resources, and activities largely define and execute key activities that provide cybersecurity for JCP&L - - typical in our experience with large utility operations. Central planning, resourcing, and execution can maximize the effectiveness of cybersecurity resources, while enabling individual operating companies to comply with individual state level reporting (and other process-oriented) requirements.

A corporate-wide Cyber Security Program establishes the overall controls and governance for FirstEnergy and its operating companies, addressing all cyber security operations. The approach includes a "Cyber Security Incident Response Plan" supporting emergency operations in the event of major cyber security incidents. Management provides a Security Monthly Briefing to key

FirstEnergy executives and key corporate stakeholders, covering cyber and physical security. Additionally, an ongoing IT operational review covers change management, system assessments, reviews of new systems and services, and vendor assessments. Cyber Security also provides a monthly briefing to FirstEnergy’s board of directors on high-level metrics, industry trends and threats, and special topics as appropriate.

[REDACTED]

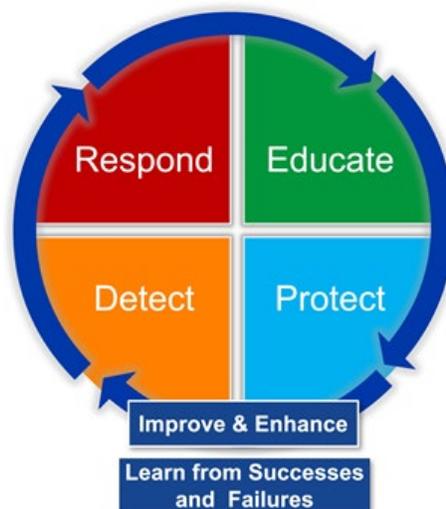
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2. Approach to Cybersecurity

FirstEnergy’s cybersecurity complies with the National Institute of Standards and Technology (“NIST”) Cyber Security framework, an important industry standard. The approach employs overlapping “layers” of security. In this manner, multiple process, systems, and applications work in a coordinated manner to arrest cybersecurity threats as encountered. The overall approach involves the protection, detection, response, and education functions that work on an integrated basis.

Cybersecurity Approach



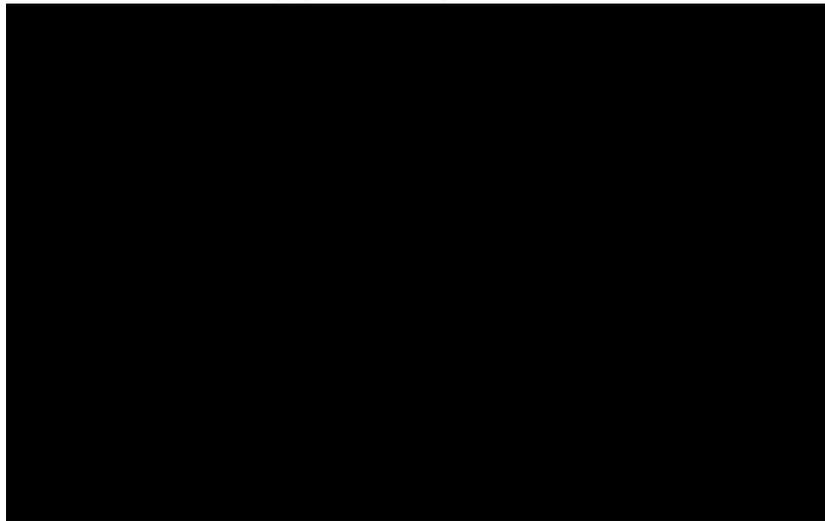
In order to achieve this integrated approach, Cyber Security performs a number of functions:

[REDACTED]

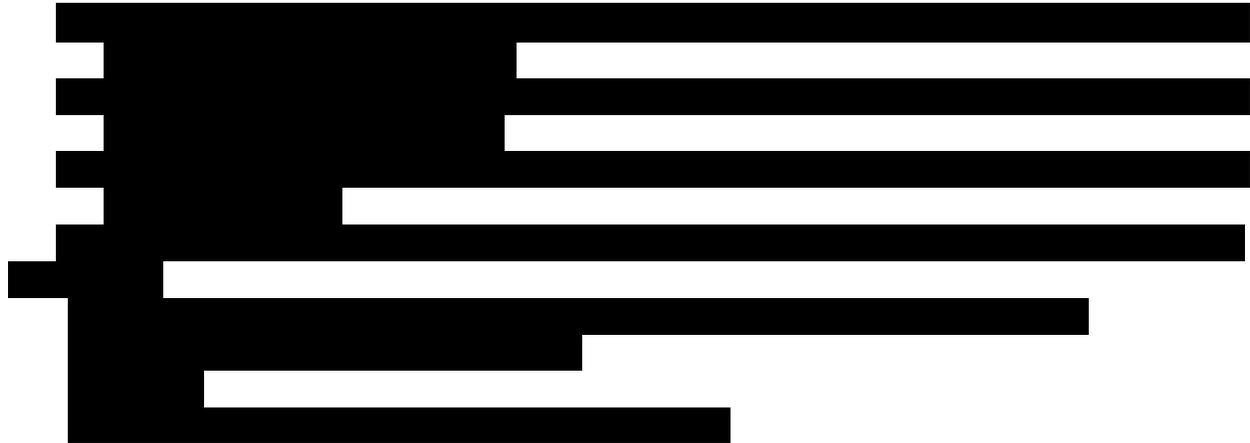
- [REDACTED]

These functions generally flow according to the graphic shown below.

Incident Response Process
(figure is confidential)



[REDACTED]



We found the systems and processes that FirstEnergy employs comprehensive and competent in identifying threats and vulnerabilities, planning to mitigate their occurrence, real-time monitoring of attacks and other threats, incident response, recovery from attacks, and application of lessons learned from incidents that have occurred. This is evident in the low number of critical incidents being realized by FirstEnergy. Their overall approach, processes, and systems are consistent with industry standards.

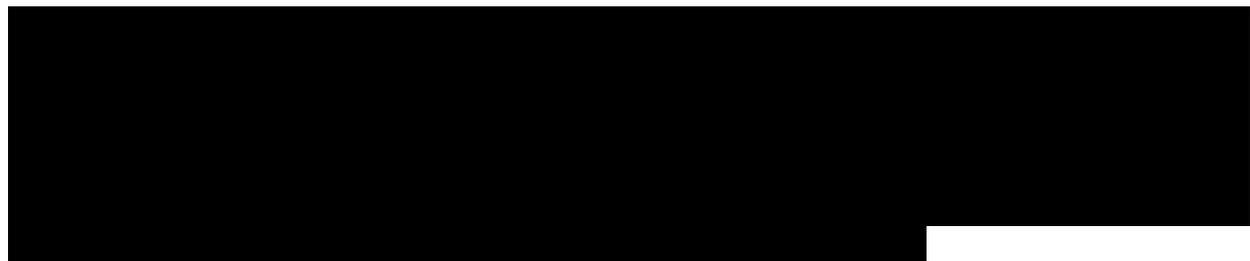
3. Cybersecurity Risk Assessment

FirstEnergy applies formal audit processes for all aspects of its security operations. We reviewed several general and focused cybersecurity audits, both internal and external. We reviewed nine separate audit (and related) reports provided by FirstEnergy and found that by and large FirstEnergy had only minor to medium vulnerabilities.

We reviewed reports from both internal and external audits performed from 2018 to the present. There are three general categories of testing done by and for FirstEnergy related to Cyber Security:

- Internal Audits
- Third Party Assessments
- Penetration Test (aka Pen Tests).

We reviewed all these reports and found that only moderate and minor vulnerabilities had been exposed, and each item was addressed and fixed.



4. Promoting Awareness of Cybersecurity Risk

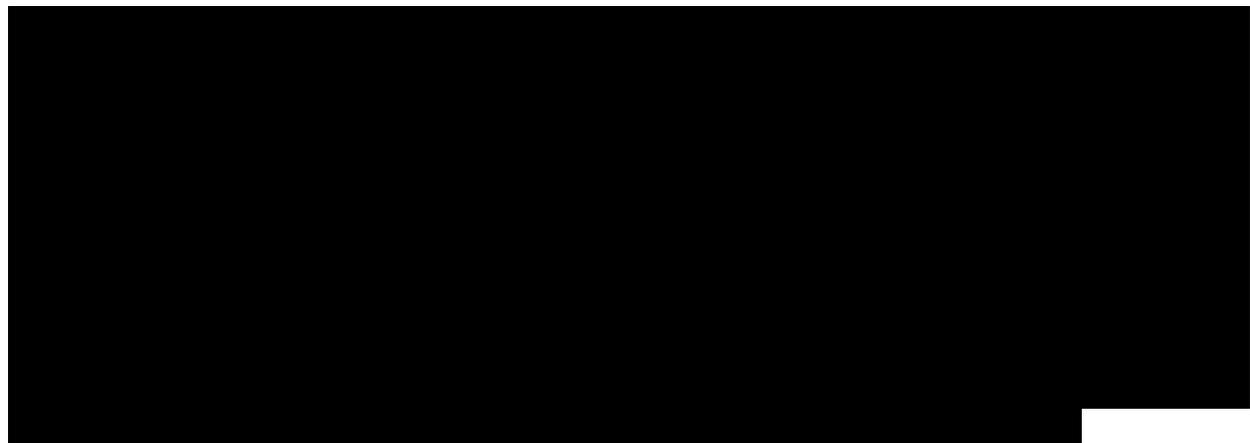
Full effectiveness of a cybersecurity program depends on educating all employees, on promoting awareness about the severity of cybersecurity risks, and on regularly instilling acceptance of the criticality of following procedures that foster effective reduction of cybersecurity threats. FirstEnergy engages in regular, comprehensive education and training of all employees related to cyber security.

Of particular importance is the role of *phishing* in cybersecurity attacks. Phishing is performed by cyber attackers by sending fraudulent emails to induce the recipient to reveal information or click on dangerous links. According to FirstEnergy, up to 90 percent of cyber attacks are attempted through phishing. As such, training to repel phishing attacks is a high priority.

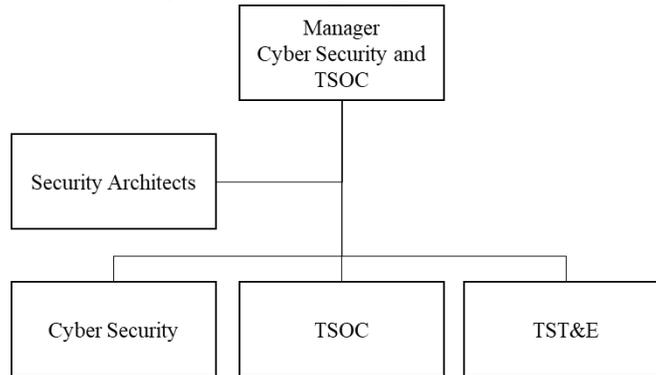
Awareness and Education Processes



5. Staffing



Cyber Security Organization



Finding and retaining cybersecurity resources has been challenging in recent years. Cybersecurity professionals, in particular, are in great demand. Worse yet, projections of the supply and demand of IT and cybersecurity personnel show a serious shortage of people. The general industry labor shortage notwithstanding, FirstEnergy has not experienced evident staffing issues in the cybersecurity functions. At this point, only two vacancies exist, as part of the normal course of turnover, neither of which is mission critical.

6. Cooperation with Government Agencies/Compliance with BPU Security Order

FirstEnergy is in compliance with NJ reporting requirements and maintains this status with a formalized approach for regulatory compliance that includes the following components:

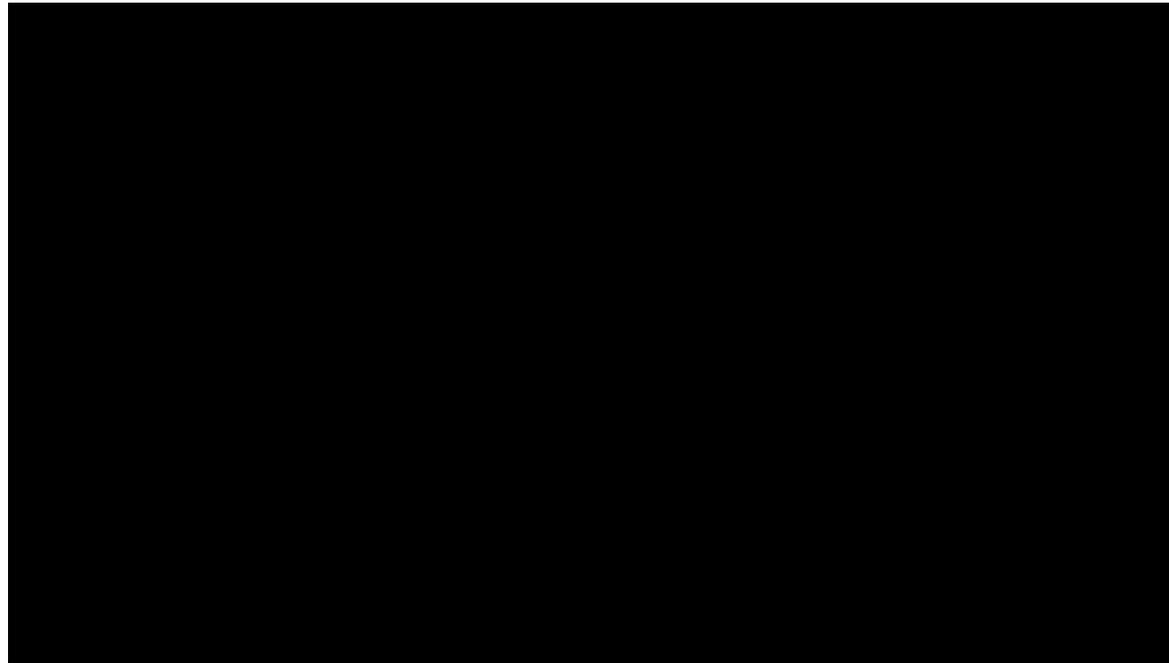
- [Redacted]

In addition to its state-level compliance for JCP&L within New Jersey, FirstEnergy also coordinates, cooperates, and otherwise participates with cybersecurity organizations, including the Department of Energy E-ISAC program, the Department of Homeland Security CISA, the US Army Cyber Shield Exercises, DoE/PNNL CRISP, Edison Electric Institute (EEI), Electric Power Research Institute (EPRI), North American Transmission Form (NATF), and the Northeast Ohio Cyber Consortium (NEOCC).

A primary focus of our review of FirstEnergy’s cybersecurity processes is the compliance with the BPU Security Order. The processes for compliance with this key order is laid out in the presentation document “NJ BPU Cyber Security Program” defining the processes for cybersecurity related to both ICS and CPI. [Redacted]



FirstEnergy and BPU Cybersecurity Information Depiction
(figure is confidential)



C. Conclusions

1. FirstEnergy’s processes and procedures are well documented and effective.

The Processes and Procedures are detailed and thorough documents, laying the groundwork for an effective cybersecurity program with low vulnerability.

2. Staffing is at an acceptable level with no major labor shortage concerns, with the exception of one recent key executive position becoming vacant. (See Recommendation #1)

Unlike many other energy industry organizations, FirstEnergy shows only three currently vacant positions and those are due to normal turnover. During the work leading to the preparation of this report, the VP of Cyber and Physical Security announced his departure, leaving a key vacancy requiring prompt filling

3. FirstEnergy experienced no “major” incidents within the last year.

This indicates the effectiveness of the cybersecurity program.

D. Recommendations

1. Fill staffing vacancies promptly. *(See Conclusion #2)*

FirstEnergy should ensure that the Vice President position and any other key positions remain filled.

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Chapter IX: System Resiliency and Restoration

A. Emergency Preparedness Plan (E-Plan)

1. Background

Emergency plans comprise a ubiquitous aspect of every electric utility emergency preparedness toolkit. They provide a ready source of information, direction, processes, procedures, organization, schedule, notifications, and contact data, among other subject areas, to company and external personnel involved in planning for and executing restoration activities following events that cause a service disruption. The plans are typically comprehensive in nature, widely and easily available to affected personnel, well-structured for ease of communication and understanding, and reflect current organizational structures, position roles and responsibilities, reporting requirements, and processes and procedures.

2. Findings

JCP&L's E-Plan, originally issued in 2013 and precipitated by a Board Order, and augmented by a massive quantity of related documents in FE's E-Plan database, describes the processes and procedures for personnel to follow for pre-event preparation and post-event service restoration. In early 2014, FirstEnergy created a corporate Emergency Preparedness Organization ("EPO") that supports JCP&L and the other operating companies. Many documents and resources have moved from a JCP&L-specific database to an FEU database where the EPO maintains them, but JCP&L individuals remain generally responsible for maintaining the JCP&L regional E-Plan SharePoint database. The FEU database provides a strong tool. We found it well-designed, easy to access and navigate, comprehensive, readily available to almost all staff, purposely and appropriately limited in users that can edit, add, or delete files, and subject to regular updating.

Similarly, JCP&L's E-Plan is well structured, comprehensive, easy to navigate, and functional in highlighting the key activities, organizational structure, reporting requirements, and emergency response requirements to various pre-defined event levels. It uses the National Incident Management System (NIMS) emergency management structure, concepts, and principles, including the incident command system (ICS). Along with JCP&L, FirstEnergy also has an E-Plan, named the FEU E-Plan. Management notes that the only substantive differences in JCP&L's E-Plan and the FEU E-Plan involve the specific restoration requirements with which JCP&L must comply in response to recommendations contained in the BPU orders related to hurricanes Irene and Sandy, both issued in 2013.

JCP&L describes the purpose of its plan is to:

[S]erve as the single controlled source of information governing JCP&L emergency planning and response plan. The E-Plan provides guidelines for all of the common processes and procedures for JCP&L's conducting emergency preparedness, response, and service restoration.

Notwithstanding the professional and comprehensive nature of JCP&L's E-Plan, it falls short of its purpose to serve as "the single controlled source." Certain areas do not reflect the reality of the

current organization and work practices. JCP&L has not performed a comprehensive update to the E-Plan since its 2013 issuance.

The lack of regular E-Plan updating has introduced numerous inaccuracies in the plan. For example, the current plan mentions the existence of a JCP&L E-Plan Users Group. The FirstEnergy Emergency Preparedness Organization (EPO) replaced and assumed the functions of the Users Group but this is nowhere noted. Restoration work practices adopted in response to the BPU's Irene and Sandy (2013) dockets have "...already [been] incorporated into practice, [and] will be specifically mentioned in the updated [2022] version of JCP&L's state-specific appendix." They are not in the existing document, years after the issuance of the Orders. The plan also notes that the Emergency Planning Advisory Committee (EPAC) has taken the place of the FEU Steering Committee and fulfills similar requirements as identified in the JCP&L E-Plan. A final example relates to titles: the Corporate Storm Management Team, as mentioned in the current plan, is now referred to as the Emergency Operations Center; and the Regional Dispatch Office (RDO) Manager is now the Distribution Control Center (DCC) Manager. Many other examples exist, making the point that the current E-Plan requires updating.

We found an update underway. The revision, due for completion by year-end 2021, will provide for a "basic plan" applicable across the states and FirstEnergy operating companies and provide a high-level overview of all common aspects of outage restoration. "In addition, state-specific "appendices" are also in development. These "appendices" will build on the information in the "basic plan" by outlining specific or unique requirements for the implementation of common functions or unique functions required locally. The JCP&L appendix began development in the fourth quarter of 2020, with completion expected by year-end 2021." It should address the current plan's outdated references and work practices, update the organizational structure, and include current position titles, among other changes.

Perhaps surprisingly, the use of an outdated E-Plan did not manifest itself to any noticeable degree in mixed signals, confused roles and responsibilities, poor communications, or obvious deficient decision-making in terms of service restoration, perhaps due to a few factors. JCP&L staff involved in emergency preparedness appear competent, knowledgeable, and experienced. Individuals with those characteristics know their roles well and generally do not require repeated reference to a manual to instruct them how to act and react. But staff move and migrate, within and without the company, and so may not always remain available. In addition, the E-Plan database appears current and contains a wealth of useful, readily accessible, and up-to-date information.

3. *Conclusions*

1. **The JCP&L E-Plan is not current in many respects.** *(See Recommendation #1)*

We found the E-Plan comprehensive in nature, widely and easily available to affected personnel, and well-structured for ease of communication and understanding. It does not reflect in many cases, however, current organizational structures, position roles and responsibilities, reporting requirements, and processes and procedures. While JCP&L emergency preparedness staff appear to know their roles and responsibilities well, an environment where certain effective practices are not codified, and therefore are not necessarily easily or readily transferrable to those new to the processes, introduces significant risk into effective storm response

2. The E-Plan database provides a sound and comprehensive tool for communicating, sharing, disseminating, and maintaining up-to-date emergency preparedness information.

The E-Plan database provides a sophisticated platform that presents significant advantages to users in quickly accessing significant quantities of relevant and up-to-date emergency preparedness information via a relatively easy to use interface.

4. Recommendations

1. Complete the update to the E-Plan and related documentation by year-end 2021, as scheduled. (See Conclusion #1)

JCP&L needs to ensure completion of the E-Plan update on schedule and that it comprehensively addresses the inaccuracies (*e.g.*, position titles and organizational structure), reporting, and other practices either extant in the current version of the plan but not representative of actual methods employed or employed but not in the plan. Timely completion of plan updating should not be difficult as this activity is well underway. It should continue to undergo at least yearly review and updating.

B. Event Forecasting

1. Background

Forecasting event type, characteristics, magnitude, timing, and potential impacts results from an interplay of numerous inputs, from hard data, such as weather parameters, which change constantly, to estimates of the downstream storm impacts and the resources necessary to provide adequate, timely, and effective service restoration. Weather forecasting serves as the foundation for event forecasting, which then provides a means to estimate storm damage and resource requirements, which then provides the basis for appropriate event classification to effectively mobilize and scale JCP&L's emergency response organization. This section discusses JCP&L's weather services function and organization, its use of its Order Volume Model (OVM), which provide estimates of the number of outage orders (subsequently translated into resource requirements) and affected customers for a given event that, combined, provides the basis for event classification.

2. Findings

a. Weather Services

FirstEnergy Service Company provides meteorological services to its affiliates, including JCP&L. FirstEnergy employs two full-time meteorologists within the corporate Environmental organization, part of Utility Services. Both are professionally degreed, experienced meteorologists with significant relevant expertise between them. JCP&L does not employ its own meteorologist or maintain professional weather data interpretation capabilities. It relies instead on services provided by FirstEnergy Service Company. Also, in contrast to many other electric utilities, neither JCP&L nor the service company contracts with third-party weather service providers to provide

independent forecast data. The service company does have an arrangement with a third-party to provide lightning data.

Weather data used by FirstEnergy meteorologists comes from publicly available sources, such as the National Weather Service (which essentially provides the raw data for all third-party weather service providers). The meteorologists internally process, analyze, and interpret the data. The E-Plan database contains sophisticated weather visualization tools available to all users, providing helpful means of conveying weather-related information.

The FirstEnergy meteorological team provides affiliates detailed weather “alerts” for expected and ongoing impactful weather events. Weather alerts provide detailed information on expected timing, magnitude, and longevity of weather events, intended to “alert” the companies, including JCP&L, of potential impacts. Alert generation occurs when predicted weather conditions meet any of the following criteria:

- Ice: 0.25" or more within a 24-hour period, or 0.10" or more combined with wind gusts of at least 15 mph
- Snow: 4" snow within a 24-hour period (wet or dry)
- Wind: 40 mph gusts or higher (includes tropical systems, damaging thunderstorm winds, tornado)
- Lightning: Off-season cloud to ground lightning (October through March)
- Flooding: Rainfall amounts expected to cause wide-spread flash flooding, flooding in low-lying areas, or general river flooding
- Temperature Extremes: Cold (below 5°F) or Heat (max temperature at least 87°F, or an overnight low 65°F or warmer followed by daytime high of at least 78°F).

Alerts do not get generated automatically. FirstEnergy meteorologists manually generate them and distribute them electronically to stakeholders. Depending on the alert and its potential impact, the meteorologists may participate in pre-storm conference calls with corporate or affiliate staff. Alerts may get updated with new or relevant forecast information at the discretion of the meteorologist. They come at least once daily, or more frequently if necessary, depending on potential event severity. Weather advisory services may also be provided during event restoration. FirstEnergy indicates that at least one of its meteorologists remains available 24/7 during major events.

In addition to providing weather alerts, FE’s meteorological services team also has responsibility for providing strategic and tactical decision support services including forensic analysis (*e.g.*, typical frequency of adverse weather events), special studies (*e.g.*, support for utility regulatory filings, etc., determining most weather sensitive assets, statistical analysis, data processing), and training and education.

Weather forecast accuracy has utility only to the extent that it provides the basis for credible experiential-based decisions (“we’ve seen this type of event before and know what to expect”) or to objectively model anticipated outages or damages to help in identifying needed resources and restoration times from an anticipated event.

FirstEnergy indicates that its meteorologists “conduct objective verification of various weather models to statistically determine how to best apply available data to provide the best forecasting guidance.” However, the FirstEnergy meteorological services group does not conduct formal benchmarking of its results or predictions. Detailed comparison of FirstEnergy weather prediction results with third-party predictions is difficult; most vendors make their results available only to their customers.

b. Outage Modeling

FirstEnergy’s Order Volume Model (“OVM”) estimates outage order volume and customer outage count on a district level for JCP&L. It does not estimate damages to equipment or other infrastructure on the network. The ‘past is prelude’ underlies the model’s premise, like almost all other outage or damage models employed by utilities. The underlying expectation is that the network will respond to an upcoming weather event as it has to similar weather events. Its results inform pre-event planning and are sometimes event restoration.

Management developed the model in 2013 with JCP&L’s system initially represented on a regional basis. Subsequent refinements now allow the model to present results on a district level. Several subsequent adjustments to the model have enhanced data querying capabilities, processing of external weather data and corrections for statistical bias. FirstEnergy notes that the primary means to provide OVM results is an internal web interface that provides the “most likely” (average) number of customers out and orders for all similar weather events. In addition to the average, the model also provides minimum and maximum values for all similar weather events. Again, the accuracy of results depends on the database containing similar events and on predicted weather conditions highly correlated with previous experience.

The model summarizes outage events for expected weather conditions drawing data from weather conditions like those currently being predicted. The OVM database includes weather induced restoration events extending back 10 years, providing a reasonable basis to compare historical events to those being experienced contemporaneously. The more events the more robust the database from which to compare. Current weather predictions compared with similar past weather conditions should cause model outputs to be comparable to the actual impacts experienced during those past events. This standard approach to outage/damage modeling presents some significant challenges. First, an increasing number of extreme weather events have little or no history. Absent similar events in the database, the model extrapolates or interpolates to find the best fit, usually with uneven results. Second, the OVM does not consider changes to network infrastructure. For example, system hardening programs, intended to reinforce previously vulnerable assets, introduce inaccuracies to an approach designed to draw inferences from past weather-related events and apply those inferences to current events now affecting a different network. Finally, the complexity of weather forecasting requires increasing modeling sophistication, not present in the current model.

Model results demonstrate these challenges, particularly those associated with major events where 10 percent or more of customers lost service. The table below presents OVM initial and final predictions for outage orders and customers affected for the five most recent major storms.

OVM Initial and Final Predictions for Recent Major Storms

Event Start	Event Response Description	Outage Orders			Customers Affected		
		Actual	OVM		Actual	OVM	
			(Initial)	(Final)		(Initial)	(Final)
7/3/20	Weather Events	832	244	1,309	170,033	7,154	52,052
7/18/20	Weather Events	528	1,345	1,265	103,505	53,978	51,154
8/4/20	Tropical Storm Isaias	6,575	615	2,720	1,025,798	16,326	85,247
12/24/20	Winter Storm Harold	426	416	838	80,522	14,346	26,785
6/3/21	Weather System Events	337	367	367	46,671	8,670	8,670

The significant inaccuracy of the OVM predictions associated with Tropical Storm Isaias and inaccuracies in predicting outages and customers affected for other events demonstrates the major challenges of reliably forecasting impacts from unprecedented or highly unusual storms. Predictive accuracy has primary importance, but prediction timeliness and usefulness in assigning event classification and assessing the need for resources has equal import. The next table provides for the events identified in the prior one the event start date, date of the initial OVM run, and the “day differential” (how soon before or after event start OVM input became available).

OVM Input Availability Summary

Event Response Description	Event Start	Initial OVM Run	Day Δ
Weather Events	7/3/20	7/5/20	2
Weather Events & JCP&L Request for Mutual Assistance	7/18/20	7/21/20	3
Tropical Storm Isaias	8/4/20	8/1/20	-3
Winter Storm Harold	12/24/20	12/21/20	-3
Weather System Events	6/3/21	6/2/21	-1

Notably, OVM output became available three days prior to Isaias’ and Harold event start dates. The two July 2020 storms did not have OVM runs until two and three days after event start. Prior to these major 2020-2021 events, the BPU, following major March 2018 storms, had already ordered refinements to the OVM in a recommendation contained in a March 2018 Order requiring that:

JCP&L’s prediction model should account for variations in weather patterns across its service territory as dictated by geographic locale. It also should include situational and locational variables that, at a minimum, include: (1) type and density of existing tree canopy; (2) the underlying soil conditions in heavily treed areas; (3) topology; (4) coastal and shoreline flooding and wind conditions; (5) distribution infrastructure configuration and resiliency; and (6) age and structural integrity of the overhead pole-line distribution system.

Management appears to have anticipated the need for model improvements; it had begun investigating externally developed tools to build upon or replace its OVM. Management considered a number of options, then entered into an agreement with a highly regarded team from

the University of Michigan and The Ohio State University to develop storm impact models for predicting customer outages, damage, and crew needs for the operating companies. The effort’s scopes include production of a model for all storm types. Notwithstanding the experienced team tasked to develop the model, it involves a broad and ambitious undertaking. Management has scheduled completion by year-end 2021.

c. Event Classification

JCP&L categorizes storms from Level I to Level V; each level has varying values or ranges of values for factors related to anticipated restoration duration, customers affected, trouble cases, and restoration strategy. The table below shows the various levels and associated values for the noted parameters. The RDO (Regional Dispatch Office) shown in the table has become the Distribution Control Center (DCC) in the updated ICS Organization.

Event Categorization Summary

Level	Duration	Customers Affected	Trouble Cases	Restoration Strategy
I	< 36 hours	<40k	<500	RDO
II	1 - 3 days	20k - 100k	250 - 1500	Line Shop
III	3 - 5 days	80k - 200k	1,000 - 15,000	Line Shop / Quarantine
IV	5 - 7 days	100k - 700k	8,000 - 25,000	Line Shop / Quarantine
V	> 7 days	600k to all	>20,000	Quarantine

Generally, an event below Level III requires only resources native to the Region affected. Events categorized as Level III or IV may require internal and external Mutual Assistance. Events categorized as Level V comprise catastrophic ones likely to result in declaration of a State or Federal Disaster. The DCC makes the formal and official categorization of an event, using a variety of criteria, including but not limited to:

- Estimated Restoration Time
- Severity of Damage
- Customers Affected
- Number of Hazards
- Number of Outage / Trouble Orders
- Anticipated numbers and types of resources needed to restore service.

According to the Emergency Plan for Service Restoration (E-Plan), FirstEnergy: *categorizes emergency events based upon their actual or estimated severity to secure and mobilize appropriate resources to restore customer outages safely and timely. If conditions change, the category is upgraded or downgraded as appropriate.*

Classification should come timely, reflect predicted or actual conditions, and undergo wide communication to allow effective mobilization of JCP&L resources, and for securing any needed external resources, all in the interests of rapid and efficient mobilization and service restoration.

Given the importance of event classification to storm response, we gauged the timeliness of storm event classification by the degree to which it preceded or lagged event start. We made a comparison of event start date with the date of initial storm classification for all Major Events from 2017 – 2021, noting final event classification. The next table presents the results.

Storm Classification Comparison

Event Start	Classification Date	Lag (Days)	Initial Level	Final Level
3/13/17	3/12/17	-1	1	1
10/29/17	10/30/17	1	2	2
1/12/18	---	---	---	1
3/2/18	3/2/18	0	1	4
3/21/18	3/22/18	1	2	2
5/15/18	5/15/18	0	3	3
6/28/18	---	---	---	1
7/16/18	7/17/18	1	1	2
8/14/18	8/18/18	4	1	2
1/19/19	---	---	---	1
2/20/19	---	---	---	1
2/24/19	2/25/19	1	2	2
3/3/19	3/3/19	0	1	1
5/26/19	5/29/19	3	1	2
6/21/19	6/29/19	8	1	1
7/17/19	7/17/19	0	1	3
10/16/19	10/17/19	1	1	2
10/31/19	11/1/19	1	1	1
11/27/19	12/2/19	5	1	3
6/3/20	6/3/20	0	2	2
7/3/20	7/10/20	7	1	1
7/18/20	7/20/20	2	1	1
8/4/20	8/4/20	0	5	5
12/16/20	12/17/20	1	1	1
12/24/20	12/24/20	0	2	2
1/31/21	1/31/21	0	2	1
6/3/21	---	---	---	1

Management classified only one event prior to its start date. Eight classifications came the day of event start; in all other cases classification came one day or more after event start, in one case by eight days. Second, initial classifications even when made well after event start (five days in the case of the event on November 27, 2019) led to higher reclassification (in this case from a 1 to 3), essentially at the storm’s end. Such a delay in classification provides little utility in proactively managing storm response. Finally, regardless of actual storm preparations underway, the table data does not make clear cases (such as for Isaias) that JCP&L requested significant resources from corporate days in advance of the storm, indicating preparations for an event of major proportions without officially classifying it as such until event start. (Isaias did not receive its “5” classification until the event start day.) Again, such delays make classification of little use as a catalyst for pre-

event mobilization. If true for other events as well, it would appear that storm classification has less significance in driving preparation and more in providing post-hoc designations of what was experienced.

3. *Conclusions*

3. Competent, degreed meteorologists provide useful, timely and sophisticated services to JCP&L and other affiliates.

FirstEnergy’s meteorological group provides sufficient, credible weather information to JCP&L that, coupled with local forecasts and communication with other New Jersey utilities, allows for considered decision-making regarding storm preparation.

4. OVM model results indicate a wide range of accuracy depending on the characteristics of the weather event being modeled. (See Recommendation #2)

The OVM model uses a database of historical weather events to make outage order and customer affected predictions about upcoming weather events, essentially by analogy. If the database does not contain an event, or events, like that being analyzed, the predictions can differ significantly from conditions experienced, thereby providing misleading, or at least not useful, input to emergency preparedness activities.

5. Storm event classification appears not to drive organizational preparation, but rather to act as a post-hoc designation of what was experienced. (See Recommendation #3)

Event classifications typically are made on or after the start of an event, thereby undermining the purpose of the classification - - organizational mobilization. Notwithstanding, this lack of early event level communication, JCP&L’s emergency preparedness function, seems to perform adequately, largely based on experienced personnel filling key roles.

4. *Recommendations*

2. Complete the development of the new OVM-like model. (See Conclusion #4)

Model completion by year-end 2021 should be a high priority action and the new model should be deployed as soon thereafter as practical. Use of the new model should improve the ability of JCP&L to respond to weather events due to improved predictive accuracy and applicability to a greater variety of weather events. Management should annually evaluate the accuracy and usefulness of the new model.

3. Ensure clear, timely and widespread communication of storm event classification. (See Conclusion #5)

Event classification and communication should serve as an organizational catalyst to the entire emergency preparedness organization as well as other affected entities. It currently does not and cannot since event classification is typically not communicated until well after such determination is made. A clear, wide-spread communication of event classification –an integral part of the E-Plan – will assure consistent response and messaging within JCP&L, which means more effective storm response.

C. Authority and Process of Securing Resources

1. Background

JCP&L's emergency response organization employs the Incident Command System (ICS); its architecture follows the principles of the National Incident Management System (NIMS) framework. The structure provides a scalable organizational framework, processes and procedures, and identifies roles and responsibilities applicable to storm response or other events that produce system perturbations causing customer outages. JCP&L exercises within this framework numerous functions including among others, training, mobilization and logistics, damage assessment, restoration management, and resource acquisition, deployment, and release. This section specifically reviews the authority and process of securing resources necessary to respond to a storm event efficiently and effectively.

2. Findings

a. Process for Identifying Needed Resources

The process of securing resources begins with the identification of need. Contemporaneous with weather alerts, the Outage Volume Model (OVM) uses specific weather parameter inputs to produce a range of outage orders and customers affected for weather events impacting affiliates, including JCP&L. Management then employs the Event Impact Estimation Tool, developed in 2018 but first used in 2020, to approximate the number of line resources required to return the system to its pre-event service level within a given restoration-day estimate, given the number of outage orders predicted by the OVM. That estimate informs internal management discussions about the number of resources required for restoration. Prior to 2020, management examined the predicted numbers of outage orders generated by the OVM, correlated those numbers to an Event Level, conducted internal discussions about the likely accuracy of the OVM prediction and potentially external communication with other nearby utilities, and then settled on estimated resource requirements consistent with the various inputs and data received, analyzed, and discussed.

b. Responsibility for Securing Resources

Upon identification of the resource need, management compares available internal and on-site contractor resources with the number of estimated resources deemed necessary for restoration. When estimated JCP&L internal resources available appear sufficient to handle anticipated work requirements, no external securing of resources follows. Should internal resources appear to require augmentation, evaluating on-site current contractor workload becomes the first step, which seeks to determine to what degree management can assign those resources to restoration work. JCP&L typically has rights-of-first-refusal giving them first call for storm work from these resources; many contractors cannot leave JCP&L's property without company consent (a sound contractual provision). Storm events classified as Level I or Level II typically indicate that internal (counting JCP&L's and its contractors' crews) resources will prove sufficient in meeting anticipated resource needs.

Where available internal resources are deemed insufficient to meet anticipated restoration needs, JCP&L communicates its needs to the FirstEnergy Emergency Operation Center (EOC),

responsible to coordinate requests for internal FirstEnergy and external resource assistance. A FirstEnergy EOC Lead, working with the FirstEnergy Logistics Support Branch Director, directs the resource allocation process and approves all final resource allocations. JCP&L does not have a decisive role in securing resources to meet needs exceeding those that it can source internally. Its resource acquisition and deployment role extends to communication and coordination with FirstEnergy. When FirstEnergy-wide resources are deemed insufficient to meet the combined requests of its affected operating company(ies), the EOC attempts to obtain needed additional resources through the Regional Mutual Assistance Groups and direct contractor/vendor partnerships. At times, FirstEnergy’s operating companies find themselves in competition with each other for resources, but on balance the ability to leverage the system’s scale, geographic reach, and deep resource base provides advantage to JCP&L.

c. Resources Secured versus Event Level Declaration

JCP&L’s Event Level classifications provide no specific guidance as to potential resource requirements, with the company noting that:

Event Level classification describes additional or different activities anticipated to be associated with the increasing severity of conditions and corresponding degree of damage but not the particulars of the resources and number of resources that may be required for specific events.

Event Level classifications and some of the descriptive detail, however, can provide germane data as to the scope of potential resource requirements. As described in the Events Forecasting section of this chapter, Event Classifications typically come at or after an event start and bear, on many occasions, little correlation to resources requested or received. We reviewed 36 Major Events to determine when JCP&L requested resources from FirstEnergy and the number of resources requested. The next table summarizes the results.

Major Events Resource Request Summary
(table is confidential)

No	Event Start Date	Initial Request Date	Lag (Days)	Initial Request	Resources Deployed (Final)	Resource Diff. (+/-)
1	1/4/18					-
2	1/12/18				47	47
3	3/2/18	3/2/18	0	800	5,095	4,295
4	3/21/18	3/19/18	(2)	1,636	3,101	1,465
5	5/15/18	5/15/18	0	250	1,885	1,635
6	6/28/18				9	9
7	7/16/18	7/22/18	6	196	347	151
8	8/14/18				247	247
9	11/16/18					-
10	12/8/18					-
11	1/19/19	1/15/19	(4)	800	1,278	478

12	2/12/19				29	29
13	2/20/19					-
14	2/24/19	2/25/19	1	400	672	272
15	3/3/19				113	113
16	5/26/19				80	80
17	6/21/19				297	297
18	6/25/19					-
19	7/17/19	7/22/19	5	1,542	2,193	651
20	8/29/19					-
21	10/16/19				558	558
22	10/31/19				657	657
23	11/27/19	12/2/19	5	150	1,685	1,535
24	12/30/19					-
25	6/3/20				516	516
26	7/3/20				97	97
27	7/18/20					-
28	8/4/20	8/2/20	(2)	2,500	8,624	6,124
29	8/26/20					-
30	9/17/20					-
31	11/8/20					-
32	12/1/20					-
33	12/16/20	12/14/20	(2)	120	285	165
34	12/24/20	12/22/20	(2)	800	727	(73)
35	1/31/21	1/30/21	(1)	75	470	395
36	6/3/01					-

Of the 36 Major Events examined, 12 produced resource requests made to FirstEnergy - - 6 of those requests on or after event start. Notably as well, 11 events ultimately produced resource deployments without a preceding request. Finally, the initial event classification data shown in the Event Forecasting section of this chapter, when correlated with the above information on initial resource requests shows that of the 6 events for which JCP&L made an initial request of 800 or more resources to FirstEnergy, only one (Isaias) involved an event initially declared at an Event Classification Level greater than II. This classification involves events typically not requiring resources external to JCP&L. Event classification in those other weather events did not correspond with the large number of resources requested.

Also, among all Major Events producing resource deployment, only one had a final resource total less than requested. This data indicates that JCP&L resource needs, if not met immediately, ultimately became satisfied. JCP&L has clarified that the final count of excludes internal (JCP&L) resources already deployed, except where one of its regions provided assistance to another. Generally, though, the final totals of resources deployed ran well above original request levels.

d. Cost Effectiveness of Resources

JCP&L has performed no formal analysis of the costs versus the benefits of using contractor resources. Reasons cited for use of contractor resources include maximizing internal resource efficiency and effectiveness, providing work planning and scheduling flexibility, and providing

on-property contract resources available to assist in storm response. FirstEnergy has the responsibility for identifying, securing and deploying resources to its affiliates when requested and ensuring that those resources are cost effective and assigned appropriately.

3. Conclusions

6. JCP&L employs a reasonable process for identifying resources needed to respond to major storms.

No formula or algorithm exists for precisely identifying resource requirements necessary to effectively respond to storm events. Along with sometimes speculative OVM model output and use of the Event Impact Tool, experienced management staff draw upon weather forecasts, institutional history, personal experience, and communication, where relevant, with other utilities in the state.

7. Event Classifications generally do not correlate to the number of resources requested or eventually deployed for major storms. (See Recommendation #4)

The JCP&L Event Classification matrix does not include, by design, ranges of resources associated with an event level. Management indicates that it incorporates other factors into event classification and that identification of resource needs is a by-product of those deliberations. However, initial, and at times final, event classifications do not correspond with the number of resources finally deployed. For instance, data show that of the six events for which JCP&L made an initial request of 800 or more resources (indicating an event with a potentially major impact) between 2018 and 2020, only one (Isaias) had an initial Event Classification Level greater than II, an event level that typically does not require resources external to JCP&L.

4. Recommendations

4. Ensure JCP&L resource requests are timely and consistent with Event Level classification declaration. (See Conclusion #7)

Resource requests that prove necessary should originate when declaring the Event Classification. JCP&L, like its affiliates, enjoys an advantageous position in terms of its ability to draw upon a large, affiliated resource base. This position may reduce the urgency to request resources in an expeditious manner but cannot serve management well in all circumstances. Resource requests made consistent in terms of timeliness with an Event Level declaration serve to provide FirstEnergy corporate with an official request, allowing it to begin its own resource acquisition and deployment processes and to send a consistent signal throughout JCP&L's organization of the event size and mobilization needs.

D. Establishing, Updating, and Communicating Estimated Times of Restoration

1. Background

Customers need to have a basis for planning to meet their needs in alternate ways during extended service disruptions. Management cannot provide full precision or accuracy in letting them know when to expect service restoration; however, a sound, well-communicated process for giving them the best information available has central importance in effective event response. Particularly for

major storm events, continuing damage assessment activities will cause changes in estimates. A process for updating estimates and communicating them therefore becomes important. Major storms affect not only utility service continuity; they also disrupt many local and sometimes state government services and private businesses that depend on electricity availability, or on street clearing performed by utilities to gain access for electricity restoration. Thus, realistic service restoration estimates prove critical to governments and communities as well.

Not only what is communicated but how becomes critical as well in effective storm response. Communications in today’s world use a much greater variety of channels; an electric utility should have the capacity to use and should use them all and to give customers willing and able to do so the ability to both provide and secure information without human intervention. Using the phone or visiting the website or an app to report an outage at home helps confirm OMS diagnoses and aids in planning and executing restoration efforts. Customer trouble and outage reporting remains an important part of outage management data collection.

Traditionally, electric utility customers have called the utility to report problems or interruptions in their electric service. Advances in computer technology and telephony have presented options for communicating service outage information to and from customers. Utilities have leveraged Interactive Voice Response technology, texting, and Mobile Apps to enable 2-way communications, allowing customers to report outages as well as obtain customer-specific restoration status information from the utility. Most electric utilities in the United States are providing outage maps on the corporate web site and offering self-service outage reporting through the web site. Outage information management is critical to effective communications both within and outside the utility. Additionally, advanced metering technologies and distribution automation present opportunities to identify customer locations that have lost power. Ultimately, automation will identify outages, reducing the need to rely on customers to report outages.

Whether a customer speaks with a representative, self-reports the outage through telephony systems or texts “OUT”, the contact creates a trouble ticket or outage event in the outage management system. Outage management systems automate trouble ticket management and expedite the analytical process, helping utilities more quickly identify outages and begin the restoration process. Outage systems present the capability to predict the affected devices by using algorithms to relate trouble tickets to the electric device schema. By automating the sorting and analyzing of outage tickets, management can better determine and dispatch the appropriate resources to restore service. Most utilities disable or limit OMS device prediction capabilities during a large event because the algorithms tend to become less predictive.

Lights-out calls from customers offer good indicators that damage exists and provide a feedback mechanism to tell whether trouble remains on the system, but damage assessment gives a utility the best means for properly planning and executing restoration. Qualified and trained individuals acting in their storm role perform damage assessment. This information then factors into the restoration planning process and allows development of initial global estimated times of restoration (ETRs) and often district, town, or individual ETRs as more becomes known about the extent of damage in an area. As ETRs get developed, the utility must incorporate these estimates into the OMS in a timely manner so that other employees, customers, corporate communications, community relations, and other interested stakeholders can access and share this knowledge.

Equally as important, the utility must update ETRs as more information becomes available. Accuracy is a key concern as the outage system usually serves as “the source” for the number of affected customers and storm restoration status for other areas of the company, including customer service, emergency operations, public, community, and regulatory relations.

The absence of ETRs can generate a significant response from customers and the public, in the form of phone calls, web site visits, and contact with government officials to try to find out something, anything about the outage. The longer the company proceeds without ETRs, the more frantic and disgruntled customers become trying to contact the company. However, offering ETRs that are grossly inaccurate can cause more damage than offering no ETRs at all. Inaccurate ETRs foster distrust and the perception of incompetence.

This section contains the primary findings, analysis, and detailed descriptions of the systems and processes that support the establishment, updating, and communicating of ETRs during an outage event. The objectives included determining how timely and accurate JCP&L:

- Established ETRs
- Updated ETRs as changes in circumstances developed and
- Communicated ETRs initially and on an ongoing basis to customers and local officials.

2. Findings

Following Tropical Storm Isaias, the BPU issued Order recommendation (TSI-EDC-1) to JCP&L and the other New Jersey EDCs to improve the ETRs automatically generated by the OMS, to test the OMS under stressed conditions, and to file a plan to improve the accuracy of ETRs to provide more reliable information to public officials, customers, and the public.

JCP&L’s response described the current ETR development process and planned enhancements designed to improve the accuracy and availability of more localized ETRs earlier in the event, reducing the number of customers that are assigned a Global ETR.

On March 2, 2021, JCP&L implemented these planned enhancements to the ETR process. Development of multi-day workplans that form the basis for setting global and district-level ETRs proved key to the enhanced process. As an event progresses, workplan updates are issued, based on available resources and incoming damage assessment information, and associated ETRs get updated as well. As crews begin work in an area, localized ETRs become updated in the OMS, providing site-specific information and restoration status.

JCP&L’s PowerOn OMS provides the primary system used to manage electric trouble orders - - lights out and wire down issues. Specific to storms and outages, PowerOn analyzes, tracks, and records information related to system outages and service problems. Outages tracking from inception through restoration follows, using the system.

The following can initiate outage tickets in PowerOn:

- Customers calling the company’s call center
- Customers self-reporting trouble through the Interactive Voice Response system
- Customers self-reporting trouble through on the website

- Customers self-reporting outages via TEXT OUT
- Supervisory Control and Data Acquisition (SCADA) automatically triggering feeder outages in the OMS.
- Dispatchers manually creating outage orders.

The OMS reviews each event received, analyzes patterns from other reported events to associate the event with a common electrical device, such as a transformer, a fuse, or switch. Based on that association, the OMS predicts the number of outages resulting from the common affected device and then facilitates the assignment of resources to troubleshoot and resolve the issue. Database tables in the OMS represent the distribution electrical connectivity model to link customers to transformers, transformers to fuses or other protective devices, devices to circuits, and so forth.

PowerOn also provides ETRs. Customers, government officials, and the public want to understand how long the outage will last, which is basic to determining if, say, alternate housing will be necessary and helps residents and businesses make the appropriate plans for dealing with an extended outage. JCP&L benefits from enhanced ETR estimates, which better serve the process of determining the extent of resources required for restoration.

The Interactive Voice Response (IVR) system, the company website, and conversations with FirstEnergy's Call Center customer service representatives provide vehicles for communicating ETR information to customers. Customers get the ETR available for their location, which could be the global ETR, a regional or district ETR, a town-level ETR, or a location-specific or individual ETR.

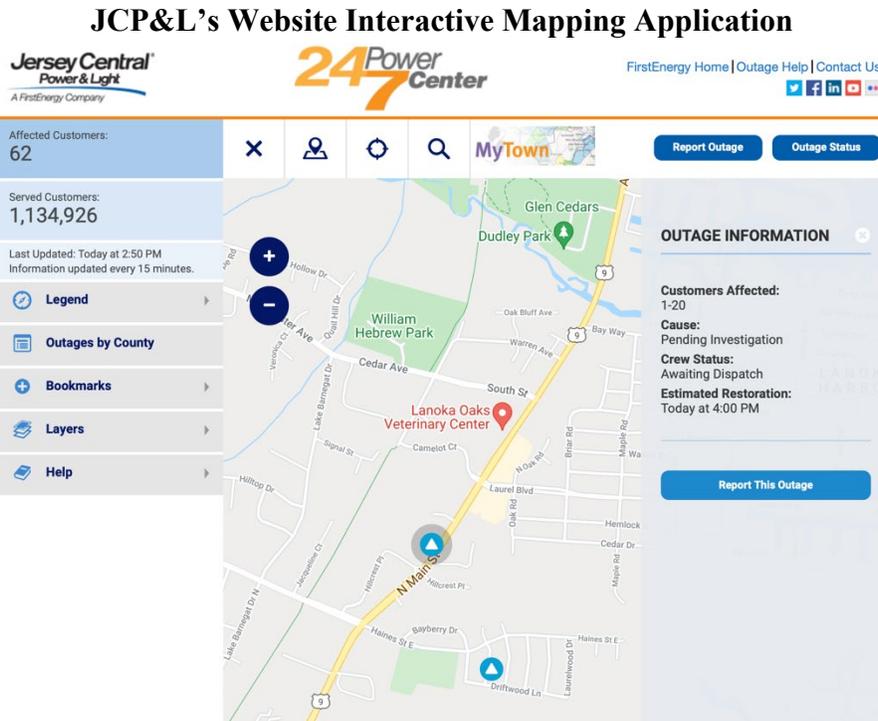
During normal "blue-sky" operations, PowerOn automatically generates initial ETRs, using historical trending and other factors such as time of day or day of week. Management can update initial ETRs, if needed, when crews assess the damage and begin service restoration. During larger outages or storm events, management typically suspends system-generated ETRs. In those circumstances an ETR team establishes global, regional, or district-level ETRs manually, updating times in the OMS. DCC management typically makes the decision to suspend system generated ETRs and disable the delivery of self-service IVR and web ETRs, based on the volume of outage orders received in a district or region within a period.

Per JCP&L's E-Plan, the Planning & Analysis Section Chief, or designee, bears the responsibility for generating and maintaining ETRs, including establishing the global ETR and assigning an ETR to each order issued to the field for restoration. Prior to setting the global ETR for an event, JCP&L's ETR team uses the Event Impact Tool to create a multi-day spreadsheet-based workplan based on available resources, the number of trouble tickets, and judgement about the severity of the event. The workplan forms the basis for setting global, regional, district and individual ETRs. Workplans and ETRs are updated, as the event progresses, and more is known about the level of damage, resource availability, and other situational information.

JCP&L's enhanced ETR development process provides a simple method to combine and process damage assessment data and other known conditions and estimate global, regional, and district ETRs. Updating of those ETRs in the PowerOn OMS permits communication of ETR projections

to Call Center Representatives, the IVR, the company website, dispatchers, and any field or office employee that has access to and training on system use.

JCP&L leverages its public website to provide outage-related information to customers and website visitors. Customers can review general information on storm preparedness and safety as well as report and check on an outage and view outage locations and estimated time of restoration on an interactive map. The figure below provides a screenshot from the website’s interactive outage mapping application.



The website receives information from OMS every 10 to 15 minutes, allowing viewing of updated outage information by state, town, or location. Clicking on the outage symbol on the map displays outage information, including ETR, number of customers affected, crew status, and cause, if known.

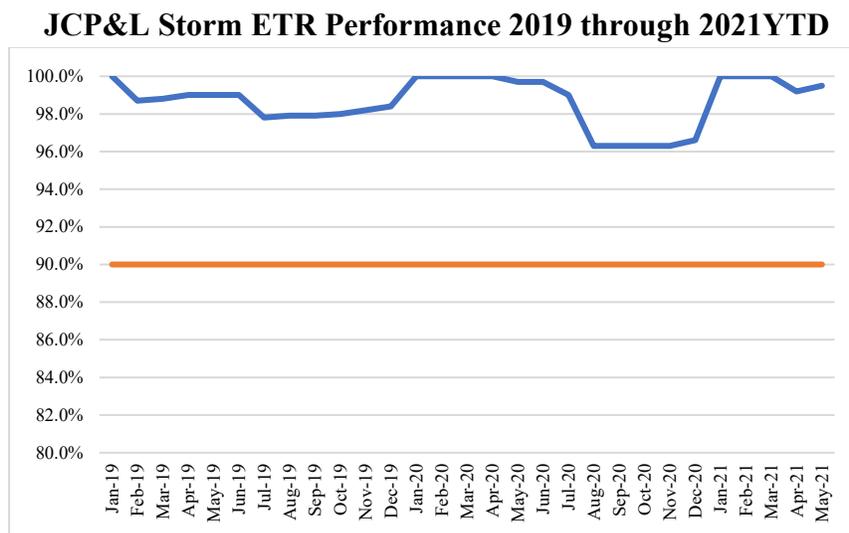
Customers can also log into a secure customer portal to report outages and receive individualized outage status updates, including ETRs. Additionally, customers can text OUT to report an outage and STAT to obtain outage status.

The Company’s Twitter and Facebook pages provide the public another source of real-time information and updates, including emergency preparedness and public safety messaging, information about restoration efforts, and options to report power outages.

FirstEnergy tracks ETR storm performance monthly using the ETR Scorecard. The scorecard tracks the percent of outages assigned an individual (user) ETR versus a global ETR. The Monthly

Performance Summary Reports contain a storm ETR KPI. The Storm ETR KPI calculates how well global or individual ETRs were issued and assigned in OMS during a storm or blue-sky event.

The following chart summarizes JCP&L’s Storm ETR KPI performance from 2019 through mid-2021. Performance has tracked well above target.



3. Conclusions

8. JCP&L’s enhanced ETR process for creating and updating global, regional, and district-level ETRs functioned well during recent storms, but has yet to face the need to operate in connection with a major event. (See Recommendation #5)

Following Tropical Storm Isaias JCP&L began developing an enhanced ETR process. Storms following Isaias have had a smaller impact on JCP&L service territory, but did provide the opportunity to test out the new process. JCP&L management reports better success in developing individual ETRs.

JCP&L plans to include the enhanced ETR process in upcoming functional exercises in 2021, using historical outage data to test the process of creating and updating ETRs, with a goal of limiting the number of customers that are assigned global ETRs.

9. JCP&L’s Call Centers manage high call volumes offered during a storm or large outage event, all but eliminating busy signals for callers.

FirstEnergy contracts with an outside vendor to provide high volume interactive voice response (“IVR”) services to communicate with customers before and during large-scale storm events. During an event the vendor’s IVR system takes overflow calls and allows customers to report outages to JCP&L. Call handling performance during recent storms proved good. During Tropical Storm Isaias FirstEnergy Contact Centers handled more than 550,000 calls, averaging an 11-second speed of answer.

In response to Board Recommendation TSI-EDC-2, JCP&L has updated the content of its automated outbound restoration “call-back” verification, both voice and text, to provide options for customers to indicate if they are unaware of the status of their service, in addition to indicating if the service is currently off or on.

10. FirstEnergy tests customer-facing communications technologies regularly.

FirstEnergy has conducted stress testing of its telephony platform during implementation using simulated call volume of the historically large storms experienced by JCP&L.

FirstEnergy conducts periodic testing and regular monitoring of its website to ensure accessibility and responsiveness. Management conducts stress testing following a change or enhancement to the website. In April 2021, FirstEnergy updated the Java platform on the website and conducted associated stress testing following that implementation, showing improved web response. Monitoring completed during storm events in 2021 show the website performing well under load. FirstEnergy’s main website, outage reporting, and outage tracking sites are hosted in the Cloud to strengthen reliability and scalability during large events. Management links to these sites using redundant connections to improve reliability.

4. Recommendations

5. Continue to monitor and measure JCP&L’s accuracy and success in creating, updating, and communicating ETRs. (See Conclusion #8)

JCP&L recently enhanced the process to generate, update, and communicate ETRs. JCP&L believes its process can be scaled to handle larger events, but the enhanced process has yet to operate during a large event. JCP&L should continue to track ETR accuracy and effectiveness in day-to-day operations to stress the importance of accurate and effectively communicated ETRs. JCP&L should also track ETR accuracy and effectiveness on a storm-by-storm basis, including regularly surveying customers, mayors, OEMs and other stakeholders to continue to incorporate feedback as JCP&L hones the process.

E. Liaison with Government Officials

1. Background

We examined the sufficiency of staffing and assignments of liaisons with government officials during normal conditions and storm events.

Even during normal conditions, it remains important for electric utilities to keep government officials apprised of plans and activities. Utilities occupy the same rights-of-way and the services electric utilities provide are essential to the continuity of many government services. In addition, residents, businesses, and institutions expect their government officials to remain aware of what is happening in their jurisdictions - - irrespective of whether it is utility-related. Thus, a utility activity with public significance can turn out to be one for which voters expect their elected officials to be cognizant. Responding to such needs takes a coordinated approach to ensuring that government officials know from whom to expect to hear regularly and to whom to turn if they have a question or concern.

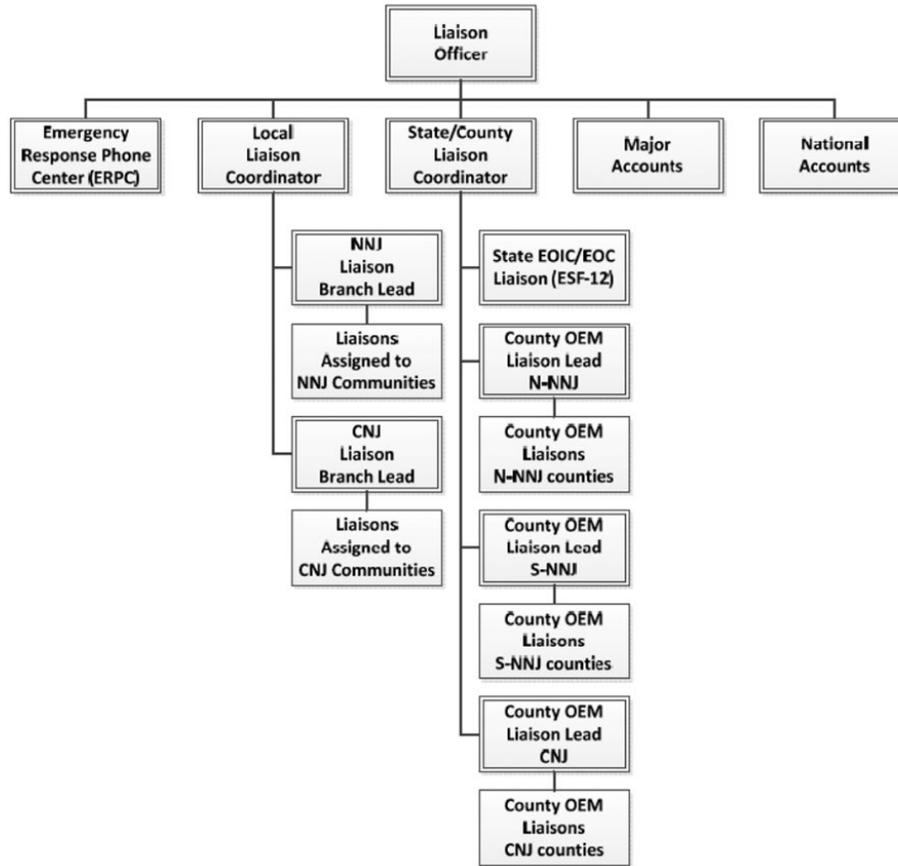
This important need magnifies greatly as major events approach and strike communities. Government officials need to know ahead of time how significant utility system consequences may be. They need to work closely with utilities as each conducts their parallel, overlapping needs to open key roads - - whether to restore electric service or to provide access for emergency vehicles and operations. Even the best-run restoration efforts produce high levels of customer confusion and consternation. Government officials hear a fair share of the questions and complaints at these times - - they need to have a clear understanding on matters like where the utility stands in completing restoration in their jurisdiction and where current efforts are focused.

It takes a comprehensive assignment of liaison responsibility for each affected government - - including more than local ones to ensure that the right information is being delivered timely and that someone with clear responsibility to run down issues and get information can be reached at any time. Moreover, as COVID restrictions on co-locating people have demonstrated, success can also depend completely on providing other communications channels when services like regular telephone are disrupted.

2. Findings

Following activation of the Incident Command Team, JCP&L's Liaison Officer presides over the Emergency Response Phone Center, Local Liaison Coordinators, State and County Liaison Coordinators, Major Accounts and National Accounts. This Liaison team facilitates storm response communications between JCP&L, major and national accounts, municipalities, counties, and state entities. JCP&L's Regional Affairs Emergency Communications Plan and the State & Federal Regulatory Emergency Communications Plan guide employees during an emergency. JCP&L's E-Plan also outlines the principles of the Incident Command System ("ICS") structure and guides overall emergency incident planning and response. The next diagram shows the Liaison Officer organization. The Liaison Officer reports directly to the Incident Commander.

Liaison Officer Organization



Prior to, during, and following a large event or storm, JCP&L works with state and county Officials to address priorities that include public safety issues, road openings, and restoration of transmission lines and critical facilities. Pre-emptively, meetings and conference calls with county OEMs (Office of Emergency Management) relay preparation efforts and protocols.

When activated, the JCP&L’s liaison team provides 24 x 7 coverage to all municipalities and counties requesting assistance during an outage or storm, assigning a liaison to communicate directly with County and State Emergency Command Centers. Regional External Affairs Consultants (EACs) become assigned specific municipal and county designations, generally consistent with their day-to-day assignments. During Tropical Storm Isaias, JCP&L received an additional ten External Affairs employees from FirstEnergy Affiliates to supplement the staff tasked with working directly as a resource to local officials.

During an event, mayors and BPU Staff receive daily System Status Reports that provide global statistics about the storm including ETR, number of customers out of service, the number of circuits and substations out of service, a high-level summary of restoration efforts, daily estimated manhours needed to restore remaining customers, and information pertaining to situational awareness. Mayors also receive specific details regarding their municipalities, including numbers of customers out of service, damaged circuits, tree-cutting locations, damaged poles, damaged

locations on the circuits, road closures, circuits schedule to be worked that day, and the estimated customers to be restored per day until restoration is complete.

JCP&L embeds customer support representatives in County OEMs in affected areas (virtually embedded during the Pandemic) to assist with prioritizing emergencies and communicating restoration status. Customer support representatives then relay priorities to JCP&L's Priority Restoration Unit so location-specific priorities and critical infrastructure information can be factored into restoration planning and crews can be dispatched in the order of highest priority.

Depending on the size of the event, JCP&L may activate its Emergency Response Phone Center, which provides a unique 800 number to key external stakeholders as well as emergency management personnel to contact the company. Management also established a 24 x 7 priority storm line for national account customers, to connect key accounts directly with account representatives, thus avoiding the IVR. Key account and national account representatives have responsibility for communicating with their normally assigned accounts.

During an event, External Affairs and Customer Support leaders attend twice daily meetings with operations personnel to obtain restoration status details that can be relayed back to municipal, county, and state emergency contacts. Additionally, External Affairs holds daily calls with mayors and other public officials and has recently added operations personnel to these calls to facilitate answering questions, addressing concerns, and providing detailed and location-specific information about the storm restoration effort. In the past, one call per day was held with all mayors and all mayors received the same information. Following feedback received after Tropical Storm Isaias, JCP&L now holds four district-level calls during the day to make sure relevant information is delivered to the right participants, this is more efficient for all parties.

Municipal liaisons during a storm communicate the magnitude of damage, update officials on resources involved in restoration effort, and relay town-specific information about crew availability and restoration priorities. All JCP&L liaisons receive formal storm response related training which introduces E-Plan and SharePoint site navigation, covers use of storm-support technology, reviews storm restoration practices, and provides ICS position-specific and FEMA training. Liaisons must also participate annually in storm exercises and attend annual storm meetings with municipalities, providing the opportunity for liaisons and municipal contacts to develop and strengthen relationships and discuss prior storms and shared histories.

As required by the BPU, JCP&L also conducts an annual service restoration tabletop exercise that BPU Staff attend. Recent exercises were held in 2021 and 2019. JCP&L was exempted from holding the 2020 exercise due to Tropical Storm Isaias restoration activities. JCP&L solicits feedback from stakeholders during and following the drills.

JCP&L also conducts annual exercises in which JCP&L liaisons staff in the County OEMs to build relationships, discuss and update restoration priorities, and review facilities and protocols. This provides the opportunity for both parties to work through an exercise and become more familiar with each other and the liaison process. Before the Pandemic, these meetings took place in person at each County OEM. The 2020 OEM exercise schedule shows 13 meetings held virtually with

county OEMs and BPU staff during July. JCP&L also attends an annual meeting of OEMs as well as the annual Conference of Mayors.

In addition, JCP&L conducts meetings with the staff of the county OEM after major storms. JCP&L invites local officials to these meetings, so they gain a better understanding of the role of the OEM and the Company's storm restoration process, which also provides an opportunity for the staff of the county OEM, local officials, and JCP&L to discuss recent events and to adjust priorities if needed.

JCP&L conducts periodic tours at both the Northern and Central Distribution Control Centers for local officials, first responders, and large commercial and industrial customers. This provides an opportunity to gain familiarity with JCP&L system operations, the restoration process, and interact with Company management. Elected and public officials receive invitations to attend regional safety trailer demonstrations conducted by JCP&L line managers and crews during the year. The demonstrations include the restoration process and safety precautions.

The External Affairs Consultants group publishes a quarterly newsletter to public officials in their respective counties. At least annually as a refresher, the newsletter reviews storm restoration process-related information.

Responsibility for broadcast communications to all external stakeholders prior to and during the event as well as more personalized communications with emergency contacts in assigned areas through email, phone, and text, rest with External Affairs. Information can include weather tracking, critical customer and well-water alerts, storm preparation reminders, and ETR updates.

FirstEnergy created a web portal for Mayors, elected officials and OEMs called *MyTown*. During an outage event the website provides restoration status, number of customers out of power, infrastructure details, and other critical outage-related information specific to the town. Recent enhancements to the website include the provision of outage times, damage assessment information, and town-level ETRs.

Prior to 2019, JCP&L administered post-storm stakeholder surveys to obtain feedback from elected officials, mayors, and county OEMs regarding JCP&L's performance during major outage events. In 2019, management elected, instead, to hold in-person post-storm debriefing meetings to obtain feedback following two storm events. Feedback from these meetings identified the need to adjust wording on automated call-backs to verify power restoration, making the calls less confusing to customers. In 2020, following Tropical Storm Isaias, JCP&L issued a post-storm survey of stakeholders in addition to conducting multiple debriefing sessions with OEMs and elected officials.

Following each major outage event, JCP&L completes an After-Action Report ("AAR") to summarize the event and identify strengths and opportunities. Recent AARs have contained recommendations to strengthen communications during a storm, including providing more accurate and individualized ETRs for customers and the public.

3. Conclusions

11. As recommended by the Board following Tropical Storm Isaias, JCP&L has enhanced communications with customers, the public, and elected officials, but the improvements have yet to be tested in a major event. (See Recommendation #6)

Following Tropical Storm Isaias and concerns from public officials about inadequate and untimely restoration information from JCP&L, the Board of Public Utilities issued Order recommendations TSI-JCP&L-2, TSI-EDC-4, and TSI-EDC-5 directing JCP&L proactively to educate customers and elected officials on the restoration process and to improve the situational information communicated to elected officials prior to, during and following a storm. Additionally, the Board recommended that EDCs update municipal and elected official contact information on a quarterly basis.

In response to recommendation TSI-JCP&L-2, JCP&L planned more frequent and more localized calls with elected and public officials to communicate real time restoration activity and respond to inquiries. JCP&L also prepared a public officials guide which lists resources and information about the Company's storm restoration process.

JCP&L presented to mayors and emergency coordinators the storm restoration process in the spring of 2021 with the New Jersey Conference of Mayors, along with other electric service utilities.

Per TSI-EDC-5, the Board asked New Jersey EDCs to update contact information for municipalities and elected officials on a quarterly basis to ensure that updates and notices are reaching the right people. JCP&L described its process to assign regional external affairs consultants to specific municipal and county elected officials. Following annual county and municipal reorganization meetings, JCP&L external affairs consultants reach out to update contact information, using the New Jersey Municipal Officials form. This information then gets updated in the appropriate email distribution lists and other communications software. JCP&L updated its process to comply with the order such that the form will be issued quarterly to officials to ensure proper update.

Additionally, in response to Board Recommendation TSI-JCP&L-1, JCP&L surveyed its customers and elected officials about JCP&L's Water and Ice Program which provides water and ice to customers without power for more than 24 hours. Recommendations resulting from this effort enhanced the water and ice program by increasing the voucher amounts provided to customers and expanding participating retailers within JCP&L's service territory, making the program more accessible and worthwhile for customers.

Feedback from Tropical Storm Isaias indicated customer and mayoral concern about the accuracy and availability of ETRs and a desire for more realistic ETRs. The Board observed the lack of district-level and individual ETRs, ordering JCP&L in TSI-EDC-1 to improve its ETR setting process. JCP&L implemented an enhanced ETR process in March 2021 (refer to section: Establishing, Updating, and Communicating Estimated Times of Restoration, in this chapter). The enhanced process is designed to improve the accuracy and availability of more localized ETRs,

provided earlier in the event, and hopefully reducing the number of customers that are assigned a Global ETR.

12. JCP&L employees serving as municipal liaisons working in that role day-to-day and during storms strengthens relationships and builds familiarity.

The role of a municipal liaison during a storm includes communicating the magnitude of damage, update officials on resources involved in restoration effort, and to relay town-specific information about crew availability and restoration priorities. All JCP&L liaisons receive formal training and are required to participate in storm exercises and attend annual storm meetings with municipalities, providing the opportunity for liaisons and municipal contact to develop and strengthen relationships and discuss prior storms and shared histories.

Experienced External Affairs Consultants (EACs), who work with county and municipal leaders on a day-to-day basis during the year, staff the roles. As a result, during a storm or large outage event, EACs already have become familiar with the territory having established relationships with local elected and emergency management personnel. JCP&L supplements this group with “buddies” who do the same job in one of their affiliates, if needed.

JCP&L’s External Affairs Consultants, combined with embedded Customer Support representatives, both of which daily support the same communities, provide familiar and knowledgeable assistance to impacted communities during a storm. This in combination with JCP&L’s recent enhancements to better educate the public and newly elected officials, to improve the accuracy and timeliness of ETRs and to provide more frequent and more individualized restoration status communications to elected officials and OEM personnel, should provide valuable situational information to officials to aid in decision-making as they support constituents during a storm. JCP&L deployed these practices during smaller storms; the foundation is there to scale response during a larger event or storm.

4. Recommendations

6. Continue to develop and improve communications with the public, elected officials and OEM staff based on feedback gathered following storm or outage events. (See Conclusion #11)

JCP&L recently enhanced communications processes to generate, update, and communicate ETRs and to keep the public, elected officials and OEM staff better informed about restoration progress in impacted communities. While JCP&L believes these processes are scalable, they have yet to be tested by a larger outage event. Effective communications during a storm can be most challenging especially with ever-increasing customer expectations.

As JCP&L continues to focus on improving ETR accuracy and effectiveness, so too should it continue to reach out to customers and the communities it serves to monitor and improve communications effectiveness. Customers and the elected and emergency response officials supporting communities provide valuable insights to further improve outage communications in the future. JCP&L should continue to reach out through after-storm meetings, forums, and surveys

and adjust communications processes to provide a better experience for impacted customers and communities.

F. Storm Order Compliance and Metrics

1. Background

We reviewed JCP&L's compliance with BPU storm-related order compliance. JCP&L identified from 2015 to the present four Board Orders addressing storm response performance.

JCP&L provided a July 25, 2018 order in Docket No. EO18030255 (*In The Matter Of The Board's Review Of Major Storm Events Of March 2018*). This order examined events from that month related to Winter Storm Riley, Winter Storm Quinn, and Toby. The order addressed 12 action items for JCP&L - - three specific to it and nine more applicable to all of New Jersey's EDCs.

A second Order, dated October 28, 2020, from Docket No. ER20020146 (*In The Matter Of The Verified Petition Of Jersey Central Power & Light Company For Review And Approval Of Increases In And Other Adjustments To Its Rates And Charges For Electric Service, And For Approval Of Other Proposed Tariff Revisions In Connection Therewith ("2020 Base Rate Filing")*), addressed JCP&L's request for a rate increase including costs related to capital investments under the Company's Reliability Plus program. The order directed JCP&L to conduct a review of storm-cost reduction opportunities, to include a review of major and non-major events and of its and industry best practices."

A third Order, dated November 18, 2020, in Docket No. EO20090607 (*In The Matter Of The Utilities' Response To Tropical Storm Isaias*), examined actions and activities of each New Jersey electric distribution company before, during, and after Tropical Storm Isaias. It specifically addressed nine storm event-related matters requiring a response from JCP&L (two that were JCP&L specific and seven requiring a response from all New Jersey EDCs).

A fourth Order, dated May 8, 2019 in Docket No. EO18070728 (*In the Matter Of The Verified Petition Of Jersey Central Power & Light Company For Approval Of An Infrastructure Investment Program (JCP&L Reliability Plus)*), addressed approval of JCP&L's Infrastructure Investment Programs. It discussed prior storm events but addressed no recommendations regarding them.

We also examined major event reports. Reliability-related metrics, including SAIDI, CAIDI, and SAIFI, comprise important focal points of operational excellence. The New Jersey Administrative Code (N.J.A.C.) establishes reliability service performance levels to which utilities must adhere and which are subject to further review, analysis, and corrective action, as and if required. Major storm events can skew metrics, making it important to understand their definition and how such events affect performance metrics.

2. Findings

a. March 2018 and Isaias Action Items

The March 2018 winter events order and the one addressing Isaias created storm-related action items for JCP&L, either alone or as part of a group of New Jersey utilities, as the next table summarizes. The 3-EDC column addresses a matter specific to JCP&L, PSE&G, and ACE.

JCP&L Storm-Order Action Items

Docket No.	EDC	JCP&L	Utility	3-EDC	Total
March 2018 Events (EO18030255)	4	5	2	1	12
Isaias - - 2020 (EO20090607)	7	2	0	0	9
Total	11	7	2	1	21

The following table summarizes the applicable items from each docket.

Storm-Order Action Item Details

Winter 2018 - - Docket EO18030255 - 2018		Isaias - - Docket EO20090607 - 2020	
Number	Description	Number	Description
EDC - 1	Participate in the Board’s collaborative initiative with the National Weather Service	EDC - 1	Improve the ETRs automatically generated by OMS
EDC - 2	Update event level classification matrices	EDC - 2	Update the content of the automated outgoing ETR messages
EDC - 3	Create an Intra-state Mutual Assistance Agreement	EDC - 3	Provide a plan to improve Call Center peak volume
EDC - 4	Maintain direct and live contact with critical care customers during an outage event	EDC - 4	Develop a plan that proactively educates customers and elected officials on the restoration process
JCP&L - 1	Refine its outage prediction model	EDC - 5	Update contact information for municipalities and elected officials on a quarterly basis
JCP&L - 2	Train employees to perform second role damage assessment duties; improve capability to mobilize third-party assessors	EDC - 6	Evaluate the resiliency impact of storm hardening projects
JCP&L - 3	Reevaluate its span of control; hire or contract with additional personnel	EDC - 7	Evaluate worst performing circuits to determine undergrounding potential
JCP&L - 4	Ensure that its Call Centers have the capability of tracking where utility crews are working	JCP&L - 1	Survey its customers and elected officials
JCP&L - 5	Provide separate global ETRs for each of its 2 regions w/in 24 hours	JCP&L - 2	Establish a process of communicating with elected officials
BPU - 2	JCP&L, PSE&G and ACE must submit a plan and cost benefit analysis for AMI implementation		
Utility - 1	Conduct a Pole Safety Audit of wooden utility poles		
Utility - 2	Develop a formal joint-use storm coordination plan		

Our review indicated timely action or response to all items listed under the orders following the March 2018 and Isaias events. Our examination of matters addressed in other sections of this report chapter or in other report chapters included analysis of actions related to the action items listed in the preceding table (e.g., 2018 items EDC-1 and JCP&L-1 and 2020 items EDC-7 and JCP&L-2).

b. Major Events

N.J.A.C. 14:5.1-2, Definitions defines a “Major Event” as any of the following:

1. Sustained interruptions affecting at least 10 percent of the customers in an operating area and extending to the EDCs other operating areas when they provide assistance to the affected area
2. Unscheduled interruptions from Independent System Operator actions to prevent cascading or uncontrolled outages or to maintain service during emergencies
3. State declarations of emergency or disaster declared by State government
4. EDCs providing mutual aid to another utility may request Board permission to exclude sustained interruptions from CAIDI and SAIFI calculations.

JCP&L may exclude the impacts from any event meeting any of these criteria in its calculation of CAIDI and SAIFI for the relevant operating area during affected periods. Other electric utilities use the first criterion, an event affecting 10 percent or more of customers. Still others employ IEEE’s definition of a Major Event, the Beta method, a complicated formula essentially defining a “major event day” as a day in which the daily system SAIDI exceeds a threshold value, around 2.5 standard deviations from a rolling 5-year average.

We examined all Major Event reports (required under N.J.A.C. 14:5-8.9). Those reports categorized Major Events from 2017 to 2020 using the categories provided by the N.J.A.C. definition. In some cases, a single storm met the major storm criteria in more than one category, in which case it received both designations. The following tables provide for each Major Event the date, number of event days, and category for each year during the period reviewed.

Major Events Summary by Year 2017 to 2020

2017				2018			
No.	Major Event Date	Days	Category	No.	Major Event Date	Days	Category
1	Mar 1 - 4	4	4	1	Jan 4	1	3
2	Mar 8 - 12	5	4	2	Jan 12 - 14	3	1, 4
3	Mar 13 - 14	2	3	3	Mar 2 - 13	12	1, 3
4	May 1 - 8	8	4	4	Mar 21 - 26	6	3
5	Jul 2 - 4	3	4	5	May 15 - 21	7	1, 4
6	Aug 4 - 7	4	4	6	Jun 28 - Jul 07	10	1
7	Sep 5 - 8	4	4	7	Jul 16 - 26	11	1
8	Sep 9 - 24	16	4	8	Aug 14 - 19	6	3
9	Oct 29 - Nov 01	4	1, 4	9	Nov 16 - 20	5	4
10	Oct 31 - Nov 10	11	4	10	Dec 8 - 12	5	4
Average Days		6.1		Average Days		6.6	

2019			
No.	Major Event Date	Days	Category
1	Jan 19 - 21	3	3, 4
2	Feb 12 - 16	5	3, 4
3	Feb 20 - 21	2	3
4	Feb 24 - 28	5	1, 4
5	Mar 3 - 5	3	3, 4
6	May 26 - 31	6	1, 4
7	Jun 21 - Jul 2	12	1, 4
8	Jun 25 - 27	3	4
9	Jul 17 - Aug 1	16	1
10	Aug 29 - Sep 8	11	4
11	Oct 16 - 20	5	1, 4
12	Oct 31 - Nov 4	5	1, 4
13	Nov 27 - Dec 11	15	1, 4
14	Dec 30 - Jan 02	4	4
Average Days		6.8	

2020			
No.	Major Event Date	Days	Category
1	Jun 3 - 7	5	1, 4
2	Jul 3 - 11	9	1
3	Jul 18 - 29	12	1, 4
4	Aug 4 - 13	10	3
5	Aug 26 - Sep 14	20	4
6	Sep 17 - 20	4	4
7	Nov 8 - 15	8	4
8	Dec 1 - 5	5	4
9	Dec 16 - 18	3	3
10	Dec 24 - 27	4	1
Average Days		8	

The next tables summaries events by category. The total number of declared major events (44) in the review period differs from the category total (59) because some events carried two category designations.

Major Events Summary

Year	1	2	3	4	Total
2017	1	0	1	9	11
2018	5	0	4	4	13
2019	7	0	4	12	23
2020	4	0	2	6	12
Total	17	0	11	31	59

A review of the data reveals several useful observations. First, JCP&L declared, on average, eleven major events per year during the period examined with those events having an average duration of 6.8 days. Said differently, JCP&L characterized an average of 75.5 days per year (11 x 6.8) as part of a major event in the period. This rate - - exceeding 1 day in every 5- - - reflects an unusually high number of Major Event days. A significant number (16) of Major Events received the classification solely because JCP&L provided mutual aid to another EDC or one of its operating areas provided resources to the other. Nine events in the review period lasted 10 or more days, some of them not single events but a chain of multiple events designated as a single major event.

3. *Conclusions*

13. JCP&L properly complied with storm-related recommendations contained in Board Orders issued during the period 2015 – 2020.

Review of the four Board Orders issued during the review period showed that JCP&L complied with all the recommendations issued.

14. JCP&L properly applied the Major Event classification to storms during the period from 2017 through 2020.

Review of the Major Reports filed with the BPU for the declared Major Events in the review period indicated sufficient justification and alignment with N.J.A.C. definition of a Major Event to make the assigned classifications supportable. JCP&L, as required, filed Major Event reports for all events it classified as such.

15. Over 21 percent of days-per-year during the review period were declared a Major Event per the N.J.A.C definition. (See Recommendation #7)

Notwithstanding that management’s application of a Major Event conforms to N.J.A.C definition, it is unusual for a utility to classify such a high percentage of calendar days as Major Event days. Part of the reason for such a high percentage derives from the declaration of a Major Event when mutual aid is provided irrespective of the number of resources provided. The logic for including all such events seems to be that release of Company resources to assist other utilities (or a JCP&L operating region) diminishes the capacity of JCP&L to meet its own internal reliability metrics during the period when those released resources are unavailable. It is not clear that in all cases where mutual aid has been provided that a degradation in reliability must inevitably follow or, if there was degradation, the degree to which such a degradation followed because mutual aid resources were unavailable.

4. Recommendations

7. Provide in JCP&L Major Event reports for which the Major Event classification was based on sharing of its resources how the unavailability of those resources directly affected its ability to maintain targeted reliability levels in its operating region(s). (See Conclusion #15)

The criteria permits Major Event designation in cases of sharing of JCP&L resources among regions, affiliates, or other utilities. However, while some occasions of such resource diversion may affect the ability of JCP&L to attain or maintain targeted service levels in its own territory, they should not be routinely accepted. For example, when only a small number of resources are shared, particularly over an extended number of days, the exclusion of service performance in the calculation of reliability metrics during that period may artificially skew (*i.e.*, better) non-major event day performance. An explanation in the Major Event report of how, and the degree to which, service was affected within JCP&L due to the sharing of resources will provide a supportable basis for application of this particular type of Major Event classification.

G. Undergrounding to Improve Reliability and Resiliency

1. Background

The general view holds that underground lines can withstand weather events particularly and improve reliability generally. However, the expense of moving existing overhead lines

underground has generally been considered too expensive (certainly with exceptions) as means for enhancing reliability in the Northeast. Undergrounding does often produce other advantages - - aesthetics, safety, lower O&M costs from avoiding vegetation management, and less voltage drop due to lower resistance. Undergrounding can also bring other disadvantages, such as shorter service life, longer repair times (and thus outage durations, when they occur), and reduced ability to withstand overloads.

We examined here the extent to which JCP&L regularly evaluates undergrounding opportunities as a method for improving system reliability and resiliency at certain reliability “trouble spots” during normal, “blue sky” days and during storm events. Our examination examined the criteria and methods employed to determine whether selective use of undergrounding at such locations would improve reliability enough to justify any added costs involved.

2. Findings

Approximately 428,000 (38 percent) of JCP&L customers take service through underground distribution systems, although underground systems do generally rely on overhead facilities to some extent. The company operates approximately 7,500 miles of underground circuits below 34.5kv. This compares with just over 12,000 miles of overhead circuits of similar voltage. The extensive use JCP&L makes of underground distribution facilities should give it a broad base of experience and, more importantly, cost and reliability data regarding overhead and underground distribution systems.

Notwithstanding its experience with underground systems, management demurred when asked to provide the costs to install and to maintain underground versus overhead distribution plant. It noted the high variability in underground costs and their dependency on several factors, including the type of underground construction (*e.g.*, new residential or commercial distribution), cost sharing with a developer (for new construction), and the number of phases to be installed. Other recognized variables included more complicated construction for a manhole-duct system with a conduit bank and vault mounted transformers and switches as well as soil types and conflicts with other below grade utilities. In comparison, JCP&L considers the cost of overhead installations less variable. The only meaningful information management provided about underground costs came from a 2018 BPU Staff mention of an average cost of over \$3 million per mile.

Concluding that undergrounding would prove cost prohibitive overall or even at virtually every individual location as a general matter does not necessarily rule out its utility at every location that experiences abnormally high reliability problems. It takes analysis, not reliance on global unit costs and certainly not a refusal to examine specific cases to determine whether undergrounding certain, limited sections of the overhead system might prove cost beneficial, if not now, then potentially in the future. Increasingly severe weather events, degradation of reliability metrics, technological improvements, cost reductions, and a change in stakeholder perception of the value of lost load might all move over time, justifying continuing attention to all conceivable means for addressing system trouble spots. Effectively, however, management appears to take the position that it need not conduct regular review of the cost and benefits of targeted conversion.

JCP&L did recently offer in response to a 2020 BPU Order an evaluation of the costs and benefits of undergrounding 11 segments of its worst-performing feeders. Management evaluated outage statistics on its five worst performing circuits and selected eleven line segments from those circuits for evaluation. It concluded that while there is a “...noteworthy reliability benefit associated with undergrounding...[the] analysis indicates an unfavorable cost-benefit result for each potential site[s].” The analysis itself requires examination.

The company first ranked its circuits by customer-minutes of interruption (CMI) incurred, including major events, during the 2017 – 2020 period. It then identified the five worst performing circuits and selected from those circuits eleven line segments that represented the most promising prospects for undergrounding. Management used the U.S. Department of Energy’s Interruption Cost Estimate (ICE) calculator to compute the dollar benefits to customers on a particular line segment that would experience an improvement in reliability as measured by standard reliability metrics (*i.e.*, SAIDI, SAIFI and CAIDI).

The calculation of reliability benefits first entails identifying the reliability impacts (*i.e.*, improved metrics) of undergrounding. JCP&L identified the outages that undergrounding would generally reduce or eliminate. It assigned to the resulting 29 distinct causes (*e.g.*, animals, human error, ice, line failure, vehicle, wind, equipment failure) a reduction percentage that the next table summarizes.

Undergrounding Outage Reduction Factors by Cause

Cause	Reduction	Cause	Reduction
Animal	95%	Other Utility-Non-Elec.	0%
Bird	100%	Overload	0%
Call Error	0%	Planned Outage	0%
Contamination	95%	Previous Lighting	95%
Customer Equipment	0%	Switching Error	0%
Equipment Failure	90%	Trees- Sec/Service	100%
Fire	95%	Trees Off ROW-Limb	100%
Forced Outage	95%	Trees Off ROW-Tree	100%
Human Error - Company	0%	Trees On ROW	100%
Human Error - Non-Company	0%	UG Dig-Up	0%
Ice	100%	Unknown	95%
Lighting	95%	Vandalism	0%
Line Failure	90%	Vehicle	95%
Object Contact With Line	100%	Wind	100%
Other Electric Utility	0%		

For example, undergrounding was estimated to reduce outages (vis a vis overhead lines) caused by vehicles by 95 percent, trees by 100 percent, equipment failure by 90 percent, vandalism by 0 percent, and so forth. JCP&L then calculated the reliability of the line segments post construction of the projects associated with the undergrounding. The improvement in reliability impacts were in most cases significant, but not striking, as the next table illustrates.

Project-Level Reliability Summary

Project	Before			After		
	SAIDI	SAIFI	CAIDI	SAIDI	SAIFI	CAIDI
	5,018	6.70	749	2,872	4.15	691
	3,424	6.13	558	2,247	3.01	748
	5,994	7.57	791	4,725	5.98	790
	5,179	5.63	920	4,255	3.64	1,169
	4,336	8.47	512	3,789	6.44	588
	3,418	5.30	645	2,151	4.45	483
	5,143	9.12	564	4,853	7.96	610
	6,083	3.97	1,532	4,464	3.76	1,188
	5,783	4.76	1,216	3,094	3.00	1,032
	14,518	10.33	1,406	14,006	9.23	1,517
	2,338	4.42	529	1,445	3.57	404

Note that the numbers shown after the name of the line segment are simply a representation of a longer alpha-numeric segment identifier.

The reliability improvements identified were, of course, directly related to the assignment of outage causes, a subjective exercise, and the concomitant minutes of interruption that would be reduced by elimination or reduction in the causes of those by undergrounding. Using the ICE calculator JCP&L calculated the dollar benefits of undergrounding.

In addition to the calculation of reliability improvements and subsequent calculation of dollar benefits, the cost of undergrounding needed to be considered. JCP&L referenced an EPRI report that provided average costs for various types of utility infrastructure. Management noted cost differences between suburban and urban areas and that rocky terrain, such as that found in northwestern New Jersey, can dramatically increase costs. Allowing for those considerations, JCP&L tripled the estimated costs EPRI provided and added another 20 percent to account for the higher cost of labor in New Jersey as well as for inflation since the production of the study (2015).

JCP&L then calculated and compared the dollar benefits of undergrounding, in both real and nominal values, for each segment evaluated to the project costs associated with achieving those benefits to derive benefit-cost ratios.

Selective Undergrounding Cost-Benefit Analysis Results

Project	# of Customers	Benefit (Nom. \$MM)	Benefit (NPV \$MM)	Cost (\$MM)	Benefit/Cost (Nom)	Benefit/Cost (NPV)
	1,153	\$14.0	\$4.9	\$14.0	1.00	0.35
	1,413	\$10.7	\$3.7	\$22.4	0.48	0.17
	922	\$12.8	\$4.5	\$20.2	0.63	0.22

		637	\$0.5	\$0.2	\$5.6	0.08	0.03
		1,518	\$3.2	\$1.1	\$5.0	0.64	0.22
		82	\$1.5	\$0.5	\$2.8	0.55	0.19
		248	\$0.1	\$0.0	\$7.9	0.01	0.00
		196	\$0.5	\$0.2	\$4.8	0.11	0.04
		1,224	\$33.7	\$11.7	\$11.8	2.85	0.99
		333	\$0.7	\$0.2	\$12.9	0.05	0.02
		263	\$1.7	\$0.6	\$2.6	0.65	0.22
	Total	7,989	\$79.5	\$27.6	\$110.0	0.72	0.25

The benefit to cost ratio of the segments analyzed averaged 0.72 using nominal dollars or 0.25 on an NPV basis, the latter being the more salient result. Several subjective assessments drove those ratios - - chiefly the reduction in customer minutes of interruption from undergrounding, the cost of undergrounding, and the dollar benefits to improved reliability, which also are subject to year-year variation.

Properly, management noted that its analysis captures neither all the benefits nor costs associated with undergrounding. For example, additional benefits identified include those associated with reduced vegetation management costs, reduction in outage restoration costs, and overall reduce storm restoration time. Additional costs include those for reconfiguring service drops, complexities in dealing with communication, natural gas and other utility infrastructure, and potential stranded costs.

3. Conclusions

16. JCP&L applied reasonable analytic rigor in evaluating the performance of sections of its five of its worst performing circuits.

JCP&L employed a reasonable approach to calculate the benefits and costs associated with undergrounding certain ‘worst performing’ segments of its network. It used government and industry data as well as applying experiential learning and considered a range of factors, both quantitative and qualitative in arriving at its conclusion that undergrounding does not show an economic benefit at this time when considering the segments of circuits analyzed.

17. Regular analyses of the benefits and costs of undergrounding employing a range of input values to allow for uncertainty would provide a more up-to-date and robust range of benefit to cost ratios. (See Recommendation #8)

JCP&L’s study assumed single values for its study variables. Allowing for a range of values, which likely change over time, provides a more rigorous analytic basis. There is enough variability and subjectivity in cost benefit analyses associated with undergrounding that regular, yearly reviews of select circuits, or circuit segments, would be informative.

18. Actual projects can provide a useful measure of the cost–benefit impact to JCP&L for undergrounding. (See Recommendation #9)

Given the uncertainty and variability in the values of key input assumptions, the acquisition of experience and data gained from undergrounding a small, but representative line segment would prove highly beneficial to providing more robust insights into the benefits and costs of undergrounding.

4. Recommendations

8. Conduct updates of analyses of the costs and benefits using selective undergrounding at least every two years. (See Conclusion #17)

The recent JCP&L's study offers a sound starting point. Management should validate at least every two years its assumptions using current data and should apply a range of variables as opposed to single point ones. The analysis should be applied to at least several circuits that yearly appear to provide the greatest potential cost/benefit ratio from undergrounding. Should ratios show movement in a positive direction, management should expand application the segments analyzed and the frequency of updating. Management should retain comprehensive documentation of the analysis for Board or stakeholder review if requested.

9. Develop a pilot project for undergrounding a poorly performing line segment or a small group of them. (See Conclusion #18)

Such a project would provide current, actual experience with the underlying costs and associated benefits of undergrounding and provide more robust and credible inputs for future analyses. Results would confirm or validate certain assumptions, disprove others, and generally provide more support and credibility to the answers to certain questions that are, given the continuing experience with unprecedented weather events and the impact on system reliability and resiliency, only growing.

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Chapter X: Customer Service

A. Background

We examined the management and operation of JCP&L customer service activities over the last five years. Our examination included organization structure, resource alignment and numbers, and activities driving JCP&L customer service costs. We examined and evaluated business practices, staffing, facilities, expenditures, performance levels, and management decisions that contribute to or solve problems. We placed particular emphasis on:

- The top-level management structure in place to plan, set goals and budgets for, oversee, and measure the levels and costs of service to JCP&L customers in New Jersey
- Alignment of customer service functions among JCP&L and FirstEnergy Service Company
- Processes in place to set goals and objectives and to track customer service performance
- Quality of services provided by JCP&L and FirstEnergy, as measured by objective metrics
- JCP&L’s level of performance as compared to other FirstEnergy customer service groups.

The following sections offer a summary level review of JCP&L’s Customer Service organization, costs, management, and performance, followed by a detailed review of key Customer Service functions including:

- Billing, Business Offices, & Payment Processing
- Customer Satisfaction Measurement
- Customer Complaints and Resolution
- Call Center
- Credit and Collections
- Meter Reading
- Meter Services & Shop
- Revenue Protection
- Linda’s Law Compliance and Customer Safety and Welfare.

B. Findings

1. Customer Service Organization and Staffing

Customer Experience, operating at the FirstEnergy level, comprises the organization responsible for delivering customer service to JCP&L’s customers. A Senior Vice President, who reports directly to the President & CEO of FirstEnergy, leads the newly created Customer Experience organization established in June 2021. This change resulted from an internal recommendation “to provide a greater focus on enhancing the customer experience while continuing to prioritize operational excellence across all aspects of our business.”

The following illustration shows FirstEnergy’s Customer Experience organization in place when we drafted this report. Following reorganization, this group has responsibility for managing billing services, revenue collection, interfacing with residential, commercial, and industrial customers, marketing and sales, and energy efficiency programs and initiatives.

FirstEnergy Customer Experience Organization

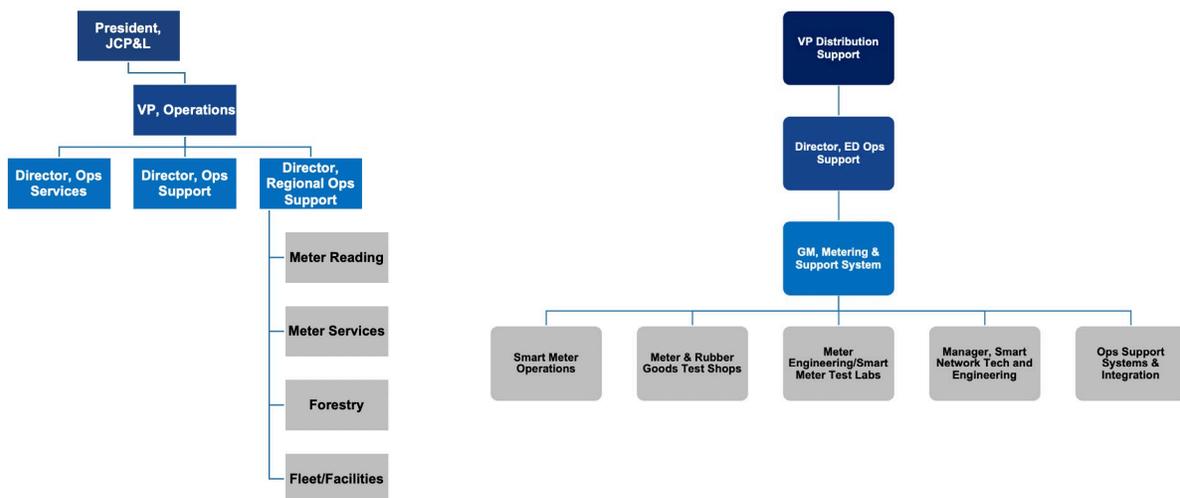


FirstEnergy consolidated most Customer Service office functions into the service company to provide more effective support for its ten operating companies. FirstEnergy also supports JCP&L and the other nine FirstEnergy operating companies by providing performance tracking and trending and through the sharing of best practices. All FirstEnergy Customer Service operations use the SAP/CRM (Customer Relationship Management) software, which facilitates consolidation of common services to provide economies of scale. FirstEnergy’s consolidated Customer Service functions include:

- Call Center Operations
- Customer Service Technology and Systems Support
- Billing and Payment Processing
- Complaint Handling
- Customer Satisfaction Measurement
- Credit & Collection (in office functions).

JCP&L Customer Service staffing support the New Jersey retail walk-in locations and field functions -- meter reading, meter services, and field collections. Reporting to JCP&L’s President, the Vice President of Operations has responsibility for JCP&L’s field-related Customer Service functions -- Meter Reading and Meter Services. The Meter Shop resides within Metering & Support Systems, reporting to the Vice President of Distribution Support. Organization charts for both organizations are presented on the following two diagrams.

JCP&L VP, Operations and VP Distribution Support Organizations



The following table summarizes JCP&L and FirstEnergy Service Company staffing levels by year from 2016 through April 2021 for each of the Customer Service functions reviewed in this chapter.

Customer Service Staffing Levels

Function	2016			2017			2018			2019			2020			2021 (April)		
	JCP&L	FES	CONT	JCP&L	FES	CONT												
Billing	0	41	8	0	56	6	0	60	0	0	49	0	0	56	0	0	59	0
Payment Processing	0	36		0	34		0	31		0	32		0	31		0	31	
Call Center	0	591	246	0	578	211	0	616	294	0	576	231	0	589	200	0	568	269
Billing & Payment	0	2		0	3		0	2		0	2		0	2		0	2	
Collections	30	30	1	29	32	0	30	32	0	31	33	0	29	29	0	29	30	0
Walk-Ins/Collections	21	0		22	0		23	0		20	0		20	0		20	0	
Meter Reading	164			162			157			152			144			133		
Meter Service	62			60			56			59			54			54		
Meter Shop	15			16			15			15			15			12		
Total	292	700	255	289	703	217	281	741	294	277	692	231	262	707	200	248	690	270
Employees	992			992			1,022			969			969			938		
Employees & Contractors	1,247			1,209			1,316			1,200			1,169			1,207		

Customer Service staffing peaked in 2018 as FirstEnergy prepared to in-source collection-related call handling, a function previously outsourced until October 2018. However, the predicted uptick in call volumes did not happen to the level expected and staffing levels in the Contact Centers declined to match 2019 incoming call volume. JCP&L reduced customer service staffing further in 2020, as call volumes declined due to the Pandemic and the pause in collection-related disconnects. FirstEnergy increased staffing in 2021, primarily in the Contact Center, as collection-related activities resumed in some of its operating companies and retail walk-in locations reopened.

Meter Reading staffing declined significantly since 2016, most notably in 2020 and 2021 due to an impending AMI project to replace JCP&L’s 1.15 million manually read meters with smart metering technology and Automated Metering Infrastructure (AMI) to facilitate 2-way communication with the smart meters. Meter Reader vacancies numbered 30 in June 2021, influenced by the Pandemic but more attributable to JCP&L’s AMI project filing with the BPU in 2020, as readers bid into other positions or left the company. To address the shortage and projected reduction in the next three to four years, management negotiated several transitional bargaining-unit job classifications -- one for transitional meter readers and another for transitional clerks that support meter reading. Management began filling vacancies in July 2021, with a goal to bring meter reader and clerk staffing back to approved staffing levels for 2021. These transitional positions will continue as needed, until AMI deployment completes (36-month deployment planned from 2023 to 2025).

2. Customer Service Strategy

Since 2016 FirstEnergy’s Customer Service strategy focused on improving the customer experience. Improvement projects in recent years included enhancing the Interactive Voice Response (IVR) and migrating Contact Center telephony to Voice Over Internet Protocol (VOIP) using Session Initiated Protocol (SIP).

Phase I of FirstEnergy’s FE Forward corporate-wide initiative, completed in February 2021, looked at business processes, policies, and work practices across FirstEnergy to identify opportunities to enhance and automate processes, provide better experiences for customers, and make better use of data. The FE Forward initiative produced several recommendations specific to improving the customer experience:

- Increasing self-services

- Improving web capabilities and navigation
- Increasing customer adoption of eBills and autopay
- Automating manual and routine processing.

The Customer Service organization incorporated FE Forward recommendations into its current Customer Service strategy. Key pillars of the Customer Service strategy include:

- Core Systems Review to assess key customer-facing technologies and systems to ensure they continue to effectively support the business
- Customer Data Lake to gather data from customer-facing technologies to facilitate data analytics and strengthen data security
- Voice of the Customer (VOC) platform to provide tools for each operating company to survey customers in near real-time in the communication channels that customers prefer
- New technologies to automate manual tasks and reduce inefficiencies using robotic process automation and machine learning.

A cross-functional Customer Service team provides oversight on all initiatives and projects under consideration by the organization. The team regularly meets to review, approve, and prioritize potential projects. Management undertook 49 Customer Service process improvement related projects in 2019, 2020 and 2021; highlights include:

- Core Systems Review
- Arrears Reduction Initiative
- Customer Portal Core Systems Review
- Credit Collection Agency Strategy Project
- Web Move-in/Move-out redesign
- Customer Outreach to gather Meter Reads
- Review of Customer Outage Journey
- Review of Customer Payment Journey
- Technologies to Increase Self-Service
- Knowledge Management.
- Modernizing Billing Platform
- Redesign Collection Process
- Work Management System Improvements (IWD)
- Customer Data Lake
- Covid Collection Strategy Project
- Out of Tablet Work
- Robotic Process Automation
- Training Program Redesign
- Voice of Customer Survey Platform

3. Information Systems

The primary systems supporting JCP&L’s customer service functions include:

System / Technology	Description
SAP/CRM	Customer Relationship Management system (Customer Billing System)
Genesys telephony platform	Genesys SIP Server, Pulse, Workspace, iWD, WFM, Routing
Fieldnet	Stores meter information and schedules routes for meter reading and collections
PowerOn	Outage Management System
Kubra/Citi	Third-party Credit Card Payment processing system
Kubra iFactor	Deliver text/e-mail alerts to customers and outage messages on the company website.
Intrado (IVR Outage Overflow)	Third-party Interactive Voice Response System for Outage Over-flow calls
Intrado (Outbound)	Third-party vendor service to send large outbound campaigns

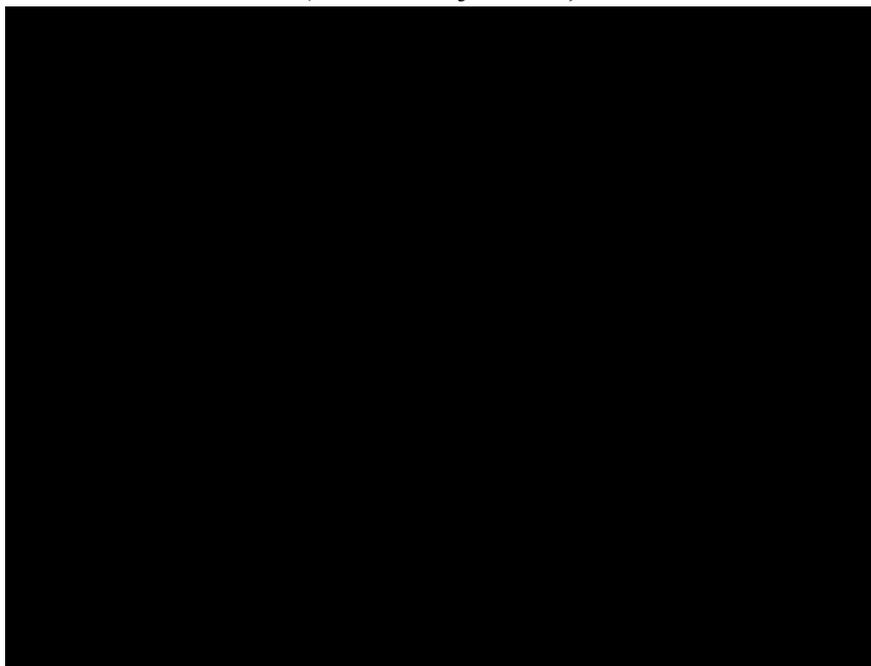
Concentrix IVR	Natural Language Interactive Voice Response System
Cnet	Knowledgebase that houses documentation to assist employees with customer inquiries.
Moxie	Contact management system used to respond to customer email inquiries.
Virtual Hold	Customers can choose to wait on hold or receive a callback at their time in queue
Nexidia	Speech Analytics tool and Quality Assurance evaluation tool.
NICE	Call recording system for inbound customer calls.
Qlikview Reporting	Reporting tool that provides performance data and statistics.
AT&T Business Center / Route-It	Application used to route and monitor calls received through the AT&T Network.
Planned Outage Management	Process planned outage campaign requests.
ARCOS	Support Call-out of staff as needed.
IVR Real-Time Monitor	Realtime monitoring application to view call volume received in the IVR.
IVR Admin Tools	IVR messaging, IVR scheduling, and outbound campaigns.

A Core Systems Review, completed in 2021, reviewed existing customer service core technologies to determine when supporting systems would require enhancements, upgrades, or replacement. Key project recommendations included consolidating technology and shifting business solutions to the cloud. Recommendations also highlighted expanding customer self-service options and enhancing routine processes through robotic process automation to increase efficiencies and improve the customer experience. The project team created a high-level technology roadmap to guide enhancement efforts over the next 3 to 5 years. Further research will be required to build out the roadmap. FirstEnergy has funded these efforts, allotting \$50 million over the next few years.

4. Customer Service Performance

Customer Service measures and reports performance and reviews metrics monthly with senior leadership. Performance metrics are routinely tracked for comparison between FirstEnergy’s operating companies. The next table summarizes Customer Service KPIs (Key Performance Indicators).

Customer Service KPIs
(table is confidential)



The Senior Vice President of Customer Experience intends to add a customer satisfaction or customer experience metric to the KPIs monitoring Customer Service performance. FirstEnergy recently contracted with a firm that conducts customer research and customer satisfaction surveys, to measure customer satisfaction among its operating companies. The firm will recommend a target for the metric and provide tools to assist FirstEnergy in routinely measuring customer satisfaction so the metric can be included in the KPIs reported monthly to the Leadership team and become a goal for the employee incentive program.

5. Performance vs Other FirstEnergy Operating Companies

JCP&L’s customer service performance as of April 2021, as measured by the following service indicators, shows poor Meter Reading performance as compared to other FirstEnergy operating companies. JCP&L has the lowest meter read rate, second highest consecutive estimate rate, and the highest meter reading error rates. JCP&L’s meters are read manually while most of the other FirstEnergy utilities listed below have fully automated or have deployments underway (Ohio Edison and Cleveland Electric Illuminating).

Comparative FirstEnergy Customer Service Indicators

	Meter Read Rate	Consecutive Estimate Rate	Meter Reading Error Rate – New Reader	Meter Reading Error Rate – Exp Reader
JCP&L	61.0%	7,866	87	38
Ohio Ed	75.6%	31	48	36
CEI	74.6%	8,341	18	22
Toledo Ed	92.4%	566	37	26
MonPower	97.2%	297	32	22
Potomac Ed	98.6%	34	48	26

6. Benchmarking Performance

FirstEnergy participates in an annual Customer Service benchmarking program conducted by First Quartile Consulting. This program benchmarks customer service functions among a panel of U.S. utilities and FirstEnergy has participated in the panel for several years. In addition to comparing costs and performance, the program brings utilities together to share Customer Service best practices and discuss challenges.

From 2015 to 2019, JCP&L's total Customer Service costs dropped from first to third quartile among the multi-company benchmarking panel, driven primarily by higher than panel costs in the Local Office, Meter Reading, Collections, and Field Service functions. JCP&L maintained first and second quartile performance in several functions including Contact Center, Billing, and Payment Processing costs. The next table highlights JCP&L first and second quartile performance as compared to panel cost per account by function.

Cost per Account Performance (Q = Quartile)

	2015	2016	2017	2018	2019
Customer Service Overall	Q1	Q2	Q2	Q3	Q3
Contact Center	Q1	Q1	Q1	Q1	Q1
Local Office	Q2	Q3	Q3	Q4	Q4
Field Service	Q1	Q4	Q4	Q4	Q4
Meter Reading	Q3	Q4	Q4	Q4	Q4
Billing	Q2	Q1	Q1	Q1	Q1
Payment Processing	Q2	Q2	Q2	Q2	Q1
Collections	Q2	Q4	Q3	Q4	Q3

From 2015 through 2019, JCP&L maintained first or second quartile performance among the benchmarking panel for key Customer Service functional performance metrics. The next table highlights JCP&L first and second quartile performance as compared to the benchmarking panel.

Customer Service Benchmarking Performance (Q = Quartile)

	2015	2016	2017	2018	2019
Self-Service IVR	Q3	Q2	Q3	Q2	Q2
Self-Service Web	Q2	Q2	Q1	Q2	Q2
Meter Reading Errors	Q2	Q1	Q1	Q2	Q2
Estimated Bills	Q3	Q3	Q3	Q3	Q4
Percent Electronic Bills	Q1	Q1	Q1	Q2	Q1
Percent Digital Payments	Q4	Q4	Q4	Q2	Q3
Days Sales Outstanding (DSO)	Q2	Q2	Q2	Q1	Q2
Average Speed of Answer (ASA)		Q3	Q4	Q3	Q3

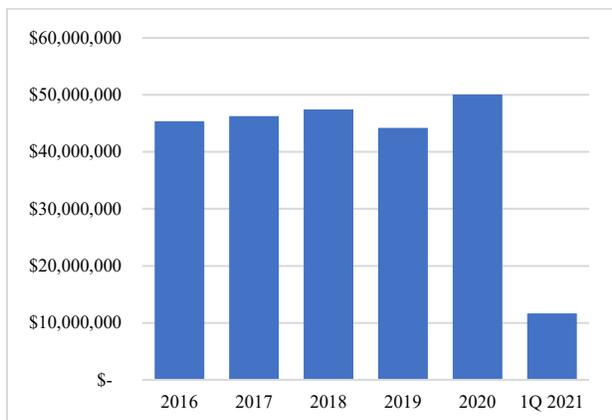
7. Customer Service Costs

a. Total Customer Service Costs

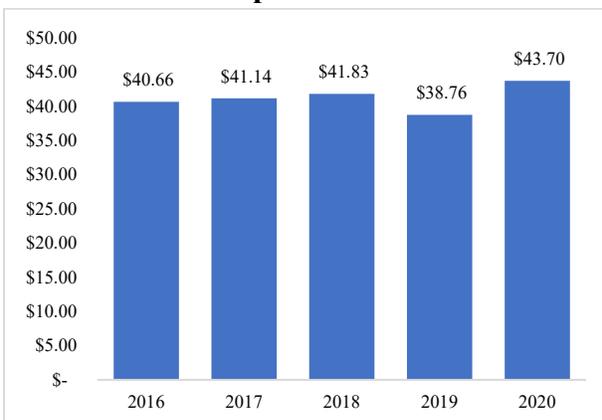
Customer Service expenses have increased since 2016, increasing cost per customer by about \$3.03 from 2016 to 2020. The following tables show recent cost changes. Functions experiencing

increasing costs include the Call Center (25 percent), Meter Reading (14 percent) and Meter Services (15 percent). Billing and Collections costs decreased over the period reviewed.

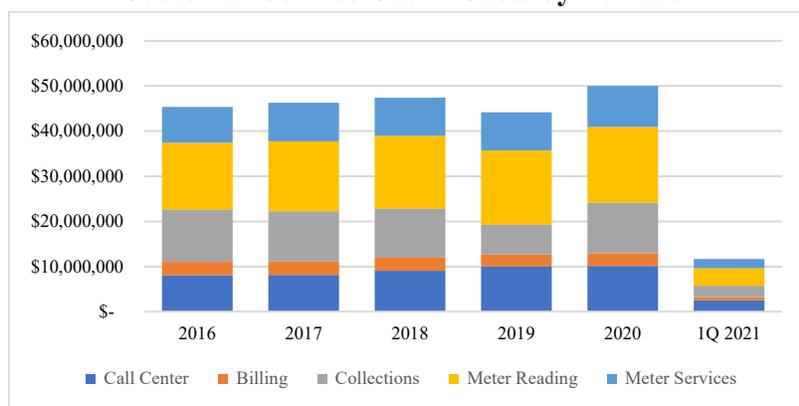
Customer Service O&M Costs



O&M Cost per Customer



Customer Service O&M Costs by Function



b. Call Center Costs

JCP&L’s Call Center operation and maintenance (O&M) costs increased by 25 percent from 2016 to 2020. Even with increasing call volume since 2016, cost per call and cost per customer have increased over the five years. As of the end of March 2021, cost per call exceeds prior year levels.

JCP&L Call Center Costs

Year	Total O&M Costs	Total Calls Handled ¹	Cost per Call	Cost per Customer
2016	\$8,101,530	2,301,368	\$3.52	\$7.26
2017	\$8,120,408	2,196,311	\$3.70	\$7.22
2018	\$9,057,541	2,585,808	\$3.50	\$7.99
2019	\$10,041,419	2,413,300	\$4.16	\$8.81
2020	\$10,127,709	2,633,269	\$3.85	\$8.84
1Q 2021	\$2,523,569	504,348	\$5.00	\$2.20

¹ Handled by agents and/or technology

c. Credit and Collection Costs

JCP&L’s Credit & Collection O&M costs have decreased slightly since 2016. JCP&L has disconnected fewer accounts since 2016 and notably very few since the onset of the Pandemic, due to the extended moratorium. Net write-offs, expressed as a percentage of revenue, have decreased as well. The pause in collection-related disconnects in 2020 and 2021 will delay most write-offs until 2022 when management expects collection-related disconnections to resume. The next table summarizes credit and collection costs, excluding Uncollectible Costs.

Credit & Collection Costs

Year	O&M Cost	Disconnects	\$/Disconnect	% Net Write-offs ¹
2016	\$11,670,059	20,690	\$564.04	0.43%
2017	\$11,092,066	16,986	\$653.01	0.37%
2018	\$10,814,670	16,671	\$648.71	0.39%
2019	\$6,639,280	14,980	\$443.21	0.41%
2020	\$11,248,385	236	N/A	0.33%
1Q 2021	\$2,581,984	148	N/A	0.23%

¹ Net write-off as a percent of total revenue

d. Billing, Business Office & Payment Processing Costs

JCP&L’s Billing, Business Office, and Payment Processing O&M costs, and cost per payment, have decreased slightly since 2016. Management cannot separate billing, business office, or payment processing costs so we have analyzed these costs as a group. The percentage of JCP&L customers receiving paperless bills each year has increased and the cost per bill and payment (combined) has decreased slightly over the same period. The next table summarizes billing, business office, and payment processing costs.

Billing, Business Office & Payment Processing O&M Costs

Year	O&M Costs	# Payments	# Bills	% Paperless	% In-Person Payments	\$ per Bill & Payment
2016	\$2,907,727	11,399,005	13,289,500	26%	1.2%	\$0.12
2017	\$2,998,807	11,424,109	13,233,581	29%	1.2%	\$0.12
2018	\$3,019,392	11,618,900	13,558,062	31%	1.2%	\$0.12
2019	\$2,640,191	11,609,401	13,628,882	35%	1.3%	\$0.10
2020	\$2,806,950	11,297,252	13,689,828	38%	0.8%	\$0.11
1Q 2021	\$656,603	2,866,002	3,362,604	41%	0.7%	\$0.11

e. Meter Reading Costs

The next table summarizes JCP&L’s Meter Reading annual O&M costs, meters read, cost per meter read and provides annual percentages of the number of estimated bills. Meter Reading O&M costs have increased by 14 percent from 2016 to 2020 while the number of meters read has decreased by 18 percent, resulting in a 39 increase in the cost per meter reading. The number of

estimated bills issued, due to unavailable meter readings has grown substantially since 2016 and has peaked in first quarter of 2021 at 42 percent.

Meter Reading Costs

Year	O&M Costs	Meters Read	Cost per Read	% AMR Reads	% Estimated Bills
2016	\$14,717,389	14,354,278	\$1.03	0.26%	6%
2017	\$15,537,543	14,334,199	\$1.08	0.30%	6%
2018	\$16,038,467	13,528,997	\$1.19	0.36%	12%
2019	\$16,379,056	13,936,741	\$1.18	0.41%	11%
2020	\$16,751,641	11,760,495	\$1.42	0.44%	26%
1Q 2021	\$3,881,197	3850746	\$1.01	0.62%	42%

JCP&L has deployed very few automated meter reading devices to-date and awaits BPU approval on a proposed project to replace 1.15 million meters in New Jersey with smart meters networked through an AMI.

8. Meter Services and Meter Shop Costs

JCP&L’s Meter Services and Meter Shop O&M costs have risen 15 percent from 2016 to 2020 while the number of service orders completed has declined by 14 percent, resulting in a 33 percent increase in the cost per service order over the five-year period. JCP&L has kept 93 to 94 percent of customer-requested appointments from 2016 to 2020. However, in the first few months of 2021, JCP&L has missed nearly half of these appointments, as seen in the table below.

Meter Services and Meter Shop Costs

Year	O&M Costs	Service Orders	\$/Order	Appointments Kept
2016	\$7,959,993	118,093	\$67.40	N/A
2017	\$8,525,860	138,804	\$61.42	6%
2018	\$8,480,678	114,932	\$73.79	7%
2019	\$8,492,573	115,924	\$73.26	7%
2020	\$9,125,880	101,824	\$89.62	7%
1Q 2021	\$2,034,562	23,002	\$88.45	46%

9. Billing, Business Offices, and Payment Processing

Accurate and timely customer accounting, like meter reading, comprises a fundamental element of the utility/customer relationship. Timeliness offers an important contributor to minimizing the billing and payment cycle, and to supporting systems of communication with and about customers. Efficiency systems and methods are critical to handling billing-support functions cost-effectively, recognizing the advances that technological improvements have made possible. Accuracy promotes full and proper revenue collections, while minimizing customer disputes and their associated time, cost, and customer-confidence impacts.

We examined JCP&L’s billing practices and procedures, payment receipt, account-crediting practices, and other customer-accounting procedures, seeking to determine whether JCP&L

designs and executes them efficiently and effectively. We reviewed billing processes to determine whether bills are accurate and timely. Liberty also examined staffing levels to determine whether adequate and capable personnel carry out billing functions.

FirstEnergy’s Customer Management organization has responsibility for customer billing and payment processing. The group reports to the Senior Vice President of Customer Experience (refer to the organization chart shown above). Billing staffing levels have increased sixteen percent over the last five years, as the next table shows.

Billing Staff

Year	Entity	Staffing	Total
2016	FES	41	49
	Contractor	8	
2017	FES	56	62
	Contractor	6	
2018	FES	60	60
	Contractor	0	
2019	FES	49	49
	Contractor	0	
2020	FES	56	56
	Contractor	0	
2021 (April)	FES	59	59
	Contractor	0	

Payment Processing staffing levels have decreased 14 percent over the last five years, as the next table shows.

Payment Processing Staff

Year	Entity	Staffing
2016	FES	36
2017	FES	34
2018	FES	31
2019	FES	32
2020	FES	31
2021 (April)	FES	31

JCP&L’s Billing, Business Office, and Payment Processing O&M costs, and cost per payment, have decreased slightly since 2016. JCP&L cannot separate billing, business office, or payment processing costs; we have analyzed these costs as a group. The percentage of customers opting to receive paperless bills has increased each year and the cost per bill and payment (combined) has decreased slightly. The next table summarizes billing, business office, and payment processing costs.

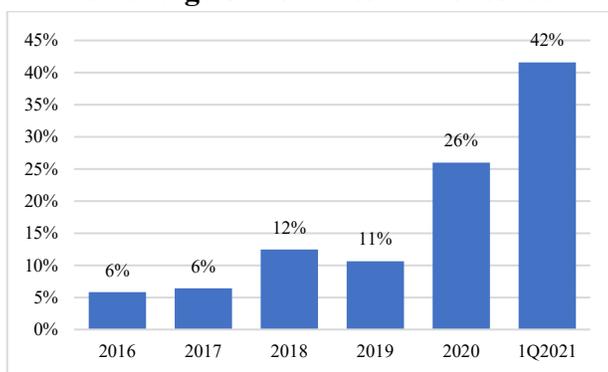
Billing, Business Office & Payment Processing O&M Costs

Year	O&M Costs	# Payments	# Bills	% Paperless	% In-Person Payments	\$ per Bill & Payment
2016	\$2,907,727	11,399,005	13,289,500	26%	1.2%	\$0.12
2017	\$2,998,807	11,424,109	13,233,581	29%	1.2%	\$0.12
2018	\$3,019,392	11,618,900	13,558,062	31%	1.2%	\$0.12
2019	\$2,640,191	11,609,401	13,628,882	35%	1.3%	\$0.10
2020	\$2,806,950	11,297,252	13,689,828	38%	0.8%	\$0.11
1Q 2021	\$656,603	2,866,002	3,362,604	41%	0.7%	\$0.11

The SAP/CRM customer information system supports the billing and revenue accounting process. JCP&L uses cycle billing. Cycle billing assigns customers to 1 of 21 different cycles or portions based on geographic locations to facilitate monthly metering reading. Using a series of monthly intervals for each cycle, management prepares and mails invoices each working day of the month for the designated fraction of the total customer population. Meter reading orders are created in SAP for each cycle based on the billing and meter reading schedule. Those requiring a manual reading get downloaded to the FieldNet system. Readings get uploaded to SAP daily as Meter Readers submit handheld data usage.

Inability to gather usage data manually or through automation generally results in usage estimation by the SAP/CRM system. Estimated bills can trigger customer inquiries and complaints, especially when the bill amounts vary noticeably from the prior month. JCP&L has increased the percentage of estimated bills since 2016. Estimates increased in 2020 and 2021 due to Tropical Storm Isaias and the Covid-19 Pandemic. JCP&L also experienced an increase in Meter Reader vacancies in 2020 and 2021. This combined with Covid restrictions limited the number of meters that JCP&L was able to read successfully, resulting in estimated bills for customers.

Percentage of Estimated Bills Issued

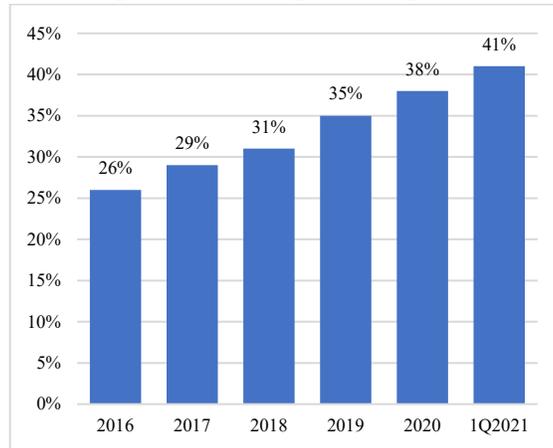


SAP/CRM performs nightly batch billing-cycle runs to prepare bills for a cycle. A series of procedures calculates bills, adds descriptive text and messaging on each bill, performs error checking, and diverts any accounts requiring additional handling. Accounts that successfully complete invoicing go to JCP&L’s bill print application, which generates a PDF copy of the bill. Printed bills, Electronic Data Interchange (EDI) bills, eBill notifications and transactions are prepared the day following the batch process. Any diverted bills go to the iWD Work Distribution

system which manages the workflow for the billing department review and for any necessary correction.

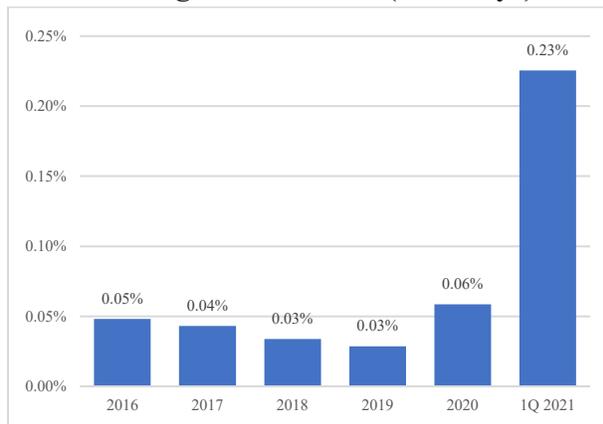
JCP&L issues approximately 1.14 million customer bills each month to customers. JCP&L bills for metered electric service and for several unmetered services, including area lights, line extensions, service establishment charges, temporary service charges, and pole charges. Paperless billing (eBills) can substantially reduce annual billing costs. JCP&L delivers more than 40 percent of customer bills electronically, up from 26 percent in 2016.

Paperless Billing Participation



JCP&L’s percentage of late monthly bills and late final bills has increased significantly in 2021. JCP&L’s field work practice changes during the COVID-19 Moratorium led to increased bill estimation, which led to increased work volumes for billing employees and increased the number of bills delivered late to customers. Delayed bills generally increase the number of inbound calls as customers call to inquire about the disposition of their bill.

Percentage of Late Bills (> 45 days)



Percentage of Late Final Bills (> 30 days)



Customers can pay their JCP&L bills by walking in to one of six JCP&L Business Offices - - three in the North District and three in the Central District. Customers can also pay bills at third-party payment locations throughout the state. Customers can pay in cash, by check, with a credit or debit

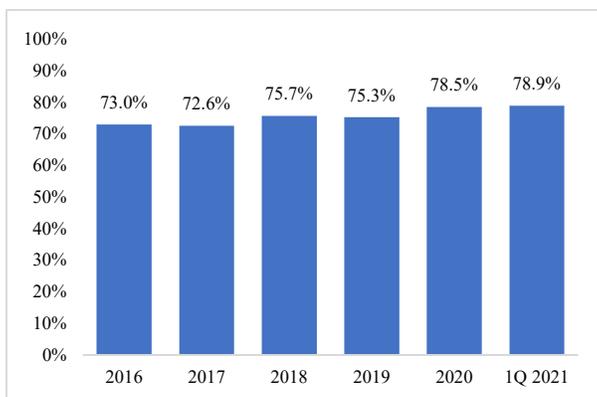
card, or through a check draft (ACH payment). Mail, phone, Internet, and in-person payment options exist. Customers may pay by credit or debit card over the phone, or can pay through the web, which adds a convenience fee. Twenty-seven percent of JCP&L payments come online through the website or through the phone (IVR and CSR-assisted), and 12 percent of customers have signed up for Auto Pay (direct debit).

10. Customer Satisfaction

Most utilities conduct research to better understand customer expectations and perceptions. Such research can be useful in gaining a better understanding, for instance, of why customers are unsatisfied with the elements of customer service and what customers’ expectations are, instead of using judgment and experience. Liberty reviewed the results of this research with the objective of determining how management makes decisions and takes actions that take advantage of the insights gained. Liberty also examined the customer satisfaction measurement process—survey format, scope, frequency, and timeliness of results reporting.

FirstEnergy measures customer satisfaction through several survey mechanisms. For many years, FirstEnergy has contracted with an external research firm, Triad, to survey customers interacting with customer service representatives at FirstEnergy’s Call Centers. Each quarter, 1,800 telephone surveys are completed asking customers to provide feedback and rate the interaction. Annual results are presented in the following chart. FirstEnergy also contracts with this firm to conduct post-storm surveys.

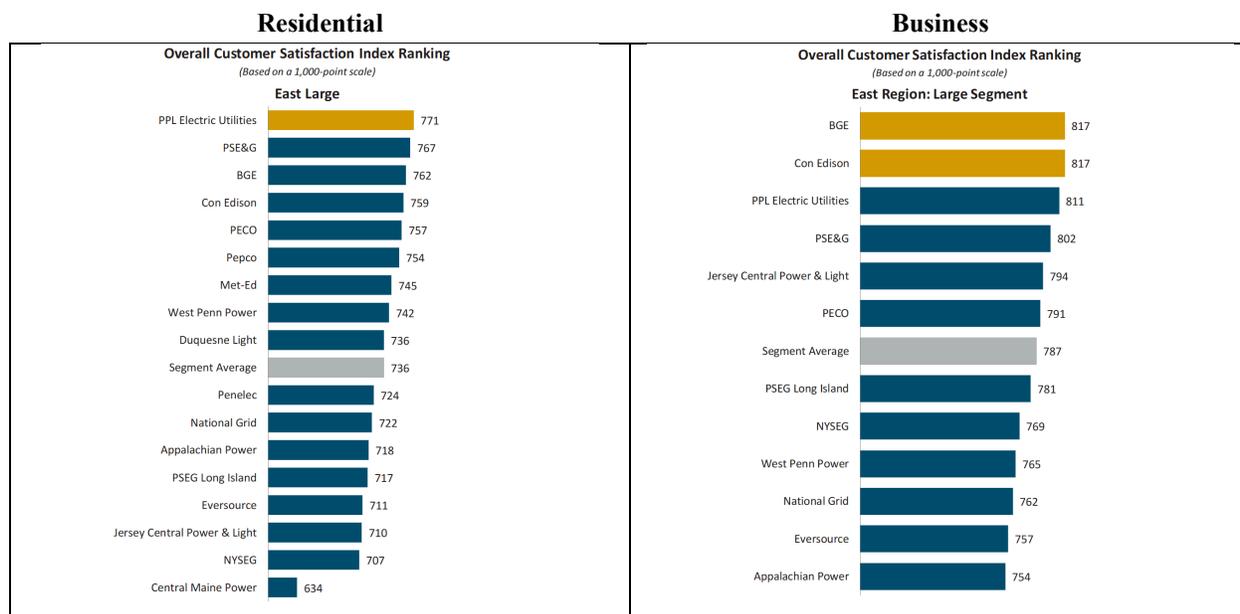
Transactional Customer Satisfaction



FirstEnergy’s Senior Vice President of Customer Experience plans to establish a customer satisfaction or customer experience KPI. FirstEnergy recently contracted with a firm that conducts customer research and customer satisfaction surveys, to measure customer satisfaction among its operating companies. The firm will recommend a target for the metric and FirstEnergy plans to implement a voice of the customer (VOC) platform that will provide the tools needed to connect with customers “in the moment”, through surveys, text messaging, and in the communications channels preferred by individual customers, and provide more actionable results in real-time, to facilitate process improvement. Plans include adding the metric to the KPIs reported monthly to the Leadership team and including customer satisfaction as a component in the employee incentive program.

The J.D. Power and Associates Customer Satisfaction Index annually compiles customer satisfaction survey results within the utility industry. This survey has wide industry acceptance for measuring overall satisfaction. This index provides JCP&L the ability to benchmark performance on a national and regional basis but may be limited in terms of understanding the views of customers in a particular jurisdiction. Business customers rated satisfaction with JCP&L above average in the 2020 J.D. Power and Associates Utility Business Customer Satisfaction Study. Residential customers, however, rated JCP&L well-below average for the 2020 J.D. Power and Associates Utility Residential Customer Satisfaction Study for the East Large Segment.

J.D. Power and Associates 2020 Electric Utility Customer Satisfaction StudiesSM

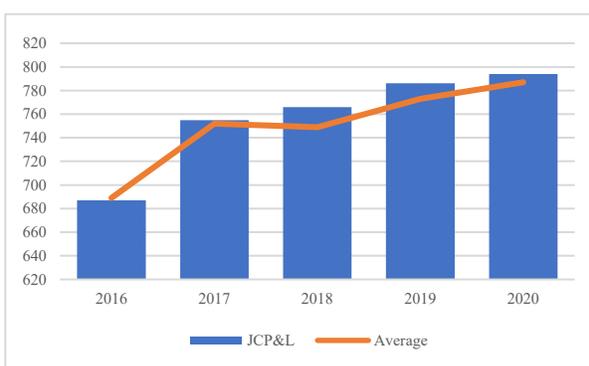
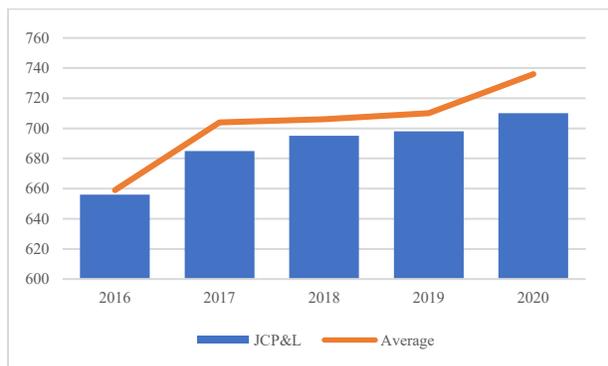


JCP&L has ranked below average in the J.D. Power and Associates Electric Utility Residential Customer Satisfaction surveys for the past five years and above average in the J.D. Power and Associates Electric Utility Business Customer Satisfaction surveys for the last four years. The next table shows trends across the last five years.

J.D. Power and Associates Customer Satisfaction Results Summary

Year	Residential		Business	
	JCP&L	Average	JCP&L	Average
2016	656	659	687	689
2017	685	704	755	752
2018	695	706	766	749
2019	698	710	786	773
2020	710	736	794	787

J.D. Power and Associates Electric Utility Customer SatisfactionSM
Residential **Commercial**



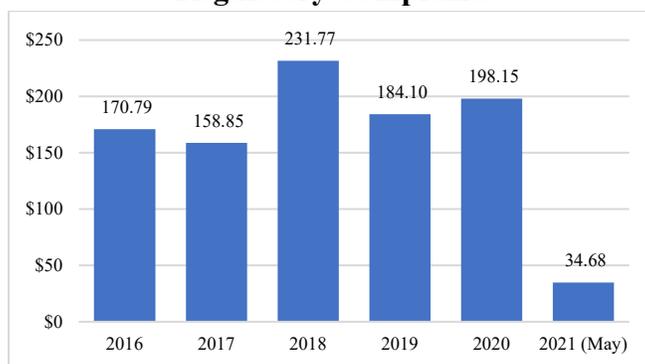
11. Customer Complaints

We sought to determine whether the approach, resources, and activities involved in handling customer complaints and inquiries have proven effective, efficient, and in conformity with customer and regulatory expectations and requirements. We reviewed JCP&L’s performance in handling complaints and ability to analyze complaints to determine root cause and effect change to business processes or organization.

FirstEnergy’s Customer Experience and Compliance group, reporting to the Director of Customer Service Analytics, has responsibility for receiving and resolving customer complaints from the BPU. A Compliance Specialist working within this department has responsibility for complaint receipt, resolution, customer follow-up, and formal response. Upon receipt of the complaint, the specialist logs the complaint, reviews the customer's concerns, and initiates an internal investigation. The investigation may be completed solely by the specialist or with the assistance of internal subject matter experts. The results of the completed investigation are communicated to the BPU via a web application, upon which the case closes or a supplemental request for information initiates. The supplemental request follows the identical complaint handling process as the original inquiry.

Since 2016, JCP&L averaged 1.2 days to respond to BPU complaints. The accompanying chart shows that the number of JCP&L’s customer complaints to the BPU, as expressed in complaints per 100,000 customers, has increased since 2016 and by 16 percent overall, peaking in 2018. Sixty percent of complaints received in 2020 related to service interruption issues caused by Tropical Storm Isaias and 31 percent of complaints received in 2018 were attributed to major storms. However, traditionally high JCP&L complaint categories - - collections, billing disputes, and deposit requirements - - were much lower in 2020 due to the cessation of deposit requirements and non-payment service disconnections. During non-Pandemic years, these three categories comprise most of JCP&L’s BPU complaints. JCP&L uses complaint classifications for trending and root cause analysis. Negative trending can instigate process review, rapid improvement efforts or more extended projects. In the future, JCP&L’s Data Lake will track complaints and other Customer Experience data to facilitate more extensive data analytics and process review.

Regulatory Complaints



per 100,000 customers

12. Call Center Operations

We examined the organizations in place over the past five years to handle customer calls, including the FirstEnergy Contact Centers, contractor Call Centers, and any 3rd-party service providers. We examined resource changes in relation to quality of service provided to customers.

Customers call JCP&L for issues related to service connection and disconnection, electric outage, billing, and credit or collection issues, or to raise general questions. Management trains all customer service representatives to handle electric customer service and emergency calls. Electric emergencies, and customer reports of hazardous conditions, such as a wire down, get the highest priority, which includes routing the call to the first available representative. JCP&L takes outage and emergency calls on a 24/7 basis and customer service calls from 8:00 am to 6:00 pm Monday through Friday. FirstEnergy’s IVR and web remain available at all hours. FirstEnergy operates Contact Centers in three locations – Akron Ohio, Reading Pennsylvania, and Fairmont West Virginia. Supervisors are responsible for teams of 16 to 17 representatives.

The Director of Customer Contact Centers, reporting directly to the Senior Vice President of Customer Experience, has responsibility for FirstEnergy’s three Contact Centers. The staffing model for the Centers relies on a mix of 70 percent full-time employees and 30 percent temporary employees. This provides management with flexibility to ramp up or scale down staffing in relation to changes in call volume. Contract employees can bid into fulltime positions as they are posted which lets management onboard employees that have been trained and have proved competency in FirstEnergy call handling. This model, referred to as Temp-to-Perm, a best practice within the contact center industry, and has been especially helpful in dealing with extended absences and vacancies that have occurred because of the pandemic.

The following table details the changes in staffing for the FirstEnergy Contact Centers since 2016. Contractors represent about one-third of the workforce. Staffing peaked in 2018 when FirstEnergy brought collection calls previously handled by an outsourcing provider back in-house. Call volumes continued to increase in 2020, largely due to Tropical Storm Isaias which brought in more than 550,000 calls in August. Without these calls, 2020 call volumes were lower than normal due to the pandemic and the moratorium on residential non-payment disconnects. FirstEnergy increased staffing in 2021 as its operating companies in other states began to resume collection

actions. Over the period internal employee numbers have fallen by four percent, while contract resources have grown by nine percent.

Contact Center

Year	Entity	Staffing	Total
2016	FES	591	837
	Contractor	246	
2017	FES	578	789
	Contractor	211	
2018	FES	616	910
	Contractor	294	
2019	FES	576	807
	Contractor	231	
2020	FES	589	789
	Contractor	200	
2021 (April)	FES	568	837
	Contractor	269	

Contact Center agents receive calls based on priority, agent skill and availability. Management trains agents to handle calls from all ten companies, using a common SAP/CRM system and telephony platform. The three Contact Centers operate under a virtual configuration, allowing agents to handle calls from any location, including remotely from home. During the pandemic, 500 CSRs were issued laptops and worked remotely from home. Some CSRs work in the Contact Centers, primarily contract employees and their supervisors, observing Covid-safety protocols and seating rearranged to support social distancing. Employees will be returning to the centers soon, however management expects to continue some degree of at-home agents going forward, to facilitate staffing up during storms.

FirstEnergy upgraded Contact Center telephony within the last few years, receiving customer calls through AT&T’s cloud and interfacing calls through a Genesys SIP (Session Initiated Protocol) Server, allowing FirstEnergy to take advantage of Voice over Internet Protocol (VOIP). FirstEnergy records all calls for safety and quality using the NICE Engage recording system. Customers are greeted by FirstEnergy’s natural language Concentrix IVR and routed based on caller intention. Callers are offered the option of a Virtual Hold during periods of extended wait. Rather than waiting in queue, Virtual Hold technology holds a caller’s place in line and then calls the customer when their turn to speak with a representative arrives.

FirstEnergy designed the Contact Centers with the capacity to receive more than 3,700 concurrent calls. Once call volumes exceed capacity, calls automatically route to FirstEnergy’s outsourced IVR provider, Intrado, a critical design to ensure that customers can reach the utility during large outages and storms.

The Customer Service Analytics organization supports Customer Service and Contact Center operations providing:

- Web and IVR customer self-service and social media
- Customer experience
- Compliance and complaint handling

- Customer satisfaction research
- Performance benchmarking
- Support for Customer Service technologies and systems
- Workforce planning, scheduling and intraday management
- Data analytics
- Process improvement project management
- Performance monitoring and reporting.

JCP&L’s Call Center O&M costs increased from 2016 to 2020. Even with increasing call volume since 2016, cost per call and cost per customer have increased over the five years. As of the end of March 2021, cost per call exceeds prior year levels. From 2016 to 2020 Call Center costs have increased by 25 percent, including overtime costs.

JCP&L Call Center Costs

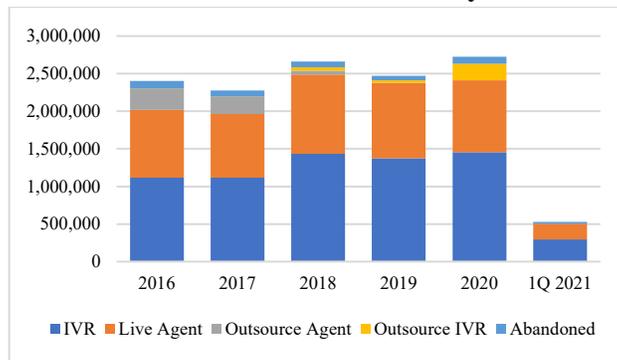
Year	Total O&M Costs	Overtime Costs	Total Calls Received	Total Calls Handled ¹	Cost per Call	Cost per Customer
2016	\$8,101,530	\$912,845	2,404,179	2,301,368	\$3.52	\$7.26
2017	\$8,120,408	\$706,585	2,276,808	2,196,311	\$3.70	\$7.22
2018	\$9,057,541	\$1,351,170	2,660,942	2,585,808	\$3.50	\$7.99
2019	\$10,041,419	\$893,171	2,471,486	2,413,300	\$4.16	\$8.81
2020	\$10,127,709	\$1,307,487	2,723,813	2,633,269	\$3.85	\$8.84
1Q 2021	\$2,523,569	\$584,478	527,735	504,348	\$5.00	\$2.20

¹ Handled by agents and/or technology

Prior to October 2018, FirstEnergy relied on iQor, an international provider of outsourced representatives to assist with handling credit-related calls. Intrado (previously Twenty-First Century Communications/West Communications) provides high volume, IVR overflow call answering for FirstEnergy.

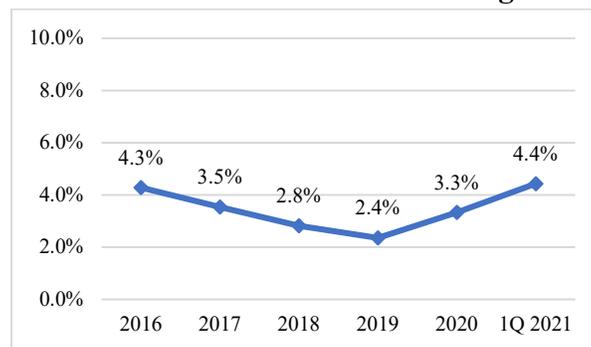
JCP&L received 2.7 million calls in 2020, more than in prior years - - primarily due to Tropical Storm Isaias (550 thousand). Without storm-related calls, volumes in 2020 trended down, due to the pandemic and reduced collection activity. The next chart depicts total calls received annually since 2016, those answered by FirstEnergy customer service representatives and the IVR, answered by the outsourcing vendor, answered by the overflow IVR, and callers abandoning.

Calls Received Annually



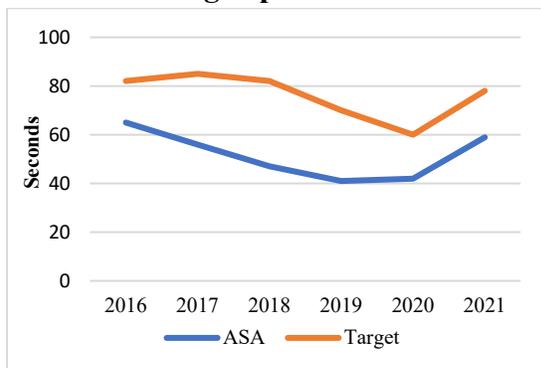
Numbers of callers abandoning before reaching the contact center remains low over the five-year period, as the next chart illustrates. Abandoning callers has remained below 5 percent since 2016.

Percent of Callers Abandoning

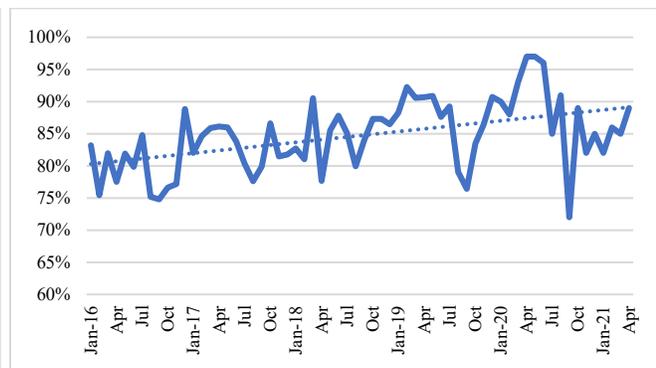


The Call Centers have meet annual targets for Average Speed of Answer in the five-year review period, as the next chart illustrates. FirstEnergy calculates year-to-date ASA by dividing the total time calls wait to be answered by the total number of calls answered. Service Level Performance (percent of calls answered within 30 seconds) has also improved since 2016, as depicted in the second chart below.

Average Speed of Answer

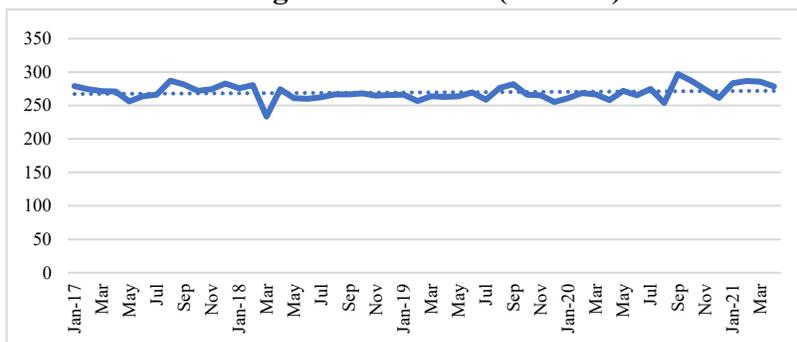


Service Level Performance



JCP&L’s Average Handle Time (AHT) has remained somewhat constant since 2017, with a slight uptick in 2020 and 2021, as seen in the following chart.

Average Handle Time (seconds)



13. Credit & Collections

We reviewed the credit and collections organization to determine services and tasks provided by JCP&L, its affiliates, and third parties. We examined staffing levels and performance over the last five years, identifying changes to the credit and collections organization and assessing collections efficiency, effectiveness, and conformity with customer and regulatory expectations and requirements.

Business Office employees support New Jersey field collection activity and work with walk-in customers. Two-thirds of these employees, Field Collectors, Customer Service Representatives, and their supervisors and managers are based in New Jersey and work for JCP&L, while the remaining one-third work within the FirstEnergy Customer Service organization. Staffing remained constant within JCP&L’s Credit & Collections and Business Offices. The following table presents Credit and Collection and Business Office staffing levels from 2016 to April 2021.

Credit & Collections

Year	Entity	Staff	Total Staff
2016	JCP&L	51	81
	FES	30	
2017	JCP&L	51	83
	FES	32	
2018	JCP&L	53	85
	FES	32	
2019	JCP&L	51	84
	FES	33	
2020	JCP&L	49	78
	FES	29	
2021 (April)	JCP&L	49	79
	FES	30	

JCP&L’s Credit & Collection O&M costs have decreased slightly since 2016. JCP&L has disconnected fewer accounts since 2016 - - very few since the onset of the pandemic and extended moratorium. Net write-offs, expressed as a percentage of revenue, have decreased as well. The pause in collection-related disconnects in 2020 and 2021 will delay most write-offs until 2022

when management expects residential collection-related disconnections to resume. The next table summarizes credit and collection costs, excluding uncollectible costs.

Credit & Collection Costs

Year	O&M Cost	Disconnects	\$/Disconnect	% Net Write-Offs ¹
2016	\$11,670,059	20,690	\$564.04	0.43%
2017	\$11,092,066	16,986	\$653.01	0.37%
2018	\$10,814,670	16,671	\$648.71	0.39%
2019	\$6,639,280	14,980	\$443.21	0.41%
2020	\$11,248,385	236	N/A	0.33%
1Q 2021	\$2,581,984	148	N/A	0.23%

¹ Net write-off as a percent of total revenue

From 2016 to 2019 JCP&L disconnected about 17,000 customers per year for non-payment. Collection activity in 2020 fell significantly to provide accommodations to customers during the difficult economic conditions brought on by the pandemic. Since March 2020, residential collection actions remain on hold, with late payment charges and collection notices, dunning, and disconnection suspended. JCP&L paused field collections from March to mid-August 2020. During this period, Field Collectors assisted Meter Reading.

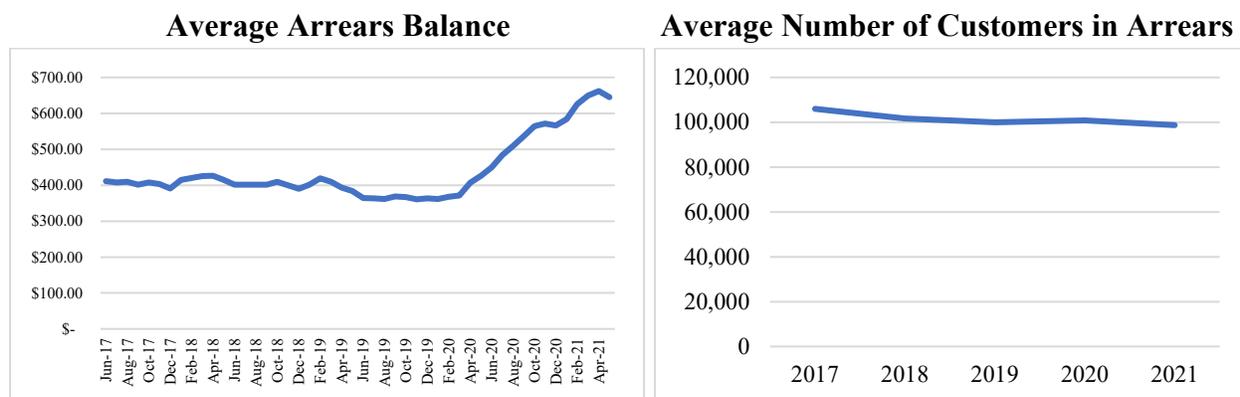
JCP&L also ceased collecting security deposits for customers applying for service. To help customers deal with growing arrears, JCP&L offered enhanced deferred payment arrangements, allowing residential customers to extend payments out 12 months with no money down. The plan resets at the end of 12 months which allows customers to spread payments out over 24 months. Non-residential customers were able to extend payments for 12 months up until mid-October 2020 when non-residential disconnections resumed.

During 2020 and 2021, JCP&L has conducted outreach to encourage customers to make payments on their accounts, through automated and live-agent outbound dialing campaigns, field outreach, bill inserts and messaging, email and social media, and radio, television, and billboard advertisements.

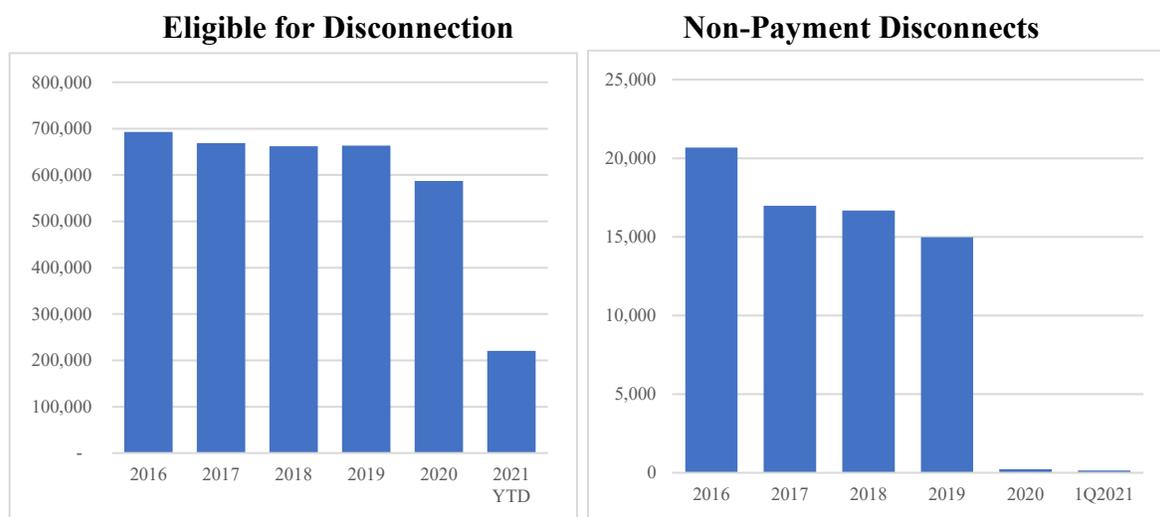
Normally, the SAP/CRM customer information system provides automated dunning functionality to facilitate collection of delinquent customer payments. This functionality manages the customer notification process, initiates service orders for manual disconnection, transfers customer receivables to collection agencies, and manages the write-off of bad debt.

JCP&L selects accounts for service discontinuation based on current balance due, length of service, credit history, and field availability. JCP&L does not terminate residential customers having qualified plans in place for arrears. Consistent with the Winter Termination Program, JCP&L may not disconnect residential customers for non-payment from November 15 through March 15, provided they participate in an assistance program, and make a good faith effort to pay.

The average balance of customers in arrears has grown substantially since the Pandemic, from \$400 to \$645, while the percent of customers 30, 60, and 90 days or more late in payment has declined slightly since 2017.



The following two charts show Credit & Collection workload trends, measured by past due accounts eligible for disconnection and non-payment services disconnected, which directly affect operations costs.



14. Meter Reading

JCP&L has approximately 1.31 million electric meters in service. Management has assigned each to a meter reading route and each route to a revenue cycle/rendition group, with reads of nearly all meters manually each month.

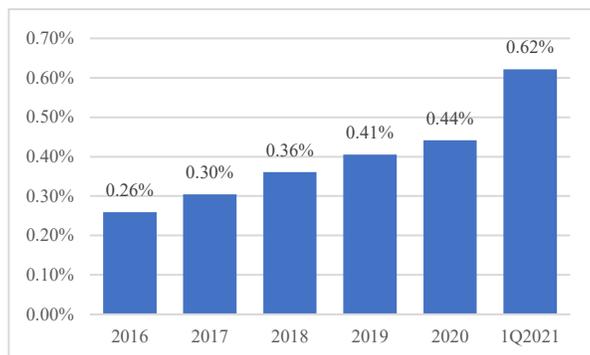
The next table summarizes Meter Reading annual O&M costs, meters read, and cost per meter read. It also provides annual percentages of the number of estimated bills. Meter Reading O&M costs have increased by 14 percent from 2016 to 2020, while the number of meters read has decreased by 18 percent, resulting in a 39 percent increase in the cost per meter reading. During this same period, overtime costs increased from 2 percent of O&M total costs to 14 percent. The number of estimated bills issued, due to unavailable meter readings has grown substantially since 2016 and has peaked in first quarter of 2021 at 42 percent.

Meter Reading Costs

Year	O&M Costs	Overtime Costs	Meters Read	Cost per Read	% AMR Reads	% Estimated Bills
2016	\$14,717,389	\$359,494	14,354,278	\$1.03	0.26%	6%
2017	\$15,537,543	\$175,654	14,334,199	\$1.08	0.30%	6%
2018	\$16,038,467	\$2,095,090	13,528,997	\$1.19	0.36%	12%
2019	\$16,379,056	\$1,261,164	13,936,741	\$1.18	0.41%	11%
2020	\$16,751,641	\$1,403,385	11,760,495	\$1.42	0.44%	26%
1Q 2021	\$3,881,197	\$548,620	3850746	\$1.01	0.62%	42%

Management has deployed very few Smart Meters within its service territory. It currently replaced only meters that require change-out due to meter testing initiatives or meter malfunction. JCP&L awaits a decision from the NJ BPU in regard a plan filed to deploy 1.15 million smart meters throughout the New Jersey service territory.

Automated/Smart Meter Share of Total

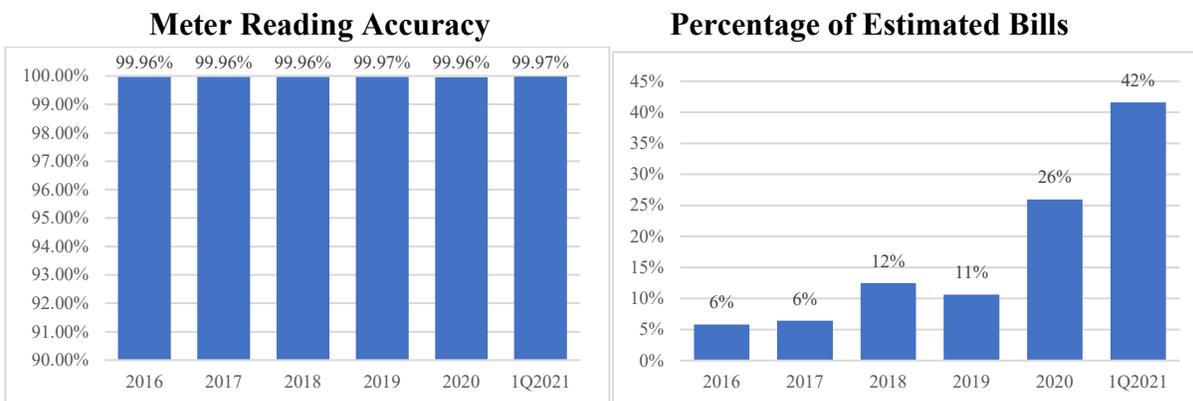


Each working business day of the read schedule, management generates a Meter Read Import (MRI) file and imports it into the Itron handheld meter reading system from the customer information system. The Meter Read Import contains the designated routes from the cycle to be read. Meter readers cover assigned routes and enter their readings into hand-held devices. At the end of the day, Meter Readers return the devices to the office, and insert them into the Itron system for processing and uploading of read information.

Typical training for new meter readers includes five days in the classroom to review the meter reading process, learn how to read a meter, receive handheld use training, review policies and procedures, and address safety and customer service etiquette. Hands-on training in the office and in the field follows, experienced Meter Chiefs shadowing new meter readers learning the routes. Supervisors walk with new readers on the next workday to reinforce training and assist with route learning. On day three, new meter readers work on their own. If needed, management provides access to MeterPro, a computer-based meter read training application that simulates meter reading and provides feedback on meter reader accuracy and performance, to strengthen reader confidence and read ability.

JCP&L gauges Meter Reader performance by the number of meters read accurately and safely. Supervisors and managers conduct field safety audits to ensure that employees are following safety protocols, using handheld equipment correctly, and accurately gathering meter readings. JCP&L’s meter reading accuracy remains high over the period reviewed, with minimal read errors reported, as seen in the first chart below.

Meter reading errors have been low, but management has proven unable to read all the meters scheduled to be read. The second following chart depicts the ensuing increase in estimated customer bills over the last five years.



Inability to gather usage data manually or through automation, generally results in usage estimation by the SAP/CRM system. The percentage of estimated bills has increased markedly since 2016. Estimates increased in 2020 and 2021 due to Tropical Storm Isaias and the Covid-19 Pandemic. JCP&L also experienced an increase in Meter Reader vacancies in 2020 and 2021. This resource limitation, combined with Covid restrictions, limited the number of meters read successfully. For instance, from the start of the pandemic up until June 2021, JCP&L meter readers did not attempt to read meters located inside customer premises, nor did they attempt to read meters that required touching surfaces, such as opening gates. Additionally, meter readers reported from home rather than reporting to shops at the start of their day.

15. Meter Services & Meter Lab

Effective management of metering requires a sound organization, sufficient staffing, appropriate qualifications, training, and operating procedures. We reviewed the Meter Services organization to determine services and tasks provided by JCP&L, its affiliates, or third parties. We examined staffing levels and performance over the last five years to identify the drivers of change in performance levels and cost.

JCP&L’s Meter Services group operates within JCP&L’s Regional Operations Support organization, and has responsibility for system and customer generated service orders. These orders include service turn-on/off, transfer of service, shut-off for non-payment, high bill investigation, off-cycle reads, crossed meters, unauthorized reconnects, installs, removes, and exchanges. Meter technicians conduct the group’s principal activities, using mobile data tablets connected to the FieldNet system (mobile data). The SAP/CRM system downloads orders nightly to the mobile system. Dispatchers route orders to the appropriate worker queues.

JCP&L employs five Meter Tech classifications: Meter Tester Apprentice, Single-phase Meter Tester, Meter Tester 1/C, Meter Tester 2/C, and Meter Tester Chief, in order of experience. The Central District operates one work reporting location; the Northern District employs three reporting locations or shops. Since March 2020, Meter Testers and the Clerks that support their operation have reported to work from home.

Meter Services supervisors and manager routinely conduct safety verifications of work activities in the field. A critical controls checklist guides rating of employees on various safety practices, including use of PPE, vehicle usage, field practices, physical security, work zone traffic control, and addressing hazards and unsafe work environments. Field supervisors, managers, and chiefs also participated in a critical controls workshop in 2019 conducted by DEKRA North America.

JCP&L's Meter Lab receives and test meters but resides in a different organization, in Metering & Support System within the Distribution Support organization. The JCP&L system employs three meter types: single phase residential, poly-phase small commercial, and transformer-rated industrial. Management tests single and poly-phase meters on a sample basis to evaluate compliance with ANSI Z1.9 and company requirements. Larger, transformer-rated meters are tested periodically, within cycles of 12 to 16 years.

An annual statistical sample test procedure, filed with the BPU, applies for residential and commercial meters. Approximately 1,000 to 3,000 meters per year undergo testing under this program. Meter sample testing divides meters into homogeneous groups or lots by manufacturer type. Sample size determination uses the population of meters in the lot. JCP&L then randomly samples meters within each lot to reach sample size requirements. Management deems meters testing outside standards as defective and makes customer-account adjustments according to state regulatory rules.

Management conducts periodic testing for non-residential meter installations. All installed meter types in this testing process undergo testing on 12- or 16-year time frame. Meters selected for testing are exchanged in the field and sent to the Meter Test Shop for accuracy testing. Management suspended periodic testing of meters in July 2020, until resolution of JCP&L's request for approval of the AMI implementation plan and program.

JCP&L personnel manage all customer requested meter tests, including witness testing, with BPU staff in observation of the tests. Quarterly reports to the BPU provide meter testing results from the statistical sampling and periodic testing programs. Management completes both testing programs each year with minimal carry-over.

Staffing levels within Meter Services and Meter Shop have declined 14 percent over these years. There are currently four Meter Tech vacancies and one Meter Service supervisor vacancy within Meter Services. Meter Shop has three vacancies currently.

Meter Services and Meter Shop Staffing

	2016	2017	2018	2019	2020	2021 (April)
Meter Service	62	60	56	59	54	54
Meter Shop	15	16	15	15	15	12
Total	77	76	71	74	69	66

During storms, JCP&L’s Meter Techs serve as Hazard Responders to assess conditions, such as downed wires, and stay on site until a line crew or other operations resource can be dispatched.

JCP&L’s Meter Services operation and maintenance (O&M) costs have risen 15 percent from 2016 to 2020 while the number of service orders completed has declined by 14 percent, resulting in a 33 percent increase in the cost per service order over the five-year period. JCP&L has kept 93 to 94 percent of customer-requested appointments from 2016 to 2020. Overtime costs also increased during 2018 and 2019. However, in the first few months of 2021, JCP&L has missed nearly half of these appointments, as seen in the table below.

Meter Services and Meter Shop Costs

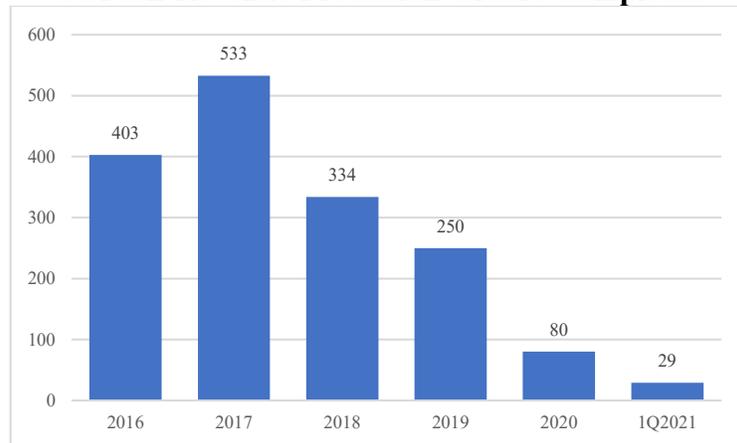
Year	O&M Costs	Overtime Costs	Service Orders	\$/Order	Appointments Kept
2016	\$7,959,993	\$402,634	118,093	\$67.40	N/A
2017	\$8,525,860	\$303,681	138,804	\$61.42	6%
2018	\$8,480,678	\$944,388	114,932	\$73.79	7%
2019	\$8,492,573	\$545,184	115,924	\$73.26	7%
2020	\$9,125,880	\$483,349	101,824	\$89.62	7%
1Q 2021	\$2,034,562	\$69,736	23,002	\$88.45	46%

16. Revenue Protection

Utilities have traditionally relied on meter readers and other field employees for the identification of meter tampering and energy diversion. JCP&L relies on this approach. No dedicated Revenue Protection organization exists at JCP&L. Rather, Meter Services or Revenue Operations personnel have responsibility for investigating suspected tampering, theft, or bypass situations based on revenue protection orders issued from the SAP/CRM and FieldNet systems. These orders get created in response to tips from customers or field observations from meter readers and other field personnel. All JCP&L field employees receive training in identifying broken seals, upside down meters, and jumpers, primarily to protect workers from flashes and safety hazards. Management does not offer any incentives to encourage employees to report possible theft of service.

JCP&L does not operate a theft hotline, which some utilities do, instead encouraging customers to call and report energy theft through the Call Centers. Nor does management track the number of theft tips received or confirmed or the number of unauthorized users identified or the associated dollar value of unauthorized usage billed. The next chart shows the number of revenue protection orders completed since 2016. Management has not prosecuted any theft of service cases since before 2016.

JCP&L Revenue Protection Orders Completed



17. Linda’s Law Compliance and Customer Safety and Welfare

In 2018 a Newark, NJ resident utilizing life-sustaining supplemental oxygen died following a utility service shutoff. New Jersey’s Governor signed into law enhanced rules which prevent electric and gas utilities from shutting of service to customers who verify that occupants use life-sustaining medical equipment. The law, and amended protocols adopted by the BPU for “medical customers” went into effect in late 2020. The law requires utilities to solicit from every residential information to determine whether their account warrants a medical customer designation. The law forbids cessation of service to any medical customer whose condition would be aggravated by the loss of utility service and extends the cessation of service to non-medical customers due to nonpayment from 60 days to 90 days.

We reviewed JCP&L’s procedures for identifying customers warranting medical customer designation and for ensuring JCP&L’s employees, training materials, and customer systems have all been appropriately enhanced.

Prior to Linda’s Law, JCP&L employed protections for customers who rely on life-sustaining medical equipment. It has coded customer accounts in SAP/CRM to indicate the presence of medical equipment or a medical condition. These notations factor into system algorithms that select past due accounts for collection treatment. In September 2020, prior to the new law’s effective date, management reviewed existing processes and protections to ensure compliance. Due to the pandemic, JCP&L has not disconnected any residential customers for non-payment.

However, once collections-related service disconnections resume, customers who submit a written statement from a licensed medical authority will be granted a 90-day protection from service disconnection annually.

Additionally, as stated in JCP&L’s Termination for Non-Payment Procedures -- “Termination shall not take place on any account that has life sustaining equipment.” The procedures specify life-sustaining medical equipment covered by the service termination exemption.

JCP&L conducts regular outreach to ensure customer awareness of these medical exemptions and includes such language in customer pamphlets and on the public website. Customer Service

Representatives receive training to ensure that customers indicate the presence of life-sustaining medical equipment or specify existing medical conditions requiring electric service and encourage customers to submit annually doctor’s statements documenting the medical requirements. FirstEnergy call quality observations routinely screen for compliance to Linda’s Law and federal and state regulations.

C. Conclusions

1. JCP&L Customer Service Costs have increased in recent years, exceeding those of a benchmark panel. (See Recommendation #1)

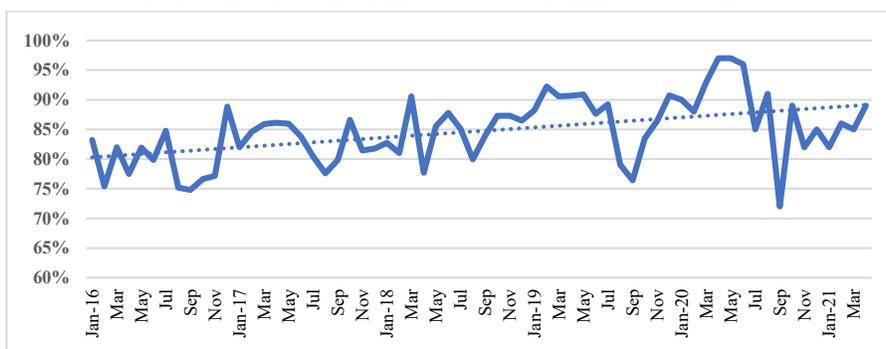
Customer Service expenses overall have increased since 2016, increasing cost per customer by about \$3.03 from 2016 to 2020. Functions with increasing costs include the Call Center (25 percent), Meter Reading (14 percent) and Meter Services (15 percent). Billing and Collections costs decreased over the past five years.

From 2015 to 2019, JCP&L’s total Customer Service costs dropped from first to third quartile among First Quartile Consulting’s multi-company benchmarking panel, driven primarily by higher than panel costs in the Local Office, Meter Reading, Collections, and Field Service functions.

2. JCP&L’s Call Center performance has been strong since 2016.

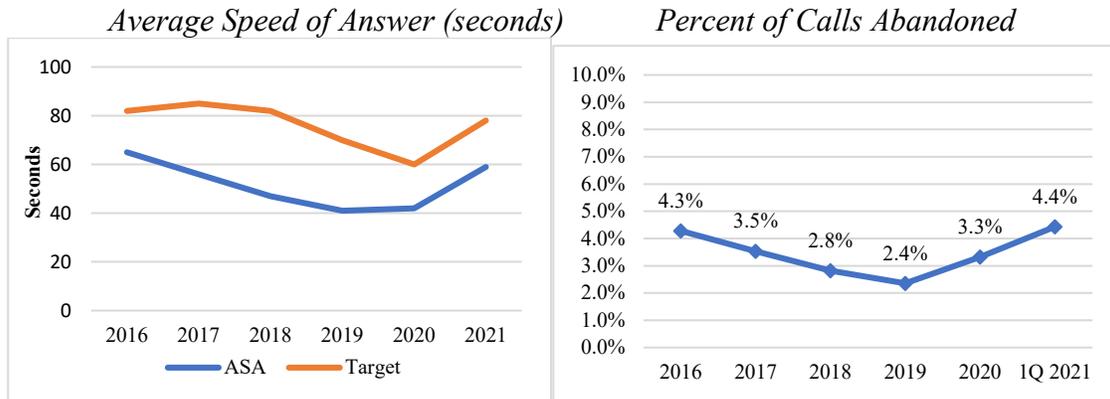
Effective day-to-day management works best when everyone understands service level objectives, when forecasts prove relatively accurate, when management schedules the required level of resources at the right times, and when processes and real-time communication addresses intra-day adjustment. FirstEnergy management has successfully staffed its customer call centers to meet service level objectives, providing a more consistent level of service to callers. FirstEnergy’s staffing model with 70/30 employee and contractor mix has provided flexibility needed to match staffing levels to incoming call volumes. FirstEnergy strives to meet a service level objective of answering 80 percent of customer calls within 30 seconds, well above the 90-second answer time required in New Jersey. Service level performance over the five years reviewed has generally exceeded goals. Dips in service level performance coincide with excessive call volumes offered during large storms which disrupt electric service for many customers.

Percent of Calls Answered Within 30 Seconds



Over this same period, call abandonment rate and Average Speed of Answer have both remained within target. Average Speed of Answer (ASA) dropped from an average of 65 seconds in 2016 to 60 seconds in 2020. Abandoned calls have remained low, below 5 percent during the period.

Call Answering Performance Trends



The process to forecast incoming-call volumes to determine the required staffing to handle those calls comprises one of the most important functions in call-center operation. Labor costs form the principal driver of operating costs; therefore, getting the right number in place is critical in terms of service and cost. A workforce management system, which FirstEnergy has in place, automates the process of forecasting workload, calculating staffing requirements, creating schedules, and tracking daily staffing and service. Management uses its workforce management system to monitor developments and trends, and to match changes in call volume with intra-day staffing adjustments.

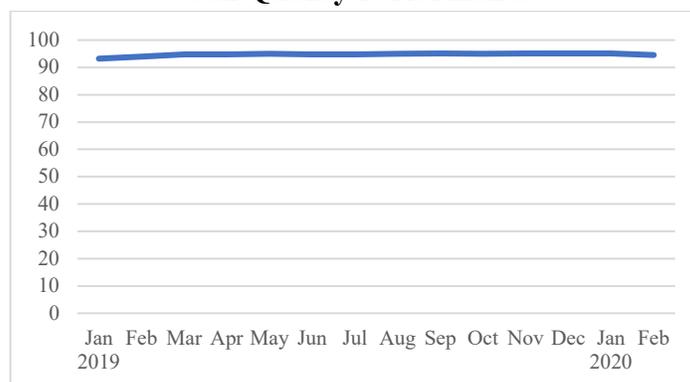
During the past few years, several steps have positioned Contact Center operations to better manage service levels in real-time and to improve customer contact center performance:

- Upgraded telephony platform based on VOIP technology
- Natural language IVR to improve call routing based on customer intent and a renewed focus on enhancing self-service options for customers
- Flexible workforce created with 70/30 mix of fulltime employees and contractors
- In-sourcing of collection-related call handling previously handled by outside vendor
- Centralized support of contact center technology, workforce scheduling, intraday management, performance reporting, quality monitoring, data analytics, and process improvement provided by the Customer Service Analytics team
- Focus on First Call Resolution and the customer experience.

3. FirstEnergy recently renewed and expanded its quality program.

The next graph shows that FirstEnergy call center representatives consistently averaged high quality performance, as measured through call quality observations, from 2019 to early 2020.

Call Quality Performance



FirstEnergy enhanced its quality program in 2020 to increase focus on employee development and coaching. Scoring of session analytical purposes continues, but scores are no longer compiled or shared with employees or management. Instead, quality specialists prepare coaching material monthly to assist supervisors in their coaching sessions with representatives. Quality observations have become more focused on addressing soft skills, to improve conversations with customers and the customer experience. FirstEnergy’s quality team, reporting to Director of Customer Service Analytics, conducts three observations per representative per month which are communicated to call center supervisors and management through coaching packages, both calls and emails are reviewed. Coaching packets are delivered to supervisors within five days following the evaluation which helps employees remember the interactions that were evaluated. The quality team also provides trending analysis and insight for continuous improvement and works closely with Workforce Development to enhance training materials. Anecdotally, employees are positive about the new approach and the shift away from scoring.

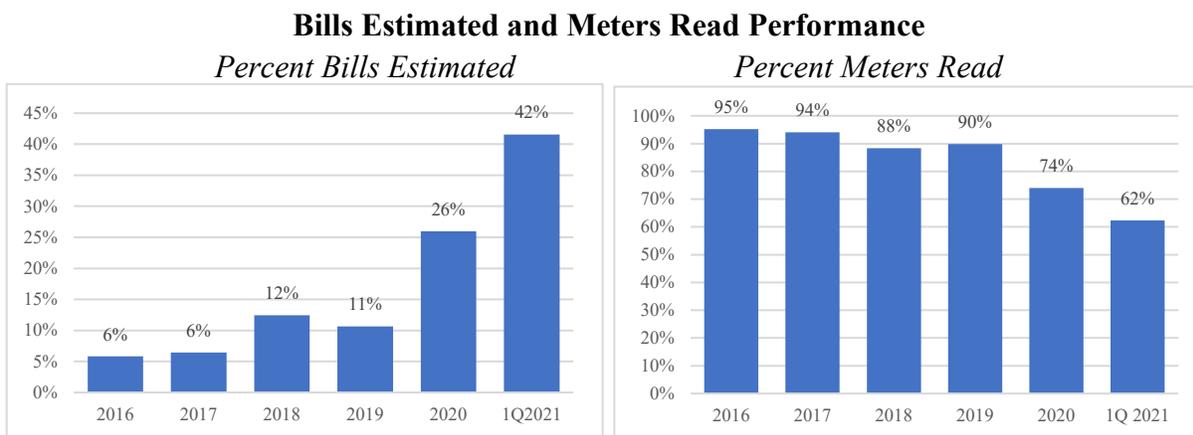
Recently, the quality team expanded its scope to begin monitoring back-office and collections work quality. In the same manner as the Contact Center, the group reviews recent transactions completed by billing and collection representatives for quality and employee development. Monthly quality packets are prepared for each employee, evaluated, and communicated to supervision to facilitate coaching.

4. Meter reading performance has declined since 2019. (See Recommendation #1)

While meter reading errors have been low, JCP&L has been unable to read all the meters scheduled to be read, resulting in a dramatic increase in the number of estimated customer bills since 2020. Estimated bill issuance increased in 2020 and 2021 due to Tropical Storm Isaias and the Covid-19 Pandemic. JCP&L also experienced an increase in meter reader vacancies in 2020 and 2021 following the announcement of plans to replace manually read meters with AMI smart meters in coming years. As a result, JCP&L meter reading staff has 30 vacancies, as employees bid into other jobs or left the company.

This combined with Covid restrictions limited the number of meters that JCP&L was able to read successfully. For instance, from the start of the pandemic up until June 2021, JCP&L meter readers were not attempting to read meters located inside a customer premise, nor were they attempting to read meters that required touching surfaces, such as opening gates.

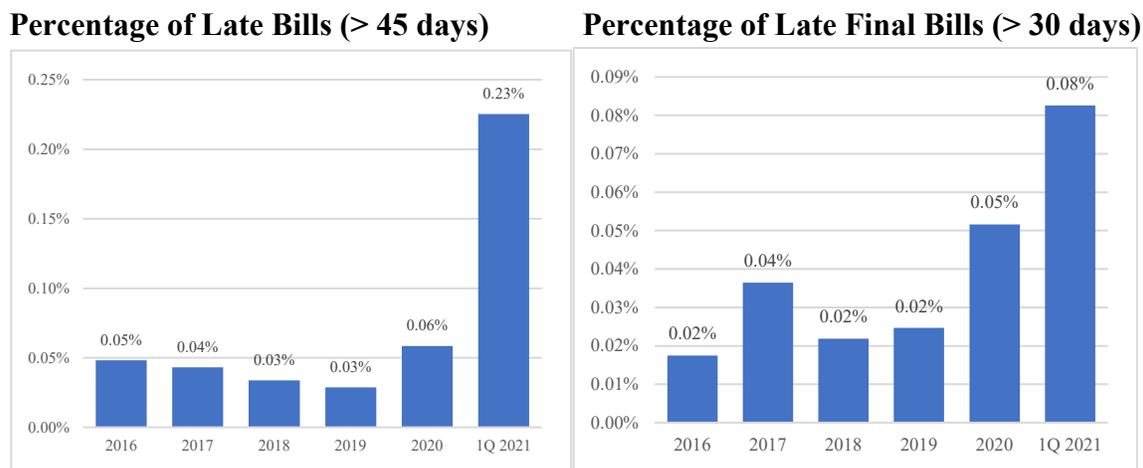
The following two charts depict the percentage of estimated bills issued to customers compared to the percent of meters read over the five-year period. Directly proportional, the inability to gather usage data manually or through automation, generally results in usage estimation by the SAP/CRM system and the issuance of an estimated bill.



JCP&L has negotiated a transitional meter reader position with the bargaining unit, to ensure that there will be enough meter readers through the AMI deployment (expected 2023 to 2025). Management began hiring and training transitional meter readers in late June, with plans to staff to pre-pandemic levels and to keep pace with future attrition.

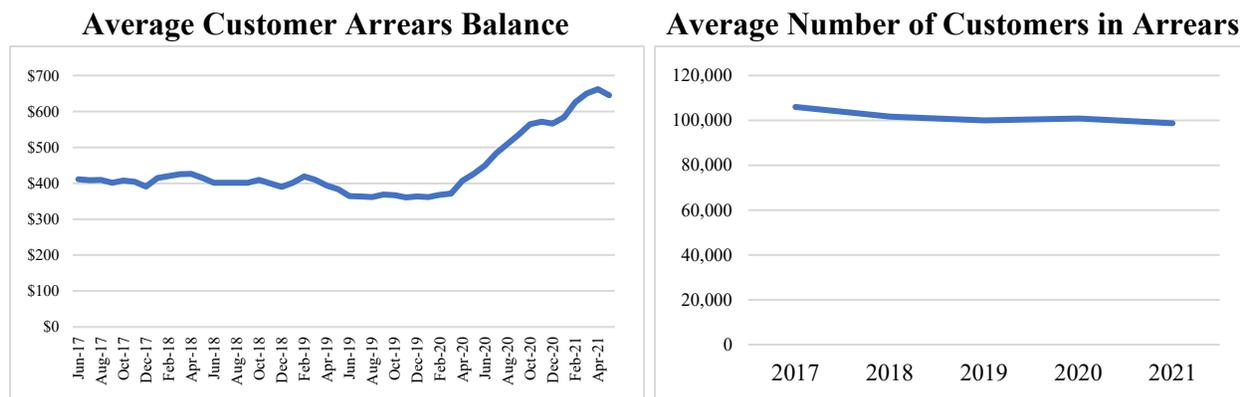
5. Billing performance has declined since 2020. (See Recommendation #1)

Off schedule and delayed bills create significant customer dissatisfaction and generally increase the number of inbound calls as customers call to inquire about the disposition of their bill. JCP&L’s percentage of late monthly bills and late final bills has increased significantly in 2021. JCP&L’s field work practice changes during the COVID-19 Moratorium led to increased bill estimation, which led to increased work volumes for billing employees and increased the number of bills delivered late to customers.

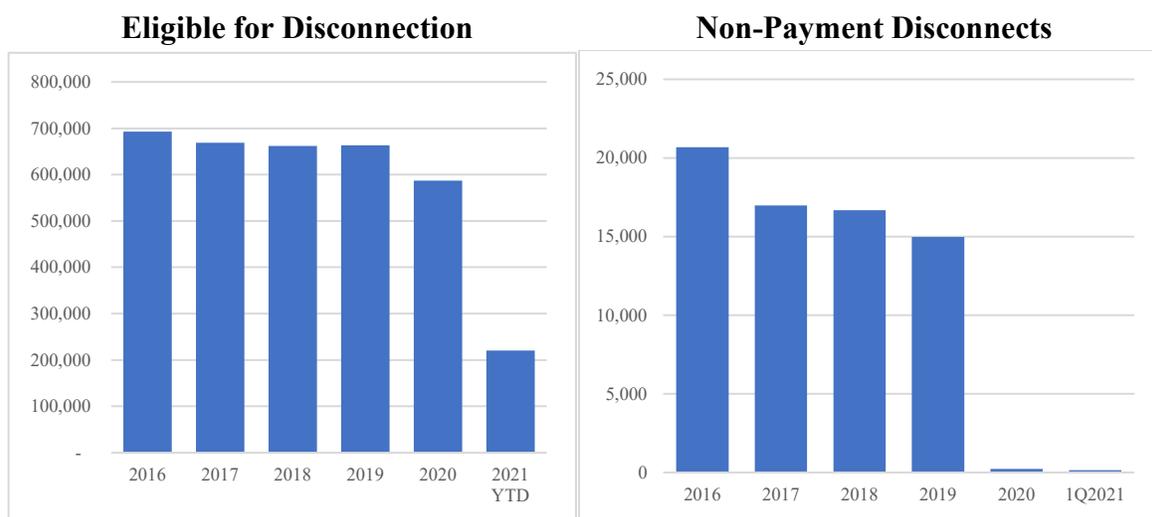


6. JCP&L’s collections performance has deteriorated significantly since the Pandemic. (See Recommendation #1)

The average balance of customers in arrears has grown substantially since the pandemic, from \$400 to \$645 while the percent of customers 30, 60, and 90 days or more late in payment has declined slightly since 2017.



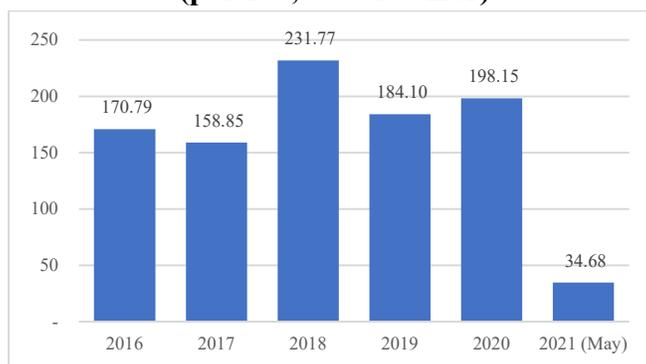
The following two charts show Credit & Collection workload trends over the 5-year period, represented by past due accounts eligible for disconnection and non-payment services disconnected, which directly affect operations costs.



7. JCP&L regulatory complaints have increased since 2016.

The following chart shows that the number of JCP&L customer complaints to the BPU has increased since 2016 and by 16 percent overall, peaking in 2018. Sixty percent of complaints received in 2020 related to service interruption issues caused by Tropical Storm Isaias. However, traditionally high JCP&L complaint categories - - collections, billing disputes, and deposit requirements - - were much lower due to the cessation of deposit requirements and non-payment service disconnections. During non-Pandemic years, these three categories comprise most of JCP&L’s BPU complaints.

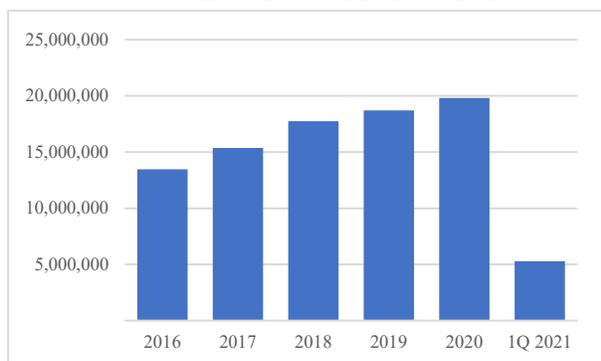
**JCP&L Customer Complaint Rates
(per 100,000 customer)**



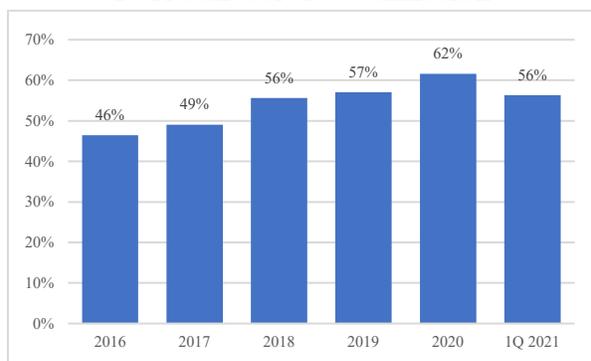
8. Growth in customer self-service utilization since 2016 has benefitted JCP&L service-delivery efficiency.

Utilities have for some time encouraged customers to use self-service options, to reduce the percentage of calls requiring agent assistance. Additionally, self-service options are available 24-hours a day. JCP&L offers several options for customers to self-serve, through its website and automated phone service (IVR). These options present ways for customers to complete transactions without the assistance of a customer service representative. Customers preferences are growing for web-based self-services. The next two charts demonstrate the increase in adoption of these cost-efficient services for customers.

Web Self-Service Transactions



IVR Self-Service Utilization



JCP&L has plans to further enhance web self-service options for customers in the coming years. These efforts should encourage increased customer usage of these self-services, avoiding more costly service assistance from customer service representatives.

9. Paperless bill adoption by JCP&L customers has improved significantly in the past five years, promoting cost efficiency.

JCP&L issues approximately 1.14 million customer bills each month to customers. JCP&L bills for metered electric service and for several unmetered services, including area lights, line extensions, service establishment charges, temporary service charges, and pole charges. Paperless billing can substantially reduce annual billing costs. JCP&L delivers more than 40 percent of customer bills electronically, up from 26 percent in 2016.

Paperless Billing Participation



10. Diversity & Inclusions Employee Survey ratings by Customer Service employees dropped overall and in most items evaluated. (See Recommendation #2)

Launched in 2018, FirstEnergy measures employee satisfaction annually through a Diversity and Inclusion (D&I) survey. Questions explore employee attitudes on workplace diversity and inclusion, respect for employees, employee value, openness, career development, and communications. Overall Customer Service employee ratings dropped by 9 percent from 2018 to 2020, from an overall average of 81 to 73.7. Of the 26 items evaluated in 2020, employees rated all but 4 items lower in 2020 than in 2018. Questions rated higher included work pride, recommending FirstEnergy as an employer, intention to remain at FirstEnergy for another year, and team comfort-level with a diverse workgroup.

11. JCP&L has placed minimal focus on potential theft of service. (See Recommendation #3)

JCP&L relies on meter readers and other field employees for the identification of meter tampering and energy diversion. No dedicated Revenue Protection organization exists at JCP&L. Rather, Meter Services or Revenue Operations personnel are responsible for investigating suspected tampering, theft, or bypass situations based on tips from customers or field observations from meter readers and other field personnel. Management does not offer any incentives to encourage employees to report possible theft of service.

JCP&L does not operate a theft hotline, as some utilities offer, instead encourages customers to call and report energy theft through the Call Centers. Nor does the company track the number of theft tips received or confirmed or the number of unauthorized users identified or the associated dollar value of unauthorized users billed.

The number of revenue protection orders completed each year has dropped substantially since 2017, from 533 to 80 in 2020. JCP&L reported no theft of service cases prosecuted since 2016.

D. Recommendations

1. Pursue cost efficiencies and customer experience improvement opportunities, including those offered by FE Forward Customer Service recommendations. *(See Conclusion #1)*

Customer Service expenses have increased since 2016, increasing cost per customer by about \$3.03 from 2016 to 2020. Functions with increasing costs include the Call Center (25 percent), Meter Reading (14 percent) and Meter Services (15 percent). JCP&L total Customer Service costs benchmarked in the third quartile of First Quartile Consulting’s 2018 and 2019 multi-company benchmarking studies, with third or fourth quartile functional cost performance in Meter Reading, Field Services, Collections, and Business Offices.

JCP&L announced plans to invest \$50 million in customer experience enhancement projects over the next few years, following recommendations from the FE Forward initiative. Plans include:

- Increasing self-services
- Improving web capabilities and navigation
- Increasing customer adoption of eBills and autopay
- Automating manual and routine processing.

JCP&L’s Customer Service strategy over coming years focuses on improving customer-facing technologies, strengthening core systems, facilitating data analytics to identify process improvement opportunities, measuring the customer experience through Voice of the Customer tools, and deploying process automation to automate manual tasks and reduce inefficiencies.

Actioning this strategy should provide further opportunities to reduce Customer Service O&M costs through more efficient operations and expanded and enhanced options for customer self-service. JCP&L should pursue the above initiatives with a focus on efficiency and improving the customer experience.

2. Staff functions sufficiently to address backlog and transaction deficits. *(See Conclusion #4, #5, #6 and #7)*

Meter Reading performance declined during the pandemic as has Billing performance. A shortage of meter readers, due to the pandemic and JCP&L’s recently announced plan to fully deploy smart meters, created a deficit of required meter readings leading to estimated bills, and increasing workload in the Billing department to produce these bills, leading to delays in issuing bills to some customers.

JCP&L created transitional meter reader and transitional clerk positions to provide a path for filling vacancies occurring in 2020 and 2021. Management has begun to select and train employees to fill these positions. JCP&L should continue filling positions to bring staffing back to pre-pandemic levels, to a level adequate to minimize the number of missed manual readings.

JCP&L should review billing staffing levels and consider supplementing resources as needed to assist with increasing workloads created by the large percentage of estimated bills due to missing meter readings. These backlogs should be resolved quickly and well before residential service

disconnections resume next spring when customers owing balances take much closer looks at their bills and question estimated usage.

3. Investigate options to address issues and develop and implement an action plan to address declining Customer Service employee ratings. (See Conclusion #10)

Launched in 2018, FirstEnergy measures employee satisfaction annually through a Diversity and Inclusion (D&I) survey. Questions explore employee attitudes on workplace diversity and inclusion, respect for employees, employee value, openness, career development, and communications. Overall Customer Service employee ratings dropped by 9 percent from 2018 to 2020, from an overall average of 81 to 73.7. Of the 26 items evaluated in 2020, employee rated all but 4 items lower in 2020 than in 2018. Questions rated higher included being work pride, recommending FirstEnergy as an employer, intention to remain at FirstEnergy for another year, and team comfort-level with a diverse workgroup.

The Customer Experience organization should investigate options to address the issues identified in the D&I survey, develop an action plan to implement changes to address declining employee ratings.

4. Dedicate resources to develop a strategy and concerted approach to identifying and pursuing potential service theft. (See Conclusion #11)

JCP&L's should strengthen its passive approach to dealing with potential service theft through the commitment of resources and the development of a strategy to pursue potential theft of service for recovery. JCP&L should consider adding and promoting a dedicated "hotline" to encourage anonymous tips from customers and the public as well as explore the possibility of offering a small incentive to frontline employees who correctly identify service theft situations.

Additionally, JCP&L should evaluate for implementation, data analytics to assist in the identification of potential cases, which can be issued to field employees for further investigation. JCP&L should begin capturing confirmed cases and quantifying the billing dollars associated with these cases. JCP&L should also track the number of theft tips received and confirmed and the sources of the theft tips.

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Chapter XI: Financial Risks and Consequences of Parent and Affiliate Operations

A. Background

On October 30, 2020 Standard and Poor’s Global Ratings (S&P) downgraded the Issuer Credit Ratings (ICRs) on FirstEnergy and its subsidiaries (including JCP&L) to BB+ from BBB. S&P explained its reasoning as:

“The two-notch downgrade reflects the termination of the company’s CEO, Chuck Jones and two other executives, for violating company policies and its code of conduct. We view the severity of these violations at the highest level within the company as demonstrative of insufficient internal controls and a cultural weakness. We view these violations as significantly outside of industry norms and, in our view, represent a material deficiency in the company’s governance. To account for these deficiencies, we revised our assessment of the company’s Management & Governance (M&G) score downward to weak from fair, which lowers the issuer credit rating by two notches.”

On November 24, 2020 S&P further downgraded the ICRs of FirstEnergy and its subsidiaries to BB from BB+, for a total downgrade of three credit notches for both the parent and JCP&L to well below investment grade levels. The S&P rationale was:

“Although we believe the company’s decision to significantly increase its borrowings under its revolving credit facility demonstrates prudent risk management given the unique challenges the company is facing, in our view, it is also an acknowledgement that the company may not have consistent access to the capital markets. Issuers in the U.S. utility sector are typically characterized by high credit quality despite operating with negative discretionary cash flow, reflecting robust capital spending and dividends. These risks are offset by having consistent access to the capital markets. We view the ongoing challenges faced by FirstEnergy as inconsistent with the current rating resulting in a one-notch downgrade. We revised the comparable rating analysis modifier to negative from neutral to account for this higher risk.

These “higher risks” arise at the FirstEnergy level; JCP&L does not cause them. ***The credit rating downgrades of JCP&L resulted from their linkage to the credit risks of the FirstEnergy parent,*** not from utility business and financial risks of JCP&L as a utility operating company.

Fitch Ratings (Fitch) on October 30, 2020 also downgraded the credit ratings on FirstEnergy and all of its rated operating utility subsidiaries to BBB- from BBB. On November 20, 2020 Fitch further downgraded FirstEnergy to BB+ from BBB-, but did not further downgrade JCP&L or FirstEnergy’s other utility operating companies.

Moody’s Investor’s Service (Moody’s) on November 24, 2020 downgraded the FirstEnergy senior unsecured credit rating to Ba1 from Baa3. Moody’s did not downgrade JCP&L’s credit ratings then.

B. Findings

1. Liquidity Impacts of Downgrades

JCP&L has two sources of liquidity to fund its day-to-day utility operations in New Jersey - - the FirstEnergy revolving credit facility (Revolving Credit Facility) and the FirstEnergy utility money pool (Money Pool). A Phase Two report chapter, *Finance and Cash Management*, details operation of the Money Pool in recent years. The Revolving Credit Facility, currently totaling \$2.5 billion, provides access to bank syndicated credit facilities for FirstEnergy, JCP&L, and the other utility operating companies. JCP&L has a \$500 million sub-limit for borrowing under the FirstEnergy credit facility.

JCP&L and the other FirstEnergy utility operating companies also participate in a utility Money Pool in accordance with an agreement dated January 31, 2017. The agreement permits the operating companies to borrow from each other and from FirstEnergy to meet their short-term working capital requirements. FirstEnergy Service Company administers the utility money pool, tracking the surplus funds of FirstEnergy and each operating company subsidiary, as well as proceeds available from bank borrowings under the Revolving Credit Facility, for lending to borrowers in the Money Pool. FirstEnergy has also operated and participated in an unregulated money pool for many years for its nonutility businesses.

A series of BPU Orders, beginning in 2002 and with the latest Order dated December 6, 2019, governs JCP&L's participation in the Money Pool. These Orders allow JCP&L to borrow from the Money Pool subject to a limit of \$500 million outstanding at any one time. A BPU condition on JCP&L participation in the Money Pool requires all borrowers to have at least an investment grade credit rating from all applicable, nationally recognized statistical rating organizations. If the senior secured credit rating of any borrower in the Money Pool falls below investment grade, all outstanding loans must be repaid within three business days, with no further loans to that borrower permitted.

FirstEnergy reported that JCP&L had Money Pool borrowings totaling \$420.9 million at September 30, 2020, and continuing until November 23 of that year. On October 30, 2020 S&P and Fitch downgraded FirstEnergy and its subsidiaries following the termination of three executives for the violation of company policy and its code of conduct. S&P also specifically downgraded the senior unsecured issuer ratings of JCP&L, Metropolitan Edison, Pennsylvania Electric, Ohio Edison, American Transmission Systems, Mid-Atlantic Interstate Transmission, and Trans-Allegheny Interstate Line Co., each to BBB- (marginally investment grade). Each participates in the Money Pool. The October 30 downgrades did not cause a BPU Money Pool violation by JCP&L at this time, but further credit downgrades could do so.

JCP&L's other source of liquidity, the FirstEnergy Revolving Credit Facility, was not available prior to a November 17 covenant waiver. FirstEnergy had violated an anti-corruption covenant of its credit facility, and was negotiating with the bank syndicate for potential waivers of the troublesome covenants. FirstEnergy's violation of the anti-corruption covenant constituted an event of default of the FirstEnergy Revolving Credit Facility, and rendered this additional source of liquidity inaccessible for borrowing by FirstEnergy, JCP&L or the other utility operating companies. Until the bank syndicated waived the covenant violation or FirstEnergy otherwise

resolved it, JCP&L did not have access to its \$500 million of Revolving Credit Facility borrowing capacity.

As a result, between November 11 and November 17, JCP&L did not have access to the Revolving Credit Facility, and was in danger of losing its ability to borrow under the Money Pool. A further credit downgrade would require JCP&L to repay its \$420.9 million in borrowings to the Money Pool, with no available source of funds to make such repayment. Clearly, JCP&L faced a liquidity crisis due to the FirstEnergy Department of Justice investigation, FirstEnergy's violation of its Revolving Credit Facility covenants, and the potential loss of JCP&L's investment grade credit rating, which would trigger a required Money Pool repayment of \$420.9 million under a BPU restriction.

FirstEnergy was negotiating with the bank syndicate to receive a covenant waiver that would permit JCP&L and other operating companies access to their borrowing capacity under the Revolving Credit Facility. However, FirstEnergy also understood that a covenant waiver and a significant drawdown of its credit facility could cause further credit downgrades from the rating agencies, causing JCP&L to repay its borrowings with the Money Pool.

FirstEnergy reached an agreement with the banks on covenant waivers for the Revolving Credit Facility on November 17, 2020. The covenant waivers, limited to the violation of terms under the credit agreement, restored borrowing capability. Faced with a crucial liquidity decision, FirstEnergy decided to withdraw \$1.95 billion from the credit facility on November 23, with \$450 million for JCP&L, \$500 million for the other operating companies, and the full \$1.0 billion of capacity under the FirstEnergy Transmission credit facility. JCP&L used the proceeds from the borrowing to repay the \$420.9 million Money Pool borrowing.

The following day, S&P downgraded FirstEnergy, JCP&L and the other operating companies, noting that “... *the large credit facility drawdown was an acknowledgment that the company may not have consistent access to the capital markets.*” JCP&L's downgrade to BB+ on its unsecured debt by S&P would normally necessitate the repayment of the Money Pool loans, had it not already made repayment. However, JCP&L could not access additional Money Pool borrowing to fund its operations, and now had only \$50 million of capacity remaining on the FirstEnergy Revolving Credit Facility.

A requirement imposed by a December, 2002 BGS Order required JCP&L within three business days of a credit downgrade to a level below investment grade to file a plan to mitigate downgrade effects, including an assessment of present and future liquidity necessary to cover BGS obligations. A JCP&L December 11 presentation to the BPU included contingency plans for its liquidity. After recognizing borrowings of \$450 million of its \$500 million revolving credit facility capacity, JCP&L noted three potential liquidity sources:

- JCP&L expected proceeds from the previously planned Yards Creek plant sale of about \$155 million, with closing expected in the first quarter of 2021
- An expedited request for a temporary increase in short-term borrowing limits (\$500 million at FERC for all short-term debt, including both the FirstEnergy Revolving Credit Facility and Money Pool).

- An expedited (BPU) filing that requested approval to issue long-term debt to refinance JCP&L short-term borrowing.

The BPU Order restricted JCP&L from utilizing the Money Pool after November 24, 2020; JCP&L later notified the BPU that it had violated certain Money Pool restrictions. On March 25, 2021, JCP&L notified the BPU that, after the November downgrades, there were periods of time during which JCP&L’s Money Pool balance was positive, meaning it was a lender to the pool. The Money Pool automatically arranges daily either borrowing or loans on a pro rata basis from each participant, based on its cash flows. As a result, JCP&L became non-compliant with the BPU Order for certain periods of time between November 23, 2020 and March 19, 2021, when it set up a separate external investment account. JCP&L then requested a waiver of the BPU Order to allow JCP&L to continue to fully participate and resume borrowing in the Money Pool, provided that one rating agency rated it as investment grade - - a change from the required three.

JCP&L closed the sale of the Yards Creek plant in March 2021 for about \$155 million in cash. JCP&L eventually resumed Money Pool borrowings, growing to \$49 million by June 2021. On May 19, 2021, JCP&L received BPU authorization to issue up to \$500 million of long-term debt, which JCP&L did on June 10, 2021.

2. FirstEnergy Credit Linkage

The credit linkage between JCP&L and FirstEnergy described previously has played a central role in JCP&L credit ratings, but its influence has varied widely across the three credit rating agencies. S&P has recognized and written extensively on the existence and impacts of credit linkage in utility holding companies for at least the last 20 years. S&P has published comprehensive guidelines and criteria for measuring the impacts of such linkage, and has included them in its consideration in many rating reports in the utilities industry, including for FirstEnergy and its utility operating companies.

Fitch Ratings (Fitch) also recognizes credit linkage and factors it into its credit ratings, also publishing specific guidelines and criteria for measuring its impacts. Fitch believes that credit linkage has clear impacts on credit risk, but not to as great a degree as does S&P. By contrast, Moody’s Investor’ Services (Moody’s) generally does not recognize credit linkage in its industry rating reports, rating utility subsidiaries primarily on a stand-alone basis, without significant influence from parent credit.

a. S&P’s Group Rating Methods

S&P has published “Group Rating Methodology” criteria documents for many years; they describe the firm’s approach for rating corporate (including utility holding companies), insurance, financial institutions and public finance groups. The most recent version, dated July 1, 2019, is extensive and detailed. Its underlying concepts and general impacts have evolved, but remained fairly consistent since the early 2000s. The group criteria articulate the steps in determining an Issuer Credit Rating (ICR) on group members and their holding companies. The process involves assessing the group credit profile (*i.e.*, the group’s overall creditworthiness, or GCP), the stand-alone credit profiles (SACP) of group members, and the status of an entity relative to other group entities. The criteria also describe how S&P assesses the potential for positive support or “negative intervention” from group entities, in this case the FirstEnergy holding company. S&P factors the

potential for extraordinary support or negative intervention into a company ICR even when the possibility for such negative intervention may appear remote.

In applying its Group Rating Methodology, S&P determines whether a group member (such as JCP&L) falls into one of five group status categories: “Core”, “Highly Strategic”, “Strategically Important”, “Moderately Strategic” or “Nonstrategic”. [REDACTED]

- Unlikely to be sold
- Integral to overall group strategy
- Possessing a strong, long-term commitment from FirstEnergy’s management
- A significant contributor to the group
- Successful at what it does
- A profit center of the group
- Closely linked to the parent’s name and reputation.

S&P next determines the Group Credit Profile (GCP), which determines the rating agency’s assessment of group creditworthiness- - here the FirstEnergy consolidated entity, including all of its utility operating and other subsidiaries, including unregulated subsidiaries. S&P typically conducts the assessment of the consolidated group as a single entity. FirstEnergy’s GCP stands at BB with S&P, as noted in its research reports and updates.

Next comes assignment of ICR for group members, such as JCP&L. A “Core” group entity such as JCP&L receives an ICR equal to that of the FirstEnergy Group Credit profile, unless S&P deems it an “Insulated Entity” that qualifies for a higher rating. S&P emphasizes centrality of insulation of members within a credit group in determining how closely a Core entity’s credit links to the group profile. S&P explains the potential harm of credit linkage to subsidiaries as follows:

“Financial stress within the group can negatively affect the creditworthiness of group entities, and in such cases a potential ICR on an entity is typically limited by the GCP because:

- *The group could potentially transfer assets from one group entity to another during financial stress, contributing to credit stress at other group entities;*
- *The distress at the group could trigger business or financial difficulties at the group member. For instance, the group's problems could cause reputational damage of the group member and a loss of business;*
- *The group member might rely on operational support from the group on an ongoing basis; and*
- *In some jurisdictions, a bankruptcy petition by one group entity could include or cause other group entities to go into bankruptcy or similar measures.*

Following its publishing of the S&P Group Rating Methodology, S&P issued a December 10, 2019 Research Update that specifically reviewed ratings on FirstEnergy Corp.’s subsidiaries labeled as “under criteria observation” after publishing its revised group rating methodology criteria. S&P came to the following conclusion for the FirstEnergy group:

In our view there are insufficient insulating measures and separateness between FirstEnergy and its subsidiaries to raise any of the issuer credit ratings on the subsidiaries above the group credit profile. Although each subsidiary is incorporated as a separate legal entity that maintains its own records and makes its own long-term debt arrangements, its short-term borrowing is linked to FirstEnergy’s consolidated credit facility. In our view, financial links between the subsidiaries and the parent remain and the subsidiaries are not highly independent from the group. (emphasis added)

Thus, S&P’s focused review of FirstEnergy and its subsidiaries found strong credit linkage between FirstEnergy and its operating companies, arising from the common FirstEnergy Revolving Credit Facility. This strong credit linkage has resulted in the same issuer credit profile and credit ratings for JCP&L and its parent, FirstEnergy. Accordingly, S&P downgraded JCP&L along with FirstEnergy to BB in late 2020.

b. Fitch Ratings

Fitch also published a report entitled “Parent and Subsidiary Linkage Rating Criteria.” The August 26, 2020 report outlines the methods Fitch uses when assigning new or reviewing existing issuer default ratings for non-financial companies linked by a parent/subsidiary relationship. Linkage strength determines whether the consolidated credit profile or a stand-alone credit profile becomes more or less important when assigning ratings. Fitch rates both the parent and the subsidiary at the consolidated level, irrespective of their standalone profiles where their linkage proves very strong.

Fitch analyzes the legal, operational and strategic ties among the parent and its subsidiaries. Legal ties generally prove the most important of the three categories, but Fitch may assess overall ties as strong in the absence of legal ties with robust operational and strategic ties present.

“Centralized Treasury” comprises one operational tie of interest to Fitch, which examines the degree of integration between the parent’s and subsidiary’s financing operations to determine the degree of linkage for a parent weaker than a subsidiary. Fitch finds strong linkage when all external funding channels through the parent, which acts as the central treasury for and on-lends funds to subsidiaries, which do not raise funds on their own account. An account in the name of the parent holds all cash for parent and subsidiary entities in this scenario. Conversely, Fitch would deem financial linkage weak under entirely decentralized funding, with all significant group companies operating their own treasury functions and raising funds (including liquidity facilities) on their own accounts, without involvement from the parent.

In the case of a weaker parent, Fitch would consider linkage strong or moderate if the weaker parent usually can extract cash or assets from the stronger subsidiaries it controls. Under strong to moderate linkage assignment of the same ratings level to the parent and subsidiary (generally that of the consolidated group) becomes the most likely ratings outcome. With weak linkage (e.g., legal or operational means limit the parent’s access to the subsidiaries cash or assets), the subsidiary may receive a higher rating than the parent’s.

Fitch’s credit downgrade announcement on October 30, 2020 applied its “Parent-Subsidiary Rating Linkage”:

Fitch considers FirstEnergy's subsidiary utility operating companies (Opcos) to be generally stronger than their corporate parent, reflecting the utilities' relatively low business risk profile, balanced rate regulation and funds from operations (FFO)-adjusted leverage. While operational and strategic ties are robust, prescribed regulatory capital structures for FirstEnergy's Opcos leads to moderate rating linkage, allowing the utilities' IDRs to be notched above FirstEnergy's IDR. Fitch applies a bottom-up approach rating FirstEnergy's Opcos. FirstEnergy's utility subsidiary IDRs reflect their stand-alone credit profiles and moderate rating linkage with FirstEnergy, while FirstEnergy's IDR incorporates a consolidated approach. ... Fitch typically rates FirstEnergy's stronger operating subsidiary IDRs one notch above FirstEnergy's IDR, reflecting centralized funding and operating strategies currently deployed at the company and relatively robust stand-alone credit metrics.

Fitch considered the FirstEnergy credit linkage “moderate,” assigning to JCP&L and the other operating companies ratings one notch above the parent’s.

Similar opinions on credit linkage by S&P and Fitch on the FirstEnergy group date back over a long period. [REDACTED]

[REDACTED]

S&P based this 2014 opinion on the criteria included in a November 19, 2013 “S&P Group Rating Methodology.” S&P previously published versions of the group rating methodology for utilities in 2003, 2004, and 2010.

3. Credit Linkage Causes

Each FirstEnergy subsidiary, incorporated as a separate legal entity, maintains its own records and issues its own long-term debt. As a result, long-term debt operations do not create a source of credit linkage for JCP&L and the other operating companies.

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

FirstEnergy has since at least 2006 jointly negotiated and operated revolving credit facilities (Revolving Credit Facilities) with letter of credit capabilities (LOCs) that provide liquidity for all its subsidiaries, as well as term loan capabilities - - all through one massive bank syndicate. The utility operating companies also have access to a Money Pool facility that provides liquidity through loans among its participants. FirstEnergy's other, non-utility entities have employed a separate money pool. All of these short-term credit facilities provide liquidity and funding to the FirstEnergy family, but produce credit linkage.

a. FirstEnergy Revolving Credit Facilities

FirstEnergy currently employs a \$2.5 billion Revolving Credit Facility that provides liquidity for the holding company and its 10 operating companies, through a syndication of 23 banks. This facility makes up to \$2.5 billion available to be borrowed, repaid and re-borrowed. The facility sets separate borrowing sub-limits for FirstEnergy and each of its electric distribution subsidiaries. FirstEnergy established the Revolving Credit Facility on December 6, 2016 for \$4.0 Billion, later making major amendments to it in 2018, late 2020 and July 2021. Prior to Amendment 2 on November 17, 2020, FirstEnergy's sub-limit for the Revolving Credit Facility equaled total facility capacity - - \$4.0 Billion from 2016 to 2018 and \$2.5 Billion from 2018 to late 2020. A November 2020 reduction of FirstEnergy's sub-limit came as consideration for the bank syndicate's providing of the November 2020 covenant waiver.

FirstEnergy Transmission (FET) and certain of its subsidiaries participate in a separate \$1.0 billion credit facility with the same bank syndicate. It incorporates borrowing sub-limits for each borrower, including the transmission subsidiaries. FirstEnergy formerly had a third Revolving Credit Facility with the bank syndicate for \$2.5 billion and later \$1.5 billion between 2011 and 2016. That facility ended after negotiation with the banks for the 2016 FirstEnergy Revolving Credit Facility.

Borrowers under the credit facilities may use the proceeds for working capital and other general corporate purposes, including intercompany loans and advances by a borrower to any of its subsidiaries. Generally, borrowings under the credit facilities remain available to each borrower separately and mature on the earlier of 364 days or the end of the credit agreement term. The credit facilities contain financial covenants requiring FirstEnergy to maintain a consolidated debt to total capitalization ratio of no more than 65 percent, and 75 percent for FirstEnergy Transmission. The Revolving Credit Facilities carry interest rates at fluctuating rates, primarily based on LIBOR.

The following chart shows the FirstEnergy Revolving Credit Facility borrowing sub-limits in effect at June 30, 2021. The table reflects Amendments 1 to 4.

\$2.5 Billion FE Revolving Credit Facility Sub-Limits

Entity	Sub-Limit (in millions)
FirstEnergy	\$1,500
JCP&L	\$500
Ohio Edison	\$500
Cleveland Electric Illum	\$500
Metropolitan Edison	\$500
Toledo Edison	\$300
Pennsylvania Electric	\$300
West Penn Power	\$200
Pennsylvania Power	\$100
Sub-Limits Total	\$4,400

Following our drafting of this report, on October 18, 2021, FirstEnergy replaced the December 6, 2016 Revolving Credit Facilities shown above with six separate five-year facilities totaling \$4.5 billion of borrowing capacity. As part of these replacement facilities, JCP&L established its own, separate \$500 million NJ Utility Credit facility with Mizuho Bank as the administrative agent. Separate revolving credit facilities were also established for the Ohio operating companies, the Pennsylvania operating companies, the West Virginia and Maryland operating companies, and a facility for FirstEnergy's transmission companies. The FirstEnergy and FET holding companies established their own Parent Credit Facility with a borrowing limit of \$1.0 billion.

In response to the new credit facilities, S&P on October 19, 2021 upgraded JCP&L's ICR one credit notch to BB+. S&P noted the changes as sufficient to rate FirstEnergy's regulated utilities up to one notch higher than its group credit profile. (As we discuss elsewhere in this chapter, the separate credit facilities were expected to result in one-notch operating company credit upgrades; this news does not change any conclusions or recommendations contained in this chapter.)

b. Money Pools

FirstEnergy's utility operating company subsidiaries also have the ability to borrow from each other and from FirstEnergy to meet their short-term working capital requirements through the Money Pool. Versions of the pool bear dates of January 31, 2017 and September 2011. FirstEnergy Service Company administers the Money Pool, tracking the surplus funds of FirstEnergy and each operating company and proceeds available from bank borrowings under the Revolving Credit Facility. Companies receiving a loan under the Money Pool agreement must repay principal and interest within 364 days of borrowing the funds. Each participant pays the same interest rate, which the pool bases on the average cost of funds available through the pool.

A similar but separate money pool exists among FirstEnergy and its unregulated companies, which currently include AE Supply, FirstEnergy Transmission, FirstEnergy Ventures, and certain other subsidiaries. The current FirstEnergy Substitute Non-Utility Money Pool Agreement, dated January 1, 2018, replaces a December 2013 agreement that was amended on December 6, 2016. Versions of this money pool predating this agreement included FirstEnergy Solutions, which this

one did not. FirstEnergy Service Company administers this money pool, tracking the surplus funds of FirstEnergy and pool participants and proceeds available from FirstEnergy bank borrowings under the Revolving Credit Facility.

c. Term Loans

FirstEnergy has also had substantial term loans outstanding during the last several years, supplementing the Revolving Credit Facilities in providing funding through a few members of the same syndicated bank group. For instance, on October 19, 2018, FirstEnergy entered two separate syndicated term loan agreements. One agreement consisted of a \$1.25 billion 364-day facility with the Bank of Nova Scotia as administrative agent, with other lenders. The second, \$500 million two-year facility employed JP Morgan Chase Bank as administrative agent, with other lenders. September 11, 2019 amendments changed the amounts of these two loans to \$1.0 billion and \$750 million respectively, and extended the maturity dates. FirstEnergy unsecured senior notes totaling \$2.5 billion refinanced these term loans in 2020.

4. *2015 Ring-Fencing Study*

A March, 2015 final Order in JCP&L's 2012 base rate case required the company to prepare a ring-fencing study. S&P's credit ratings for JCP&L stood at BBB-, one notch above speculative grade. A highly-respected firm retained by FirstEnergy Service Company completed the study, issuing a December 18, 2015 final report.

The report focused on six aspects regarding JCP&L ring-fencing. We examined the report's treatment of ring-fencing, giving consideration to the root cause of JCP&L's need for ring-fencing, S&P rating reports and ratings criteria available at that time, credit linkage with the parent, and conformity with provisions widely applied in other states. The report made three, limited recommendations for changes to then-existing ring-fencing:

- Develop and implement formal documentation of methods, procedures, and practices to achieve the desired financial outcome and define accountabilities for required, correspondence, reports, and supporting documentation.
- Create a process to provide "relevant information" from rating agencies, corporate governance rating agencies and investment banking firms for provision to the BPU after developing an "information filtering process" to keep the BPU "from being inundated with superfluous information."
- Employ a dividend payout limitation policy considering generally accepted liquidity measurements.

The report found no basis for recommending any further ring-fencing measures with the potential to improve subsidiary credit ratings, curiously citing as a basis the comparability of FirstEnergy and JCP&L credit spreads and credit ratings difference with those of other utility holding companies. The report cited "no compelling evidence" that added measures would have improved prior JCP&L credit ratings "to any significant degree," contrary to S&P's clear opinions at that time. The report strongly rejected the value notion of the adoption of a special purpose entity to provide bankruptcy insulation, used in a number of other mid-Atlantic utilities operating in holding company structures. It noted, somewhat disingenuously, that creation of those special entities was "voluntarily" adopted. Conditions made part of settlement agreements in utility regulatory authority reviews of mergers or mergers can clearly be read as reflecting what applicants

considered themselves “compelled” to do to secure needed approval. If not, their inclusion in orders “compel” applicants to do what approval orders consider consistent with the public interest in those circumstances.

Interestingly, the report also distinguishes JCP&L’s circumstances from the basis of bankruptcy “fears” surrounding a regulatory commission order requiring more extensive ring-fencing measures than existed to protect JCP&L at the time. Bankruptcy soon became a significant factor for FirstEnergy, making clear that ring-fencing should never depend on current circumstances but on potential future conditions - - like those FirstEnergy would come to experience. The report also fell into the false sense of confidence that reliance on historical actions can produce. It credited FirstEnergy with credit supportive actions taken in recent years. The irony of that reliance (and demonstration of the fact that potential or future risks, not the past and present should form the focus of ring-fencing) also became clear with the later emergence of financial difficulties at FirstEnergy for reasons not connected to JCP&L or even other utility subsidiary operations. Thus, both factors cited to support the conclusion that no further ring-fencing was required at the time seem to suggest the opposite both in 2015 and in more recent times.

5. Financing Governance and Approvals

The FirstEnergy Treasury Group performs external financing for JCP&L from corporate headquarters in Akron. A manager in the FirstEnergy treasury group has served as Treasurer of JCP&L since 2012. The JCP&L Treasurer’s duties fall largely in forecasting and planning for financing the capital requirements of JCP&L (short and long-term), obtaining financing authorizations from the BPU, and signing documents as JCP&L Treasurer. However, this officer does not perform or manage financing transactions. Nor does this officer advise or provide the JCP&L board of directors advice regarding them. Those responsibilities lie in Akron.

JCP&L recently issued long-term debt consisting of \$500 million of unsecured notes in June 2021. Following large expenditures at JCP&L related to storms in the 2020 summer season, the JCP&L Treasurer monitored the growing amounts of short-term borrowing required to fund the expenditures. The Treasurer worked with and made presentations to the New Jersey BPU regarding the need for a long-term debt issuance, as well as regarding other liquidity and short-term debt financing issues as discussed above. The BPU approved the long-term debt issuance in May 2021.

FirstEnergy’s legal department and the corporate secretary, who manage the JCP&L Board of Directors schedule, prepare board resolutions approving long-term debt issuances and materials explaining them to board members. The JCP&L Treasurer generally does not discuss with or make presentations to the JCP&L Board regarding specific analyses of the long-term debt issuances, but remains “on call to answer questions.” The FirstEnergy capital markets manager worked concurrently with investment bankers on the long-term debt issuance for JCP&L, as well as debt issuances for four of the other operating companies in 2021. The FirstEnergy treasury managers handle the analysis, pricing, and closing of the long-term debt deals.

We found the sources and natures of analysis, authorizations and approvals of JCP&L participation in the FirstEnergy Revolving Credit Facility and in the Money Pool less clear. The JCP&L Treasurer has described a “two-tiered management” of company liquidity and short-term debt

requirements. The Treasurer makes forecasts of liquidity needs and financing requirements for 12 months going forward on a rolling basis. The Treasurer regularly confers with FirstEnergy treasury, who has responsibility for day-to-day liquidity operations for all FirstEnergy companies.

Board of Director monitoring and approvals of the FirstEnergy Revolving Credit Facility and Money Pool programs fall under the FirstEnergy Board of Directors Finance Committee. FirstEnergy Treasury handles negotiations of the revolving credit facilities with the bank syndicates, and makes regular presentations to the Finance Committee regarding liquidity, financing, bank relationships and rating agency issues. The FirstEnergy Revolving Credit Facility, Money Pool and related rating agency views provide critical resources for JCP&L and the other operating companies. FirstEnergy Treasury and the FirstEnergy Board Finance Committee have primary roles in their design and use, with little input from JCP&L.

The FirstEnergy board's Finance Committee has oversight of the Revolving Credit Facility programs and the money pools. We requested Finance Committee meeting minutes and presentations made by FirstEnergy Treasury in the second half of 2020 and to date in 2021 regarding the Revolving Credit Facilities, liquidity and money pools and their impact on the credit ratings of the operating companies. FirstEnergy redacted all information related to financing plans, liquidity, bank exposures, credit risks, rating agencies, debt covenants, bank facility updates, and liquidity updates in presentations made starting September 14, 2020 and ending March 16, 2021. We found the numerous presentations regarding these issues at six Finance Committee meetings during this period heavily redacted in places apparently related to these specific financial issues, which have primary importance for JCP&L and which relate directly to subjects within the scope of our engagement. FirstEnergy also declined to provide any portion of a July 2021 Finance Committee presentation cited specifically by FirstEnergy's CFO and Treasurer as addressing the re-negotiation of all of the Revolving Credit Facilities with the banks, and the impact on the operating company credit ratings.

The signature of the JCP&L Treasurer appears on all the FirstEnergy Revolving Credit Facility agreements, including the establishment of the facility in December 2016, as well as Amendment 1 in October 19, 2018, Amendment 2 on November 17, 2020, and Amendment 4 on July 21, 2021. However, the JCP&L board minutes did not show any discussion, resolutions, or approvals of the establishment of the FirstEnergy Revolving Credit Facility and its important recent amendments. In addition, to become effective, the FirstEnergy Revolving Credit Facility agreement and each amendment required resolutions of the Board of Directors of each borrower, including JCP&L.

FirstEnergy maintains that occasional Board approvals of the FirstEnergy revolving credit \$500 million short term debt limitation established by FERC covers all issues regarding short-term financing, including the Revolving Credit Facilities. While questionable, the more material point is that the establishment of and major amendments to JCP&L's credit facility comprise major liquidity decisions, and should require JCP&L board knowledge of impacts and approval thereof.

During an interview with the JCP&L Treasurer we referred to S&P reports that noted credit linkage between FirstEnergy and JCP&L and the other operating companies and we asked if the JCP&L board had been notified of rating agency issues and their relationship to the short-term debt

facilities. The JCP&L Treasurer responded that he does not advise the JCP&L board regarding credit rating agency issues.

6. Utility Insulation and Ring-Fencing

S&P's Group Rating Methodology states that:

Some entities may be insulated, segmented, or ring-fenced from their group, from a credit perspective. Such insulation may lead to the rating on the entity being higher than the GCP. The lower the likelihood that the creditworthiness of the entity would be impaired by a credit stress scenario for the group, the greater the potential difference between the potential Issuer Credit Rating (ICR) on the entity and the GCP.

S&P describes ring-fencing that would result in various levels of insulation between a holding company and subsidiary. S&P defines the requirements for four distinct levels of credit insulation, ranging from minimum to maximum. Currently and for many years, JCP&L has not qualified for the first (or baseline) level of credit insulation from FirstEnergy, making it ineffectively ring-fenced considering the measures that S&P employs. The next paragraphs describe these four levels.

First Level - - A potential ICR of an insulated entity is one notch above the Group Credit Profile where: (a) that entity has operational separation from the group and (b) its Stand-Alone Credit Profile falls at least one notch above that group profile. Key characteristics of operational separation generally include all of the following:

- Holding itself out as a separate entity, financial performance and funding highly independent from the group, no significant operational dependence on other group entities, maintains its own records and funding arrangements, does not commingle funds, assets, or cash flows
- A strong economic basis for the group to preserve the entity's credit strength
- No expectation of a default by other group entities leading directly to an insulated entity's default.

Second Level - - A potential ICR of an insulated entity is two notches above the GCP where, in addition to the First Level insulation: (a) independent parties limit the group's control of the entity, and (b) the entity's Stand-Alone Credit Profile falls at least two notches above the group's profile. Limited control generally takes at least one of these circumstances:

- Significant minority shareholders with an active economic interest
- Effective influence by independent directors on decision-making, including dividend policy and bankruptcy filings
- Strong legislative, regulatory or similar restrictions inhibiting the entity from supporting the group to an extent unduly impairing stand-alone creditworthiness.

Third Insulation Level - - A potential ICR of an insulated entity is three notches if, in addition to Second Level insulation: (a) material structural safeguards protect the entity from group influence,

and (b) stand-alone credit profile is at least three notches above the group's profile. Structural safeguards that protect the entity from group influence would generally include at least one of these circumstances:

- The regulator or appropriate legislative body has acted or is expected to act to protect the entity's credit quality (e.g., by prevent the entity from supporting the group to an extent unduly impairing stand-alone creditworthiness
- Protective governance arrangements (e.g., effective independent director influence on decision-making) and significant minority shareholders or joint venture partners with an active economic interest
- Independent trustee or equivalent governance arrangement with the ability to enforce rights of third parties and an expectation to exercise that ability
- Existing governmental authority to change ownership of the entity and expectation that it would exercise that authority.

Fourth Insulation Level - - Potential ICR de-linking of an insulated entity, making it *not constrained by group creditworthiness of the group* if either following conditions exist:

- Condition One
 - Eligible for the Third Level of insulation
 - The parent does not exert control from substantial creditor protections and as a result cannot adversely affect entity credit quality
 - The entity benefits from governance constraints severely limiting parent influence, preventing parent control over matters such as strategy, changes in business conducted, dividends and other material cash flows, and bankruptcy filings
- Condition Two
 - Evidence of minimal historical or expected going-forward impact on entity credit profile due to group credit stress.

We believe that FirstEnergy currently targets changes in its liquidity structure and financing operations that would qualify JCP&L for only S&P's first level of credit insulation, without intent for seeking higher levels.

7. JCP&L Credit Metrics and Status

JCP&L credit ratings have tied closely to those of FirstEnergy parent - - ties that have produced detriment to the New Jersey utility. JCP&L has posted strong financial metrics in recent years and as projected by the credit rating agencies. Its own financial strength and metrics qualify JCP&L for a significantly higher credit rating, as documented in the recent March 22, 2021 S&P rating report. JCP&L's corporate credit rating (ICR) has fallen to BB, but its own financial metrics and the S&P business risk and financial risk evaluations for JCP&L indicate a rating higher by three rating notches, at BBB.

S&P prepares evaluations of "Business Risk" and "Financial Risk" at utility companies like JCP&L. Evaluations of business risk and financial risk have primary importance, but S&P also employs modifiers that can adjust ratings upward or downward. S&P prepares a financial matrix that graphically portrays its evaluations of business and financial risk underlying indicated rating levels for subsidiary entities, such as JCP&L, that it evaluates.

S&P evaluates the JCP&L business risk at “Strong” (its second highest of six levels). The JCP&L business risk assessment reflects its low risk, rate regulated electric operations, partially offset by its difficulties in managing New Jersey regulatory risk. JCP&L’s relatively large customer base provides solid cash flow stability.

S&P has described JCP&L’s BPU relationship as “historically challenging,” but that its management of regulatory risk is improving. JCP&L’s various rider mechanisms, including recovery mechanisms for infrastructure enhancements, reduce regulatory lag. JCP&L could earn a higher business risk score (Excellent, or the highest category) if it gradually improves its management of regulatory risk and consistently earns higher returns. S&P has noted that FERC regulation of JCP&L’s transmission business has produced forward-looking rates and annual cost true-ups, which S&P assessed as credit supportive.

S&P rates JCP&L’s financial risk as “Significant.” S&P evaluates JCP&L’s financial metrics using volatility financial benchmarks reflecting the utility company’s low-risk, rate regulated electric operations. S&P’s forecast base case scenario projects key financial metrics that:

“... consistently reflect the middle of the range for the company’s financial risk profile category. Specifically, we expect funds flow from operations (FFO) to debt of 15% to 17% over our forecast period”.

The following table shows the key financial metrics for JCP&L from 2015 through 2019, projected for year-end 2020 and estimated for 2021 and 2022.

Key JCP&L Credit Metrics: 2015 through 2022

Metric	2015	2016	2017	2018	2019	2020p	2021e	2022e
FFO/Debt	11.1%	14.2%	20.1%	15.5%	19.8%	14-16%	15-17%	15-17%
Debt/EBITDA	5.4X	4.9X	3.8X	5.0X	4.0X	4.5-5X	4.5-5X	4.5-5X

S&P prepares a summary “Business and Financial Risk Matrix” that underlies the JCP&L credit rating. JCP&L’s “Strong” business risk profile and “Significant” financial risk profile with JCP&L’s solid financial metrics result in a current JCP&L rating score of BBB, based on its own business characteristics and financial metrics.

Unfortunately, a clear negative modifier on S&P’s assessment of JCP&L comes from a Management and Governance score that reflects the weak score of its parent in this category. The result is a lowering of JCP&L’s score by two rating notches. A FirstEnergy “Group” modifier adds further negative weight to JCP&L’s rating, producing a total credit linkage burden of three rating notches, decreasing the corporate credit rating from BBB to BB.

C. Conclusions

- 1. Credit linkage with the FirstEnergy holding company caused JCP&L’s credit rating downgrades in late 2020.**

Late October and November 2020 S&P downgrades of FirstEnergy by three credit rating notches produced a corporate credit rating of BB. FirstEnergy also received credit rating downgrades from Fitch and Moody's at that time, with the rating agencies acknowledging increased risks at the holding company.

S&P stated the following regarding the October 30, 2020 FirstEnergy downgrades:

The two-notch downgrade reflects the termination of the company's CEO, Chuck Jones and two other executives, for violating company policies and its code of conduct. We view the severity of these violations at the highest level within the company as demonstrative of insufficient internal controls and a cultural weakness.

S&P further downgraded FirstEnergy on November 24, 2020, immediately following draw-downs of \$1.95 Billion on its revolving credit facilities because:

... the company may not have consistent access to the capital markets... We revised the comparable rating analysis modifier to negative from neutral to account for this higher risk."

The violations of corporate policies, the lack of sufficient internal controls and "higher risk" related to capital market access described above distinctly arise at the holding company level, and not JCP&L or the other utility operating companies. Nevertheless, the rating agencies similarly downgraded JCP&L and the other operating companies by like amounts concurrently. Clearly, JCP&L credit rating downgrade came from linkage to the credit risks of the FirstEnergy parent, and not from any change in the risks and capital access of JCP&L, which continued its strong internal financial strength.

2. FirstEnergy's joint negotiation and operation of liquidity facilities for the holding company and all of its regulated and unregulated subsidiaries comprise a primary contributor to credit linkage.

Short-term borrowing facilities for providing liquidity to all of the FirstEnergy companies, regulated and unregulated, are linked and centrally operated by FirstEnergy. The liquidity facilities of concern include the Revolving Credit Facilities, primarily for FirstEnergy, the operating utility Money Pool and separate money pool serving remaining FirstEnergy subsidiaries. S&P and Fitch have recognized ties in the short-term debt facilities as financial links between FirstEnergy and its subsidiaries. S&P has stated that:

... its (subsidiary) short-term borrowing is linked to FirstEnergy's consolidated credit facility. In our view, financial links between the subsidiaries and the parent remain and the subsidiaries are not highly independent from the group.

Fitch has also made clear that FirstEnergy's short-term borrowing facilities cause credit linkage:



FirstEnergy jointly negotiates all Revolving Credit Facilities with a large bank syndicate to provide market liquidity for each FirstEnergy company. The current FirstEnergy and FirstEnergy

Transmission Revolving Credit Facility facilities negotiated in late 2016 considered the termination of a previous third Revolving Credit Facility for FirstEnergy Solutions, replacing it with a new, dedicated credit line from the parent. FirstEnergy had increased its Revolving Credit Facility capacity to \$4.0 billion and revised the money pool serving the non-utility entities as of December 6, 2016, clearly as a piece of the overall FirstEnergy liquidity package, including FirstEnergy Solutions liquidity. The revised unregulated money pool agreement allowed FirstEnergy Solutions to maintain access to the money pool for two years, even though the banks had terminated its Revolving Credit Facility access.

The December 2016 Revolving Credit Facility agreement allowed FirstEnergy to borrow up to \$4.0 billion, or the entire amount of the Revolving Credit Facility capacity, potentially leaving the operating companies with no liquidity market access. We found this feature of the Revolving Credit Facility particularly problematic, but it has formed part of FirstEnergy credit facilities since at least 2011. FirstEnergy’s Treasurer stated that FirstEnergy has had “consolidated credit facilities” since 2001, with Revolving Credit Facility agreements starting in 2001, 2006, 2011 and 2016. Term loans were also available to FirstEnergy, offered by certain members of the bank syndicate, providing another source of funding for the holding company.



Joint negotiation and operation of the Revolving Credit Facilities and both money pools have enabled FirstEnergy to control liquidity facilities centrally.

As a result of these linked liquidity facilities, FirstEnergy in 2017 could borrow the full \$4.0 billion from the Revolving Credit Facility and make loans to:

- FirstEnergy Solutions and its subsidiaries, under the new, dedicated \$500 million loan facility
- FirstEnergy Solutions and its subsidiaries as participants in the unregulated money pool
- Any of the other unregulated subsidiaries of FirstEnergy participating in the unregulated money pool

FirstEnergy could also retain proceeds from borrowings and re-direct the funds. FirstEnergy could, especially under financial stress, divert the Revolving Credit Facility capacity of JCP&L and the operating companies to itself, and lend the proceeds of the Revolving Credit Facility borrowings and proceeds from term loans to unregulated companies through loans and the unregulated money pool. This joint operation of all of the FirstEnergy liquidity facilities by FirstEnergy has imposed on the utility operating companies credit risks originating at FirstEnergy and its unregulated subsidiaries. The joint operation of the liquidity facilities is observed by the rating agencies, who have signified potentially damaging credit linkage to JCP&L and the other operating companies.

3. Holding company debt and its unregulated businesses have produced FirstEnergy’s elevated business and financial risks.

[REDACTED]

FirstEnergy management reports that most of the parent debt relates to large, sustained losses at FirstEnergy Solutions prior to its bankruptcy and to large holding company payments related to the FirstEnergy Solutions bankruptcy. For instance, FirstEnergy contributed a waiver of \$700 million of FirstEnergy Solution's recent 2018 borrowings outstanding from FirstEnergy under a secured credit facility and a credit agreement to support surety bonds payments in the FirstEnergy Solutions bankruptcy settlement in 2018. FirstEnergy also waived \$112.5 million of shared service costs owed to FirstEnergy by FirstEnergy Solutions debtors. FirstEnergy made additional payments of \$978 million to FirstEnergy Solutions debtors for bankruptcy settlement and tax sharing upon the emergence from bankruptcy in 2020. These bankruptcy waivers and payments added to the already-significant FirstEnergy debt. In addition to the large debt burden, FirstEnergy also has debt guarantee commitments of about \$1.3 billion for its unregulated businesses, further compromising its creditworthiness. The guarantees are another legacy of the FirstEnergy Solutions failures and credit support of other unregulated business ventures.

FirstEnergy's utility operations involve low risk and predictable earnings and cash flows, as recognized by the rating agencies. The state and federal regulation of the utilities is credit supportive; the core utility and transmission operations benefit from relatively low business risk and strong cash flows from regulated markets. The operating companies have strong financial and credit metrics and business profiles. The operating companies have FFO/debt ratios, a key credit metric, of [REDACTED], with JCP&L's projected at [REDACTED] going forward. The operating companies also have strong capitalization ratios, with most having equity percentages of total capitalization above 50 percent.

[REDACTED]

4. JCP&L experienced a liquidity crisis in late 2020 and 2021 due to restricted access to both the Revolving Credit Facility and the Money Pool.

JCP&L has a borrowing sub limit of \$500 million under the FirstEnergy Revolving Credit Facility. The borrowing limitation for JCP&L in the regulated Money Pool is also \$500 million, by BPU Order from December 2019. JCP&L's limitation per the FERC is \$500 million in total short-term debt, from both the Revolving Credit Facility and Money Pool. A condition on JCP&L participation in the Money Pool requires that all borrowers maintain investment grade ratings from

all three principal rating agencies. If the senior secured credit rating of any Money Pool borrower falls below investment grade, it must repay outstanding loans within three days.

A liquidity crisis for JCP&L occurred in late 2020, caused by credit rating downgrades related to an Ohio U.S. Attorney’s Office investigation and recognition of related parent control issues. JCP&L had borrowed \$420.9 million from the Money Pool as of September 30, 2020. The violation of anti-corruption covenants in the FirstEnergy Revolving Credit Facility caused an event of default, and removed the credit facility as a liquidity option, unless waived by the bank syndicate. With credit downgrades on October 30, JCP&L’s access to the Money Pool also became threatened. Further rating downgrades would require JCP&L to pay back its \$420.9 million in borrowings to the Money Pool under a BPU restriction.

A large drawdown of the Revolving Credit Facility would probably have caused further credit rating downgrades. FirstEnergy chose to have JCP&L pay back its Money Pool borrowings with a draw of \$450 million from the Revolving Credit Facility. JCP&L had only \$50 million of capacity remaining on the FirstEnergy Revolving Credit Facility. JCP&L did not note its limited access (due to BPU restrictions regarding) the Money Pool in its liquidity presentation to the BPU on December 11, 2020.

With only \$50 million of available liquidity, by March 2021 JCP&L had not yet received BPU authorization to issue \$500 million in long-term debt to pay down the Revolving Credit Facility. On March 25, JCP&L notified the BPU that it had been in violation of the Money Pool restrictions at times since November. It also requested a waiver to the BPU investment grade restriction, restoring full participation in the Money Pool. JCP&L in June 2020 reported Money Pool borrowing of \$49 million after taking advantage of the waiver.

JCP&L experienced a lack of access to the FirstEnergy Revolving Credit Facility pending bank covenant waiver of FirstEnergy’s anti-corruption violations. JCP&L eventually was in violation of a BPU restriction on the Money Pool as of November 24, 2020, due to the loss of its investment grade credit rating, also caused by the FirstEnergy DOJ investigation and the credit facility draw-downs. Circumstances created by its affiliation with FirstEnergy forced JCP&L into an untenable liquidity situation.

- 5. JCP&L leadership and its board of directors have only insubstantial influence over planning, negotiation, approval and amendments to liquidity facilities necessary for access to financing; FirstEnergy Treasury and the parent board of directors control these facilities. (See Recommendation #2)**



The FirstEnergy Revolving Credit Facility, Money Pool and the related rating agency views regarding these facilities are pivotal for JCP&L financially. The joint and intertwined operations of the Revolving Credit Facility and money pools that include the parent, the operating companies and unregulated affiliates have proven a primary source of the strong linkage of JCP&L and FirstEnergy credit.

[REDACTED] Liberty’s review of JCP&L Board minutes from 2016 did not reveal any information or presentations on the Revolving Credit Facility or its potential impacts or value to the company. We found no resolutions approving JCP&L participation in the Revolving Credit Facility. [REDACTED]

The FirstEnergy Revolving Credit Facility agreement underwent major amendment in 2018, late 2020, January 2021 and July 2021. These amendments addressing JCP&L liquidity also required Board resolutions to become effective. Review of JCP&L Board minutes and presentations for 2020 and 2021 found no information related to the Revolving Credit Facility amendments.

The JCP&L Treasurer does not make presentations to the BOD regarding the negotiation or operation of the Revolving Credit Facility or the Money Pool, the company’s liquidity resources.

6. JCP&L’s existing ring-fencing does not qualify for even the first of Standard and Poor’s four levels of insulation from FirstEnergy’s risks.

JCP&L has received the same Issuer Credit Rating as the FirstEnergy parent because of the strong credit linkage between them. S&P’s “Group Rating Methodology” dated July 1, 2019 provides its current requirements for a subsidiary entity to be insulated from the group credit profile. S&P defines four levels of insulation building from minimum to maximum levels. The first level can place an insulated entity one rating notch higher than the group, the second two notches, and the third three notches. The fourth level would provide maximum insulation and allow the potential Issuer Credit Rating of the insulated entity to be de-linked and therefore “ ... not constrained by the credit worthiness of the group.”

S&P has concluded that the cumulative value of structural protections in place for subsidiaries is not sufficient to insulate them from the parent FirstEnergy sufficiently to produce even a one-notch raise. Neither JCP&L nor the other operating companies had enough insulation from FirstEnergy to reach even S&P’s lowest level of insulation.

7. We have not seen plans sufficient to secure Revolving Credit Facilities adequate to reduce JCP&L credit linkage.

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Treasurer as addressing the re-negotiation of all of the Revolving Credit Facilities with the banks, separate credit facilities, and the impact on operating company credit ratings.

[REDACTED]

[REDACTED]. We consider such a target inadequate for JCP&L, whose credit ratings should be based solely on the utility’s own business and financial risks. Doing so requires significantly more JCP&L insulation from the parent company.

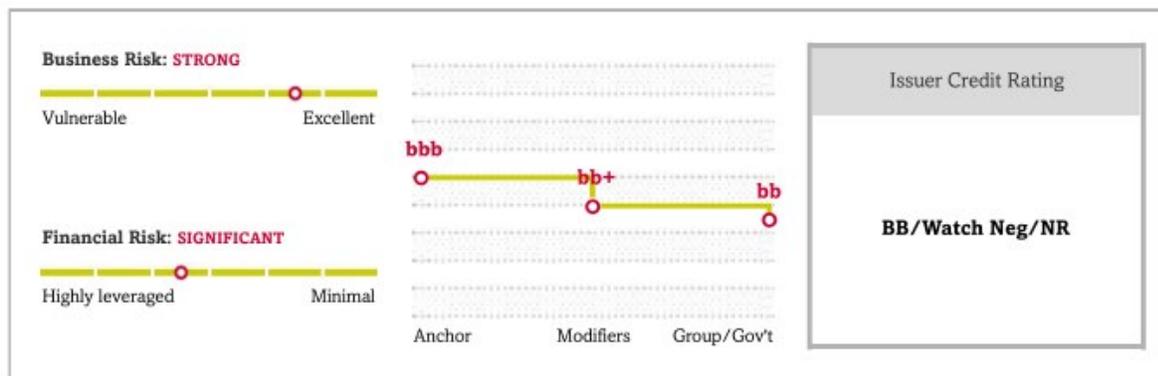
Following the drafting of this report, on October 18, 2021, FirstEnergy replaced the December 6, 2016 Revolving Credit Facilities with six separate five-year facilities totaling \$4.5 billion of borrowing capacity. As part of these replacement facilities, JCP&L established its own, separate \$500 million NJ Utility Credit facility with Mizuho Bank as the administrative agent. Separate revolving credit facilities were also established for the Ohio operating companies, the Pennsylvania operating companies, the West Virginia and Maryland operating companies, and a facility for FirstEnergy’s transmission companies. The FirstEnergy and FET holding companies established their own Parent Credit Facility with a borrowing limit of \$1.0 billion.

In response to the new credit facilities, S&P on October 19, 2021 upgraded JCP&L’s ICR one credit notch to BB+. S&P noted the changes as sufficient to rate FirstEnergy’s regulated utilities up to one notch higher than FirstEnergy’s group credit profile. As noted above, the separate credit facilities were expected to result in one-notch credit upgrades; this news does not change any of Liberty’s text, conclusions or recommendations in this Chapter.)

8. FirstEnergy risks negate JCP&L’s strong credit metrics; stronger insulation measures would and should allow significant improvement in JCP&L’s credit ratings. (See Recommendation #1)

An S&P March 22, 2021 research report on JCP&L followed the late 2020 FirstEnergy issues and credit rating downgrades. A summary graphic from the report (reproduced below) shows its JCP&L business and financial risk analysis, which culminates in an anchor credit rating for the company. A later updated report showed similar data, but changed the “Watch” indicator from “Neg” (negative) to “Pos” (positive).

S&P Global March 22, 2021 Summary



S&P prepares a “Business and Financial Risk Matrix” that measures JCP&L’s own business and financial risks. JCP&L’s “Strong” business risk profile and “Significant” financial risk profile with JCP&L’s solid financial metrics (FFO/Debt projected at 15-17 percent) have resulted in a JCP&L “anchor” corporate credit rating of BBB, based solely on its own business characteristics and financial metrics.

As noted in the graphic above, JCP&L’s anchor credit rating is diminished by “Modifiers” (two notches) and “Group Influence” (one notch). FirstEnergy holding company circumstances and credit linkage with JCP&L cause the all of the three-notch decline.

JCP&L should be strongly insulated from the FirstEnergy parent in accordance with S&P’s Group Rating Methodology. The insulation, or “ring-fencing” for JCP&L should be structured to fully remove the negative impact of FirstEnergy’s risks, and to allow JCP&L to have credit ratings that are based solely on its own business risks, financial risks and credit metrics. Such strong insulation will allow JCP&L to reach its anchor credit rating with S&P - a corporate credit rating of BBB, and a senior unsecured debt rating of BBB+.

9. The 2015 JCP&L Ring-Fencing Study does not provide a helpful guide for assessing current ring-fencing needs.

One element of the 2015 study reviewed S&P and Moody’s policies to assess the extent to which ring-fencing measures might improve the credit ratings of a subsidiary operating within a utility holding company. The report of the study noted the rating agencies’ making of a connection between operational and financial separation from the parent company and differential holding company versus operating company credit risk.

The report then went on to make no recommendations for improving ring-fencing for JCP&L. Significantly, however, and unmentioned in the report, S&P had already concluded by March 2014 that, “There are no meaningful insulation measures in place that protect JCPL from its parent and therefore, JCPL’s higher SACP is capped at FirstEnergy’s GCP of BBB-.” Thus, the existing ring-fencing for JCP&L was ineffective in 2013-2015, and substantial improvements were required to improve JCP&L’s credit ratings with S&P.

The 2015 ring-fencing study undertaken also sought to review credit history to determine whether additional ring-fencing measures would have materially altered rating agency actions since 2001. The study reported that, “...additional ring-fencing measures would not have improved JCP&L’s credit rating to a significant degree, if it all, over the previous 15 years.” The study also reported that such additional measures would not likely improve JCP&L’s stand-alone credit rating in 2015 either.

In fact, S&P ratings for each year since at least 2013 rated JCP&L the same as FirstEnergy, dropping JCP&L by one notch. We doubt that looking at earlier years would have shown different results from S&P. With S&P attributing the common ratings to the lack of insulating measures, it is clear that contemporaneous information showed clearly that additional ring-fencing measures would clearly have improved JCP&L’s credit rating to a degree we consider significant.

The report of the study also cited its search for potential advantages and disadvantages of additional ring-fencing and other implications, including costs. The report cited consideration of additional measures that included: creating a special purpose entity, adding parent bankruptcy provisions and non-consolidation opinions, and applying a dividend payout limitation. The report downplayed the relevance of instances where the use of a special purpose entity and bankruptcy provisions had formed part of the conditions required by state regulatory authorities in approving utility acquisitions.

The report first noted the voluntary adoption of such provisions. Agreeing to conditions in a settlement agreement to secure a regulatory authority’s approval of a merger or acquisition does not make them any more voluntary than deciding whether or not to proceed with a merger or acquisition after examining the conditions the regulatory authority proposed on its own initiative. In either case, conditions become “ordered” not “voluntary.”

The report then noted that bankruptcy fears prompted ring-fencing measures in other cases, offering another distinguishing feature of JCP&L’s 2015 circumstances. Ring-fencing exists to address risks imposed by non-utility business, including bankruptcy. The term “fear” distracts from the fact that financial risk from merchant generation and retail electric supply existed not only in the cases that the report mistakenly distinguishes. It proved an important factor for FirstEnergy as well by the time of the report. That risk was already influencing S&P’s views of

JCP&L’s insulation in 2015, as well as before and after that time. When it comes to bankruptcy, JCP&L would not only face the fear, but the actual existence, of merchant affiliate bankruptcy.

We did not find the report’s attribution of higher costs from the use of a special purpose entity or bankruptcy provisions well founded. Its findings regarding exclusion from a money pool and higher interest costs simply do not comport with industry experience. Effective insulation and segregation of the revolving credit facilities and the Money Pool reduce the borrowing costs for an entity like JCP&L, whose borrowing costs would be driven by their own superior credit status, not the lower one of its parent.

We do not believe that the report accurately addressed circumstances, conditions and available rating agency opinions regarding ring-fencing at the time. Continuing evolution in the use of ring-fencing in the holding company/utility subsidiary context further diminish its applicability now.

D. Recommendations

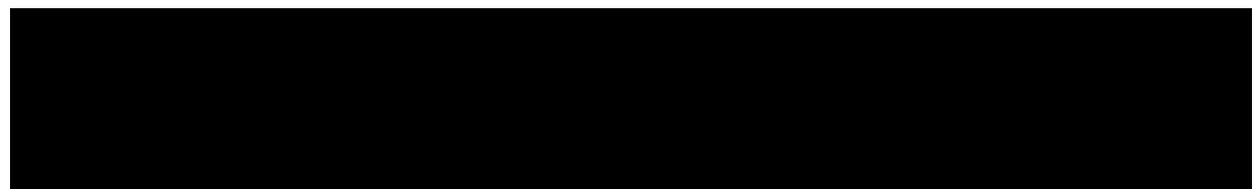
- 1. Create for FirstEnergy and JCP&L lasting and enforceable ring-fencing measures sufficient for JCP&L to make the utility an “insulated entity” by Standard & Poor’s, and to be rated on its own credit characteristics by all three credit rating agencies. (See Conclusion #8)**

JCP&L should be ring-fenced to fully protect the utility from the risks of the FirstEnergy holding company and its unregulated businesses. S&P has been the most effective proponent of the “credit linkage” concept, especially regarding utility holding companies and their subsidiaries. S&P has been transparent in assessing credit linkage causes and in setting forth requirements for the insulation of an entity within a holding company group. Ring-fencing for JCP&L should meet all of S&P’s criteria for full, effective insulation. Liberty recommends ring-fencing for JCP&L to meet S&P’s fourth, or maximum level of insulation, which would result in JCP&L being rated solely on its own financial characteristics and metrics, with no negative influence from the parent.

Ring fencing that meets S&P’s insulation criteria should also cause Fitch to rate JCP&L on its own financial merits and metrics. As a result, the ring-fencing to meet S&P’s insulation criteria should be targeted in any ring-fencing process.

Ring-fencing for utility entities should be contained in a state commission order to be effective. Ring-fencing left to voluntary company action is subject to change at any time, with change probably a virtual certainty when protection proves most necessary. FirstEnergy in recognizing the credit linkage issue has targeted the weakest, or first level, of insulation for JCP&L and its other operating companies through its proposal for separate revolving credit facilities.

- 2. Give JCP&L full governance and operational control over all of its financing facilities. (See Conclusion #5)**



The FirstEnergy Revolving Credit Facility agreement was negotiated in late 2016, and had major amendments in 2018, late 2020, January 2021 and July 2021. The establishment of the FirstEnergy Revolving Credit Facility and amendments to it are major events regarding JCP&L liquidity that also required Board resolutions to become effective. Liberty’s review of JCP&L Board minutes and presentations for 2016, 2020 and 2021 did not find information related to the original Revolving Credit Facility agreement or amendments.

The JCP&L Treasurer acknowledges that he does not make presentations to the JCP&L Board regarding the negotiation or operation of the Revolving Credit Facility or the Money Pool, the company’s crucial liquidity resources. The negotiation and approval of and major changes to these liquidity sources, as well as the monitoring of liquidity operations, are major financing decisions that should entail specific input from JCP&L and Board approvals to protect the interests of the utility and its customers.

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Chapter XII: External Affairs - - The “DOJ Investigation”

A. Background

We have been tasked with examining the consequences for JCP&L of matters associated with what has been termed “the DOJ Investigation” and related matters. The Office of the U.S. Attorney for the Southern District of Ohio has been conducting an investigation that produced a late-July 2020 announcement of grand jury indictments of the Speaker of the Ohio House of Representatives, a campaign and political strategist of Speaker, and three lobbyists in Ohio. On July 20, 2021 the United States Attorney’s Office entered a Deferred Prosecution Agreement that addresses FirstEnergy Corp.’s engagement in activities associated with the earlier, 2020 indictments.

This agreement came in the criminal proceeding captioned *UNITED STATES OF AMERICA, Plaintiff, vs. FIRSTENERGY CORP., Defendant*. The deferred prosecution agreement calls for the filing of a charge of conspiracy to commit honest services wire fraud, subject to dismissal, should the company comply with the agreement over its continuing course. The agreement requires FirstEnergy to pay a \$230 million penalty, not subject to rate recovery from JCP&L customers and those of the other operating companies.

Our examination began with attempts, essentially unsuccessful, to learn more about the DOJ Investigation than had already reached the public. To the extent we learned more, it largely came from information made public through work leading to prosecution of FirstEnergy by federal authorities for wire fraud.

We also examined the conduct and implications for JCP&L of an examination FirstEnergy undertook of a set of vendor invoices and the charging, assignment, or allocation of their costs to the operating companies. That examination found costs assigned or allocated to the operating companies, including JCP&L, improperly or without sufficient justification. We also learned of a lawsuit that involves the downloading of FirstEnergy files by an individual recently terminated by an outside firm that had for some time been providing audit services to FirstEnergy. The individual provided those files to the Securities and Exchange Commission, has alleged that they demonstrate conduct that violates the law, and has connected the removal of the files to matters associated with event addressed in the DOJ Investigation.

These circumstances and actions we addressed inextricably engage the external affairs organizations, resources, and activities that FirstEnergy employs at the corporate level to serve JCP&L, among the other affiliates. They provide a framework essential to understanding how and how well FirstEnergy has served and continues to serve the interests of JCP&L. The questions normally applicable to a management and operations audit’s examination of external affairs paled in importance when compared with the impacts and implications of the DOJ Investigation and related matters. That investigation would ultimately lead to the dismissals or separation of eleven senior executives and managers with responsibility for external affairs across the range of FirstEnergy operations, including for JCP&L. It would also produce a deferred prosecution agreement under which FirstEnergy accepted responsibility for the commission of a federal, criminal wire fraud.

We learned at the outset of our work of management’s own examination of a set of vendor invoices and charges, which showed mis-classified, insufficiently substantiated, or incorrectly allocated charges to JCP&L. There appeared to be some connection between this examination and matters connected with the DOJ Investigation. We had some optimism that a looming resolution of at least some of the issues under federal investigation would cause a relaxation of consistent company refusal to provide more than already-public information (with some fairly narrow exceptions), but that has proven unfounded. The July 22, 2021 announcement of the Deferred Prosecution Agreement and an accompanying Statement of Facts whose truth FirstEnergy’s CEO has acknowledged caused the release of more public information. Our optimism about meaningful transparency from FirstEnergy has faded, as management continues to use various claims of legal privilege to deny us important information. We still remain largely dependent on public information, to the credit, it appears, of the U.S. Attorney’s Office for the Southern District of Ohio - - not FirstEnergy.

Nevertheless, the available information gave strong reason to connect those issues to conduct or inaction by the former FirstEnergy CEO, and senior leadership of FirstEnergy external affairs (which included company lawyers). We made baseline inquiries into matters involving the “investigations.”

B. Findings

1. The “DOJ Investigation”

a. Background

Our engagement included an examination of the implications for JCP&L and New Jersey of what has come to be termed “the DOJ Investigation.” Our work began with some public knowledge about the existence of investigations surrounding activities largely focused on legislative and executive matters - - functional areas largely within the responsibility of FirstEnergy’s external affairs functions (which included responsibility for managing both legislative and regulatory affairs). We sought to learn about those investigations and their potential implications for JCP&L and its customers, but met strong and consistent company resistance in providing information other than that already made public (for example, in its releases and reports to the Securities and Exchange Commission). This chapter generally, supplemented by its appendix, summarizes the difficulties we encountered, whose resulting barriers have made FirstEnergy a significant outlier in providing transparency regarding matters with potentially very large implications for operations and costs.

The DOJ Investigation’s existence became known with the late-July 2020 announcement by the U.S. Attorney’s Office of grand jury indictments of the Ohio House Speaker and four others. The announcement of the federal racketeering conspiracy indictments cited payments of about \$60 million to a 501(c)(4) entity for the purpose of securing the passage and upholding of a “billion-dollar nuclear plant bailout.”

Section 501(c)(4) organizations can qualify for income tax exemption when organized solely to promote social welfare, are not organized on a for-profit basis, and do not produce earnings enuring to the benefit of private shareholder or individual. Section 501(c)(4) organizations can seek

adoption of legislation, including lobbying, relevant in attaining its social welfare purposes. However, Section 501(c)(4) organizations may not directly or indirectly participate in political campaigns for public office. They may engage in political activity, but not as a primary activity. Section 501(c)(4) entities have grown very substantially as sources of political spending following the landmark ruling of the U.S. Supreme Court in the *Citizens United* case. They can, like other groups, participate in political activities, but they do so not under Federal Election Commission oversight, which requires disclosure of contributors and expenditures. The IRS, which oversees Section 501(c)(4) entities, does not require filing and disclosure of the sources of their funding or about much of their spending, apart from expenditures explicitly advocating for or against a candidate or made for issue ads run close to an election.

b. Senior FirstEnergy Personnel Terminations and Separations

The information about the investigations available in the first stages of our audit focused on Ohio, and in particular on actions by top-level FirstEnergy personnel. Nevertheless, even early information raised implications for New Jersey. Senior personnel terminated or “separated” from the company had responsibilities that extended across multiple or all of the FirstEnergy operating companies, including JCP&L. The list of individuals terminated or separated is long and involves top-level FirstEnergy corporate leadership, FirstEnergy’s two top legal officers, executives responsible for external affairs, two senior lawyers (one responsible for state regulatory matters) and two persons responsible for regulatory or government affairs in Ohio):

- President and Chief Executive Officer, termination announced and effective October 29, 2020
- Senior Vice President of Product Development, Marketing, and Branding: termination announced and effective October 29, 2020
- Senior Vice President of External Affairs, termination announced and effective October 29, 2020
- Senior Vice President and Chief Legal Officer: separation announced and effective November 8, 2020
- Vice President, General Counsel, and Chief Ethics Officer (also serving as Vice President, General Counsel), separation announced and effective November 8, 2020

- [REDACTED]

FirstEnergy manages external affairs and legal affairs related thereto at the corporate level. The senior personnel terminated or separated since last October whose responsibilities are known to us had responsibility for JCP&L and New Jersey matters managed or executed at the FirstEnergy level. We inquired into the bases for the terminations and separations, reported as connected with the DOJ Investigation. Given their responsibilities, these inquiries fall within the base scope of our

engagement, which directly included external affairs. We also considered them relevant in addressing the request that we address the DOJ Investigation.

Our baseline inquiries sought to learn about:

- U.S. Department of Justice, Federal Energy Regulatory Commission, Securities and Exchange Commission, internal and any other investigations of conduct surrounding external affairs associated with what we knew publicly about events and charges involving activities in Ohio
- What events transpired and who led and participated in them
- How those events came to happen
- Dollar amounts of payments in question
- What controls existed and if and how they may have failed
- Communications about the matters at issue with the FirstEnergy Internal Audit department, the independent auditors (PWC), and the Audit Committee of the Board of Directors
- Identification of gaps, deficiencies, and problems, remediation plans, and accomplishments to date
- Assurance that internal investigation was thorough and remediation successful
- Assurance that amounts improperly charged to JCP&L have been captured and reversed, including, but not limited to, refunds to ratepayers for amounts improperly included in rate proceedings.
- Assurances that the improprieties engaged in by the eleven executives no longer employed did not extend to others still employed.

We made these inquiries to assess potential consequences and implications for the effectiveness of external affairs management and operation related to JCP&L and to frame an examination of the potential for inappropriate cost charging, assignment, or allocation to JCP&L.

The structure and conduct of external affairs and legal performance that may concern those affairs give the responsibilities, decisions, actions, and inactions of most of the terminated or separated persons power that affect JCP&L and New Jersey directly or indirectly. We asked for information about the departures of five executives, specifically requesting that management “describe in detail the specific reasons” for their separation. Management provided only the information already available in FirstEnergy Corp’s 10-Q Reports to the Securities and Exchange Commission. The response said that FirstEnergy terminated three top officers on October 29, 2020:

- FirstEnergy CEO
- Senior Vice President of Product Development, Marketing and Branding
- Senior Vice President, External Affairs.

As we summarize below, the reasons provided were in no meaningful way specific or helpful in assessing implications for JCP&L. In some cases, we could not even determine to which executives the reasons offered applied. The response was transparent in repeating public statements, but nothing short of opaque in providing information useful in determining implications for how corporate level FirstEnergy leadership managed external affairs and related legal matters with implications for JCP&L or New Jersey. More importantly, the phrasing opens the question of whether additional personnel were involved in whatever may have been specific

actions or inactions behind the terminations. For example, the one specific act cited related to an approximately \$4 million 2019 payment in connection with termination of a consulting agreement (benefitting, according to the U.S. Attorney’s Office a person who became the Chair of the Public Utilities Commission of Ohio). However, the wording appears carefully to avoid identifying those among the three terminated executives who were involved.

The extremely general reasons given for the terminations were failures to:

- Maintain and promote a control environment with an appropriate tone (no discussion of specifics to support this general statement)
- Sufficiently promote, monitor, or enforce adherence to certain FirstEnergy policies and code of conduct (no discussion of specifics to support this general statement)
- Ensure communication of relevant information by certain former members of senior management (no identification of who those members were, whether they included other members of management, or whether they even included some or all of the three executives about whom the statement appears to address).

The response addressing the November 8, 2020 separation of FirstEnergy’s Senior Vice President and Chief Legal Officer and its Chief Ethics Officer (also serving as Vice President, General Counsel), also limited to information already public in 10-Q reports simply cited “inaction and conduct that the Board determined was influenced by the improper tone at the top.”

Perhaps the most detailed information from management came with regard to the May 27, 2021 separation of the FirstEnergy Vice President, Rates and Regulatory Affairs, and Acting Vice President, External Affairs. This executive, with almost four decades of experience with FirstEnergy, had responsibility for all aspects of federal and state regulatory affairs, strategy, analytics, and forecasting across the spectrum of FirstEnergy operating utilities, including JCP&L. The executive also directed and coordinated, Regulatory Affairs, Regulatory Strategy, Regulatory Analytics and Forecasting processes. These responsibilities included directing, coordinating, and administering regulatory issues and proceedings for all the FirstEnergy operating utilities and transmission companies. Management’s response to our requests for the reasons for the separation of this executive cited “inaction” regarding a 2015 amendment of the above-noted consulting agreement terminated in 2019 with the approximately \$4.3 million payment.

We learned of a [REDACTED]

Similarly, we asked for the specific reasons for the separation of [REDACTED] executives [REDACTED]. Responses to these requests were likewise lacking any useful detail.

FirstEnergy has described only the first three (October 2020) departures as terminations, calling the remainder separations. We asked for the distinction between the two actions; management did not explain it.

c. The Deferred Prosecution Agreement

The Office of the U.S. Attorney for the Southern District of Ohio announced on July 22, 2021 federal wire fraud charges growing out of the DOJ Investigation. The announcement stated that:

FirstEnergy Corp. acknowledged in the deferred prosecution agreement that it paid millions of dollars to an elected state public official through the official’s alleged 501(c)(4) in return for the official pursuing nuclear legislation for FirstEnergy Corp.’s benefit.

The company also acknowledged that it used 501(c)(4) entities, including one it controlled, to further the scheme because it allowed certain FirstEnergy Corp. executives and co-conspirators to conceal from the public the nature, source and control of payments.

This July 20, 2021 Deferred Prosecution Agreement with the United States Attorney’s Office for the Southern District of Ohio came in the criminal proceeding captioned *UNITED STATES OF AMERICA, Plaintiff, vs. FIRSTENERGY CORP., Defendant*. Under the three-year agreement, FirstEnergy has agreed to the government’s filing of a single charge of conspiracy to commit honest services wire fraud. The charge will be dismissed, provided FirstEnergy abides by all terms of the agreement, which include a penalty of \$230 million - - expected by the company to be charged in 2021. Then penalty will be split equally between the U.S. Treasury and the “Ohio Development Service Agency’s Percentage of Income Payment Plan Plus program for the benefit of Ohio electric-utility customers.” The agreement prohibits FirstEnergy Corp. from seeking recovery of any of the \$230 million directly or indirectly from customers.

FirstEnergy Corp. has agreed not to contradict the Statement of Facts made part of the Deferred Prosecution Agreement (as Attachment A) and that the Statement’s facts are true and accurate. The government acknowledged substantial cooperation by FirstEnergy Corp., citing specifically a thorough internal investigation by the company, its proactive identification of issues and facts, regular factual presentations, and the sharing of information not otherwise available to the government.

Through the Statement of Facts, FirstEnergy Corp. has acknowledged conspiring through the acts of its officers, employees, and agents, with public officials and others to pay millions to and for the benefit of public officials in exchange for specific official actions for FirstEnergy Corp.’s benefit; e.g., securing the passage of favorable nuclear legislation by the Ohio legislature and in official actions as a utility regulatory official on ratemaking matters.

FirstEnergy acknowledged in a Statement of Facts made part of a Deferred Prosecution Agreement the truth and accuracy of statements that include the following:

Partners for Progress, Inc. was incorporated in Delaware on or about February 6, 2017, weeks after certain FirstEnergy Corp. senior executives traveled with Public Official A on the FirstEnergy Corp. jet to the presidential inauguration in January 2017. On or about February 8, 2017, Partners for Progress registered as a foreign nonprofit corporation in Ohio, specifically as a 501(c)(4) entity “to engage in activities consistent with those

permitted of an organization exempt from tax under Section 501(c)(4) of the Internal Revenue Code...

FirstEnergy Corp. exclusively funded Partners for Progress through payments from FirstEnergy Service, which totaled approximately \$25 million between 2017 and 2019

To further the scheme, FirstEnergy Corp. used Partners for Progress, a 501(c)(4) controlled by and operating for the benefit of FirstEnergy Corp., to conceal payments to Public Official A. In October 2019, FirstEnergy Corp. paid \$10 million (October 10, 2019) and \$3 million (October 22, 2019) to Generation Now for Public Official A’s benefit by first wiring the money through Partners for Progress rather than paying the money to Generation Now directly.

The Statement of Facts ends with the signature of the FirstEnergy CEO on July 20, 2021 under his acknowledgement as follows:

As set forth in the Corporate Officer’s Certificate, I am duly authorized to execute this Agreement on behalf of FirstEnergy Corp. I have read the Statement of Facts and have carefully reviewed it with counsel for FirstEnergy Corp. and FirstEnergy Corp.’s Board of Directors. On behalf of FirstEnergy Corp., I acknowledge that the Statement of Facts is true and correct.

We also asked for all payments made to any non-profit entity to the extent they exceeded \$1 million total for a year. The response listed payments out of the Corporate Affairs and Community Involvement group to Edison Electric Institute. That response did not appear to match the breadth of the Statement of Facts made part of a Deferred Prosecution Agreement. A follow up question clarified that the earlier request sought all payments to non-profits, not just from the Corporate Affairs and Community Involvement group identified in the earlier response. Management responded that the Accounts Payable master data did not track vendors by tax exempt status historically, and therefore it could not answer the question.

FirstEnergy’s use of non-profits as acknowledged in the Statement of Facts made part of a Deferred Prosecution Agreement makes the responses troubling. The later response disclaims an ability to provide information relevant to examine in determining whether use of non-profits similar to that acknowledged in the Statement of Facts has occurred in other cases and if so, with potential assignment or allocation of costs to JCP&L.

d. Use of Non-Profits and Payments to Influence Ohio Legislation

The Deferred Prosecution Agreement’s Statement of Facts sets forth facts that FirstEnergy Corp. has agreed accurately reflect important elements of its execution of external affairs activities, as the next two subsections summarize. We summarize those relating to Ohio circumstances below.

By November 2016, FirstEnergy Corp. had begun reporting conditions threatening large losses from its generation business. In 2017 and 2018, the company was seeking a federal solution that would benefit its generation business. FirstEnergy Corp. executives met with federal officials and hired consultants closely connected to federal officials. FirstEnergy Service Company also approved a \$5,000,000 wire to a 501(c)(4) entity connected to federal official(s) around May 1, 2017, shortly after hiring a consultant with close connections to those federal official(s). By the fall of 2018, FirstEnergy Corp., with doubts about the eventuality of federal action, focused on an Ohio solution for addressing losses being sustained at its nuclear power plants.

The government found that it could institute criminal or civil forfeiture proceedings against certain funds that passed through accounts controlled by FirstEnergy Corp. to the accounts of Partners for Progress Inc. in the amounts of \$6,366,476.29 and of \$108,960.32. As mentioned above, Partners for Progress was controlled in part by certain former FirstEnergy executives, who funded it and directed its payments to entities associated with public officials. FirstEnergy executives participated in choosing the three directors of Partners for Progress, two of whom were FirstEnergy lobbyists.

Before the formal organization of Partners for Progress, *Executive 2* directed that \$5 million be designated for an unnamed 501(c)(4) in December 2016. Payments from FirstEnergy Service exclusively funded Partners for Progress through payments of about \$25 million between 2017 and 2019. This amount includes payments of about \$15 million that Partners for Progress eventually made to Generation Now. This 501(c)(4) entity began in early 2017 and was known by FirstEnergy to be controlled by the same state legislator. Between 2017 and March 2020, FirstEnergy Service paid to Generation Now \$16,904,330.86 attributable to FirstEnergy and \$43,092,505 attributable to FirstEnergy Solutions.

The various payments associated with the state legislator included, among others:

- April 2018: approximately \$400,000 paid through another 501(c)(4) entity
- Mid-August 2018: wire of \$500,000 from Partners for Progress to Generation Now
- October 2018, FES payment of another \$500,000, with \$400,000 hand-delivered
- October 29, 2018 \$500,000 electronic transfer to a Dark Money Group for the benefit of the state legislator.

Following the election in November 2018, a nuclear support bill was introduced in the Ohio House in April 2019. Between then and October 2019, FES wire transfers to Generation Now exceeded \$40 million and those of Partners for Progress to Generation Now exceeded \$13 million.

The Statement of Facts recites substantial payments related to countering the potential for a referendum that would defeat the enacted legislation addressing nuclear generation in Ohio:

- October 10, 2019: \$10 million wired at the request of FES to Partners for Progress, then paid to Generation Now
- October 22, 2019: \$3 million wired request of FES to Partners for Progress, then paid to Generation Now.

The Statement of Facts recites a March 2, 2020 FirstEnergy wiring of \$2 million Partners for Progress to Generation Now.

e. The Consulting Agreement

The Statement of Facts also described actions related to what was termed a consulting agreement. FirstEnergy Corp. entered into a contract with two companies in 2010. The same individual owned both companies. Through FirstEnergy Service Company, FirstEnergy Corp. later entered another agreement with one of those companies in 2013. The owner worked at a law firm, serving as general counsel for an industrial group of energy users. The parties amended that agreement in

2015, in exchange for the withdrawal by an industrial group of its opposition to a settlement package in proceedings before the Public Utilities Commission of Ohio. The owner became Chair of the Ohio commission in April 2019.

The 2015 amendment was not actually executed, but payments were made pursuant to its terms, with invoices from the service provider structured to bypass FirstEnergy’s required approval authority levels. Between 2010 and January 2, 2019, FirstEnergy Service payments under the agreements totaled over \$22 million. This sum included \$4,333,333 wired around January 2, 2019 through FirstEnergy Service to one of those companies. This payment reflected the payments that would have come due between 2019 and 2024, were the consulting relationship to have lasted that long. Following discussion about this payment, FirstEnergy Corp. “pushed” for the individual’s appointment as commission chair.

The Statement of Facts cites FirstEnergy’s purpose in making the January 2, 2019 payment as furthering its interests in passing nuclear legislation and other FirstEnergy legislative and regulatory priorities, as opportunities arose.

f. Remedial Actions

The Deferred Prosecution Agreement contains an extensive list of controls, compliance code, policies, and procedures commitments, obligating FirstEnergy to modify its existing program where required to meet them:

High-Level Commitment

1. Strong, explicit, visible director and senior management support and commitment against violations of U.S. law and FirstEnergy’s compliance code.

Policies and Procedures

2. Clearly articulated, visible corporate policy against violations of U.S. law set forth in a written compliance code.
3. Compliance policies and procedures designed to reduce the risk of violations of U.S. law and FirstEnergy Corp.’s compliance code
4. Appropriate measures to encourage and support observance of policies and procedures against violation of U.S. law by personnel at all levels of FirstEnergy Corp.
5. Application of such policies and procedures shall apply to all directors, officers, and employees and outside parties acting on behalf of FirstEnergy Corp.
6. Notification to all employees that compliance is the duty of all at the company.
7. Ensuring a system of financial and accounting procedures and internal controls designed to maintain fair and accurate books, records, and accounts
8. Design sufficient to (a) provide reasonable assurances that transaction recording permits preparation of financial statements in conformity accounting principles and other criteria applicable to such statements and (b) maintain accountability for assets.
9. Ensuring that all contributions to 501(c)(4) entities and all payments to entities operating for the benefit of a public official get review and approved by a trained compliance officer
10. Quarterly reports to the board of amounts, beneficiaries, and purposes of such contributions and payments
11. Ensuring review and approval of lobbying and consultant contracts by a compliance officer trained to evaluate conformity of contract and payment purposes with law

12. Ensuring compliance code prohibition of billing and payment practices used to subvert internal controls

Periodic Risk-Based Review

13. Use of periodic risk assessment to develop compliance policies and procedures

14. Annual review of policies and procedures and updating as required

Proper Oversight and Independence

15. Assignment of senior corporate executive responsibility for compliance code, policies, and procedures implementation and oversight

16. Allowance of direct reporting of those filling that role to internal audit, and to the board and its committees

17. Autonomy of those filling that role from management and sufficient resources and authority to maintain it

Training and Guidance

18. Mechanisms to ensure effective communication of compliance code, policies, and procedures

19. Periodic training for all directors, officers, employees in positions of leadership or trust, positions that require such training, and, as appropriate, agents and business partners

20. Certifications by all covered of compliance with training requirements

21. An effective system for providing guidance and advice (available on an urgent basis) on complying with compliance code, policies, and procedures

Internal Reporting and Investigation

22. An effective system for internal and confidential reporting and protection of reporters regarding violations of U.S. law and compliance code, policies, and procedures.

23. An effective and reliable process and sufficient resources addressing allegations of violations

Enforcement and Discipline

24. Mechanisms for effective enforcement of compliance code, policies, and procedures

25. Effective incentives for compliance and discipline for violation

26. Disciplinary procedures appropriate for addressing violations of law and compliance code, policies, and procedures

27. Procedures to remedy harm from incidents of misconduct discovered, prevent repetition, and assess need for modification internal controls, compliance code, policies, and procedures

Mergers and Acquisitions

28. Requirement to conduct appropriate risk-based due diligence on potential mergers and acquisitions

29. Prompt application of compliance code, policies, and procedures and training requirements to new acquisitions

Periodic Reviews and Testing

30. Periodic reviews and testing of compliance code, policies, and procedures, to evaluate and improve their effectiveness.

Citing its cooperation with the federal investigation, FirstEnergy reported “...sharing information that would not have been otherwise available to the government; and making such material available to the government on an expedited basis.”

FirstEnergy cited remedial actions in the following four categories:

- Employment consequences for executives and employees who engaged in misconduct

- Compliance program enhancements
- Policy and procedure improvements
- Monetary remediation to ratepayers.

Other actions taken include

- Establishing a board of directors executive director role (supporting enhanced controls and governance policies and procedures)
- Hiring a new chief legal officer, with responsibility for the legal and internal audit departments
- Ending the prior combination of chief legal officer and chief ethics and compliance officer
- Hiring a new chief ethics and compliance officer, reporting directly to the Audit Committee of the board and administratively to the chief legal officer
- Working to establish a culture of ethics, integrity, and accountability at every level of the organization
- Creating a Compliance Oversight Subcommittee of the board Audit Committee to implement compliance recommendations received from outside counsel
- Reviewing and revising political activity and lobbying/consulting practices
- Requiring “robust” disclosures about lobbying activities.

g. Other DOJ Investigation Data Limitations

The appendix to this chapter details or lists additional failures of management to respond transparently and fully to a number of data requests impairing our ability to make a full assessment of the implications for New Jersey of the DOJ Investigation and related matters.

2. *DOJ-Related Examination and Audit Costs*

We asked for the types of outside counsel costs assigned to JCP&L for the audit. The response simply identified Cozen O’Conner as the outside counsel. We also asked for the accounting for employee time related to the investigations. The response stated that the parent bore FirstEnergy costs, but employee and outside costs associated with audits by state regulators are being charged to the utility. Management provided a largely non-responsive answer to a data request asking for a schedule of costs that have been charged to the parent for investigation.

3. *Information Provided to Other Authorities*

We sought to gain insight into the DOJ Investigation’s potential impacts on JCP&L by asking for copies of all responses to data requests, information requests, interrogatories, or other formal requests for information from the Securities and Exchange Commission (SEC), Federal Energy Regulatory Commission (FERC), or any state regulatory authority where FirstEnergy has an operating utility. We received no substantive response. Management objected to answering on three bases:

- The question was not relevant and beyond the scope of the audit
- Both the FERC and SEC investigations are confidential, non-public and protected from disclosure

- The request was overly broad and unduly burdensome.

The objections observed that “ongoing audits” in Pennsylvania and Ohio were not related to JCP&L and therefore not relevant to the scope of our examination and that Ohio law protects information of the type protected from disclosure. This question followed up on an interviewee statement noting the existence of investigations underway by such authorities. The request did not extend beyond filings already made to regulatory authorities; *i.e.*, documents already existing and provided to government authorities. Thus, to the extent that FirstEnergy entities have responded to such requests, they leave us, on behalf of the BPU without information that other government authorities outside the U.S. Attorney’s office already have.

A separate request sought any findings to date in Federal Energy Regulatory Commission investigation referred to by management as underway. Management responded that there were no findings yet, but went on to say that when findings are made, the BPU would get a copy of all public findings, but that non-public findings would be confidential and protected from disclosure. It then made an objection to providing any findings other than public ones, citing federal statutory and regulatory limitations that permit only the FERC to “authorize the public disclosure of the existence of an investigation or information obtained during an investigation.” Responses to requests for information are not public when the company requests confidential treatment of them - - which it has done as a matter of course to date. Moreover, the response discloses no offer or intent to request release even if required despite the fact that it has already established the FERC communications links through which to do so. The company has understood since audit inception the need for dispatch in meeting the audit’s schedule. Its flat avoidance of support for providing the information requested is inconsistent with the profession of transparency it makes publicly. Its position is that the BPU may have only what the general public sees with respect to the FERC investigation.

4. *The “Vendor Invoice” Issue*

a. Background

We began work in a number of areas with presentations we asked management to provide. FirstEnergy offered at a kickoff session principally scheduled to address credit ratings a presentation titled, “Overview of Certain Payments and Discussion of Customer Refunds” The presentation, initially prepared for the BPU, presented management’s summary of payments to outside vendors - - payments determined to have been improperly charged to JCP&L through improper classification, misallocation, lack of sufficient supporting documentation, or some combination thereof. The presentation concluded that the improper charges had resulted in \$525,000 collected through customer electric service charges in New Jersey through the end of 2020.

Examination of the kickoff presentation indicated the potential for a larger issue than that management presented. We inquired into management’s efforts to address the vendor payments issue at an interview with FirstEnergy’s Vice President, Controller and Chief Accounting Officer. We sought to understand the purpose, scope, status, and findings of management’s review of vendor payments. We had initially anticipated addressing it in our coming work on cost assignment and allocation, but learned that it has connections, at least in the origins of management’s examination, to the DOJ Investigation.

We therefore sought to understand those connections in addressing the DOJ Investigation and in scoping our later review of cost assignment and allocation. We asked about timing, status of the investigations, terminations of senior officers, communications with internal auditors, the company’s independent accountants, and the Audit Committee of the FirstEnergy Board of Directors, how the situation happened, what internal controls failed, remediation efforts, and evidence that their investigation was thorough, complete, and demonstrated, with some level of confidence, that the issue has been fully remediated.

b. Management’s Invoice Examination

An extended series of interview questions and data requests have left us with little regarding the reasons for developing concern about the propriety and accuracy of assigning and allocating vendor costs to JCP&L. It does appear, that concern arose somehow in connection with knowledge gained during the course of examinations commencing after the July 2020 announcement of the federal indictment of Ohio officials, but we have seen no documentation of that and our questions of management produced no helpful detail.

We asked a comprehensive data request to learn more about the vendor examination. We understood that the examination had produced findings raising three important concerns regarding costs charged to FirstEnergy electricity delivery customers:

- Charges for goods or services not actually rendered or received
- Charges for which available documentation did not support such charges sufficiently
- Charges charged, assigned, or allocated improperly.

These three factors comprise fundamental underpinnings of effective control of ensuring the propriety and accuracy of costs charged from central corporate providers to operating companies like JCP&L.

[REDACTED]

[REDACTED]. Materiality measured with respect to the FirstEnergy consolidated financial statements has applicability for multiple purposes, including ensuring proper charges to JCP&L, but it is not alone sufficient for that purpose, given:

- The scope and scale of the New Jersey utility’s operations
- The nature and extent of inquiries in state utility rate proceedings into costs that comprise part of revenue requirements
- That the first (at least) of the concerns listed immediately above and the implications of the conduct alleged regarding the Ohio matters indicate the potential not merely for accidental or even merely negligent conduct or attention, but deliberate misrepresentation.

Before we issued that comprehensive data request, we made clear the nature and importance of our interest in understanding the nature and details of company efforts to designing and executing an examination of vendors and transactions commensurate with both the information that caused its initiation and the information learned in conducting it. We sought to validate two essential things.

First, we sought to confirm that the findings reached about costs charged to JCP&L resulted from a soundly designed, objectively and diligently executed examination plan, and produced results accurately and fully capturing both improper and insufficiently substantiated costs to JCP&L.

Our second goal was substantially far more important. It was to determine whether it is sound to conclude from the company’s efforts that no further substantial risk of improper or insufficiently substantiated costs to JCP&L existed.

We have been denied access to the information necessary to identify results for the population of vendors and transactions examined. We do not know how representative that population is of the full universe of vendors and transactions whose costs end up charged to JCP&L. We do not know what the results of the company’s efforts show about the risks that similar issues affect more than the population examined. We do not know how management either qualitatively or quantitatively determined whether and if so, why the initial list of vendors subject to examination was broadened to address risks of similar problems in other parts of the vendor universe.

c. Remediation Plans and Actions

We requested documentation of actions to remediate issues disclosed by the Vendor Invoice examination and to strengthen internal controls and of status in executing those actions. A response listed a series of payment processing enhancements made or underway:

- Additional processes and procedures to prevent/detect payments (completed in second quarter of 2021)
 - Made to a vendor through the Non-Purchase Order process
 - That do not meet the policy
 - Not associated with a valid contract
- Additional processes and procedures to prevent/detect vendor payments separated to circumvent Level of Signature Authority (LOSA) limits (completed in second quarter of 2021)
- Policy and control enhancements and clarifications, including requirements around legal agreements (ongoing, expected to be complete in third quarter of 2021)
- Further training and communication in payment processing policies, requirements, and LOSA setting (ongoing)
- SAP configuration changes in SAP to ensure payment-processing employees confirm the existence of a contract and proper documentation (completed in second quarter of 2021)
- Regular audits and data analytics on payment processing to confirm appropriate approval process, existence of contracts, substantiation of services/value provided, etc. (ongoing).

Management plans no further activities to provide assurance that the issues identified in the Vendor Invoice examination have been remediated, considering the payment processing deficiency corrected.

d. Potential for Additional Invoice Questionability

We do not know whether the findings as to the population examined are correct and more importantly, we do not know if, where, or why the examiners expanded the population to ensure that the full scope of compliance concerns was investigated.

To put the controlling point succinctly, we have no way of knowing whether it is proper to put confidence in a conclusion that the three concerns (among them dishonesty) have not had substantially greater impact on the accuracy of charges made to JCP&L. Moreover, we do not consider a calculation limited to costs improperly included or included with less than full substantiation in a test period an appropriate measure of their materiality. Costs need to be accurately accounted for on an ongoing basis, not just during test years. We have been auditing affiliate costs and allocations in broad management and operations audits and in audits limited to affiliate costs for 30 years. Our scope in more than two dozen reviews has not been limited to determining revenue requirements impacts, but rather to how effectively such costs are accounted for and charged, assigned, and allocated on an ongoing basis. Controlling them properly on an ongoing basis is required to ensure that no occasion arises for them to influence revenue requirements improperly.

We encountered a persistent lack of transparency in providing the information needed to address the implications of the DOJ Investigation for FirstEnergy management or conduct of external affairs affecting JCP&L and to identify any adverse cost impacts to customer rates in New Jersey. That lack of transparency affected four investigation aspects we sought to examine:

- Scope and methods of management’s investigation
- Comprehensiveness of management’s investigation
- Costs of management’s investigation
- Remediation of issues identified.

Management’s lack of transparency in addressing its Vendor Invoice examination creates substantial uncertainty (apart from accepting management’s word) about the ultimate magnitude of the issues and the accounting for payments. At a minimum, this uncertainty will guide our Phase 2 examination of cost assignment and allocation. Moreover, while management has acknowledged and reported a single material weakness in controls (Tone at the Top), controls weaknesses exposed and the effectiveness of remediation remain an issue for Phase 2’s examination of controls. Finally, the lack of information about management’s own investigation, shrouded by claims of privilege, leaves its statement that no further unsoundly assigned or allocated costs have come to JCP&L costs verified only by management’s verbal assertions of that conclusion and description of its examination.

As with other areas of inquiry related to or arising from our attempted examination of the DOJ Investigation, management has failed to provide requested information on multiple occasions, impairing that examination and raising substantial concerns about the transparency on which effective management of regulatory relations depends. The appendix to this chapter describes our inquiries and, where applicable, the limits management has imposed on our ability to reach meaningful conclusions about risks of JCP&L responsibility for costs for goods or services not actually rendered or received, costs lacking sufficient support, and costs charged, assigned, or allocated improperly.

e. Vendor Issue Costs Impacts for JCP&L Customers

The presentation made at our kickoff meetings (and apparently provided earlier to BPU representatives) constrained the size of the electric distribution rates concern for JCP&L

customers. The overview slide shows approximately \$525,000 collected through December 31, 2020, but the underlying calculations slide shows revenues to be collected in 2021 of \$307,524, the addition of which makes the impact higher. Moreover, this amount only captures revenue requirements impacts from 2016 and 2020 rate cases. Management sized the overall cost from 2016 through 2020 at \$26.8 million. For the longer period beginning with 2005 the FirstEnergy total amounted to \$43,207,630 - - \$1,653,673 attributed to JCP&L.

Portions of payments to Hardworking Ohioans and Generation Now were allocated to JCP&L and were disclosed in the “Vendor Payments and Customer Collections” slide of the presentation. We learned that management “inadvertently did not include” these two vendors in a calculation spreadsheet provided to us - - later corrected. The Statement of Facts made part of a Deferred Prosecution Agreement makes clear that one of them served as a principal conduit for the FirstEnergy conduct leading to the agreement, making forgetting to include a major omission.

Given the concerns raised by expenditures to influence matters of public policy in Ohio and the separation of executive leaders with responsibility for external affairs, we inquired into the costs for professional services retained by FirstEnergy external affairs organizations. Excluding Generation Now, Inc. and Hardworking Ohioans, the costs reported by FirstEnergy since 2017 amounted to about \$750,000, made to 23 entities. FirstEnergy reported that about three percent of them did not relate to services benefitting JCP&L and that it could not state that three percent of them related to services benefitting JCP&L. We consider a 57 percent confirmation rate of benefit to New Jersey by provider and 93 percent by dollars both concerning low; however, we find the dollar amounts of the unconfirmed transactions (about \$50,000) nominal.

5. Controls Weakness

We asked for Internal Audit reports, investigations, or other activities regarding the Vendor Invoice examination and management’s responses to them. After objecting to the question on legal grounds, the response redefined it inappropriately, limiting it to Internal Audit activity conducted relative to the 2020 10-K disclosure. Even as redefined, it merely addressed the scope of the work performed, but did not provide any reports or other requested information. A supplemental response referred to copies of SOX control reviews conducted by Internal Audit. This was also not responsive to a request for Internal Audit reports dealing with the vendor invoice issue.

The response provided the company’s views of the sufficiency of its inquiries, the accuracy of its findings, and the correctness of its view exceptions resulted. It provided only a general outline of the scope, methods, and procedures of its examination, requiring any conclusion from us to rely solely on trust, and not any independent insight into methods, techniques, and results. As outside counsel observed in the interview with the controller that first addressed this issue said, “we” (interpreted as meaning the BPU) could do its own detailed review. However, in the absence of visibility into what the company has done, despite our requests for information, a detailed audit of cost accounting, charging, assignment, and allocation does comprise the only alternative to informed reliance on a well-designed, objective, and comprehensive company review. We were seeking to determine whether such a review has in fact taken place - - the company has foreclosed that determination on any basis other than trust.

JCP&L’s presentation to the BPU limited itself to revenue requirement impacts. This limitation was not consistent with full transparency, diminishing the importance of complete, accurate, and objective cost data at all times - - a standard necessary for ensuring that regulators and stakeholders can rely on the information claimed to support rate levels. An audit like this one has the same interest in those criteria on an ongoing and continuing basis.

We also asked for copies of communications, reports or other activities conducted by the independent accountants regarding the Vendor Invoice issues. Following another legal objection, management again narrowed the question it was willing to answer, limiting it to FirstEnergy’s actions to remedy the [REDACTED] in the fourth quarter of 2020. Even as inappropriately limited the response did not provide any reports, but [REDACTED]

Neither was responsive to the question.

[REDACTED]

[REDACTED]

(graphic is confidential)

[REDACTED]

[REDACTED] Clearly, the independent accountants have produced documentation beyond these conclusory statements. The response to the question about the matter does not make clear whether everything else from and about the independent accountants that has a connection to the vendor examination or what conclusions result from it fall under legal privilege, was deemed irrelevant based on the company, or simply omitted. Whatever concern arises from management’s repeated refusals to provide any helpful detail about the vendor examination, there is reason for concern about controls applicable to affiliate cost assignment and allocation, particularly given:

- The independent accountant’s language reproduced above
- A deferred prosecution agreement addressing wire fraud occurring over a multi-year period
- Our observation of a high error rate in a separate, small sample of transactions we examined (described above) - - a sample that involves a different population from the one described

in the company’s disclosure to the BPU about test year errors in and lack of justification for charges to JCP&L.

Management’s response to our request did provide the opinion of the independent accountants that FirstEnergy’s financial statements, “...present fairly, in all material respects, the financial position of the Company...” We would anticipate that similar statements were made on preceding years and that the BPU encounters similar statements virtually always from the utilities it regulates. It nevertheless commissions audit of this type, and in our view correctly, because the standard for materiality on a consolidated basis for a widespread enterprise like FirstEnergy differs substantially from what a state regulatory has concern for validating when it comes to charges to customers in its particular state as opposed to whether dollar amounts accurately accounted for on a consolidated basis have been appropriately allotted to each utility operating company in a large enterprise.

Determining Vendors to Examine: We asked how management determined the list of vendors to subject to review. Management objected on the grounds that this request fell outside the scope of the audit (a commonly repeated, largely gratuitous objection followed by substantive response in most cases) and was subject to legal privilege.

Comprehensiveness of Management’s Examination: To test the reasonableness and comprehensiveness of the invoices investigated, we asked several questions about invoices. First, we asked for 2015 to date payments to vendors that equaled or exceeded \$1 million per year for which JCP&L paid all or part and originating from organizations under the President and CEO, Rates and Regulatory Affairs, External Affairs, CFO, Chief Legal Officer and SVP Strategy. The response provided a schedule of 20 payments, none related to those identified as problem vendors. Without useful data from the DOJ Investigation, one cannot verify that none of the payments in the investigation did not originate in one of those organizations. We also asked for payments from 2015 to date to the extent equal to or greater than \$1 million and originating under the President or External Affairs.

The second response shows a \$20 million payment to a major participant in the money transfers acknowledged by FirstEnergy’s CEO in Statement of Facts made part of a Deferred Prosecution Agreement. The fact that this is the only place that Partners for Progress shows up in the Company’s responses raises questions about the accuracy of the responses provided.

Plans for Further Examination: We asked for a description of any examination and evaluation planned, its current status, its expected completion date, and results to date. The answer stated that, “If FE identifies any other vendor payments that were misallocated to JCP&L, JCP&L will bring forward those amounts.” It did not, however, answer the questions posed, which is whether such plans exist, of what they might consist, or where progress on them stands.

6. *The “57 Documents”*

Litigation involving FirstEnergy produced an April 2021 court order in a federal proceeding in which FirstEnergy was both plaintiff and counter-defendant. The following discussion summarizes factual findings of that order. The reported facts have implications for controls, but also bear upon

the extent of transparency shown in response to our efforts to examine the DOJ Investigation and related matters.

Federal indictments of Ohio officials had become known by July 21, 2020, with their announcement by the U.S. Attorney’s Office for Southern District of Ohio. That announcement connected the indictments with the receipt of millions of dollars in exchange for assistance in passing a bill that would provide assistance intended to forestall the closure of two Ohio nuclear plants owned by a FirstEnergy subsidiary at the time of the underlying activities.

At that time an outside firm that had been doing work for FirstEnergy since 2019, was providing outside audit services to FirstEnergy. An individual working for that outside firm allegedly began to raise on July 23, 2020 concerns within the firm about whether a 2019 audit conducted by the firm had violated federal law. The firm terminated the individual on July 30, 2020, but, according to the individual, the individual had outstanding tasks performed through that day. The individual took 57 files from the firm’s database relating to the 2019 audit of FirstEnergy, and, according to the individual, made an August 7, 2020 confidential report of suspected federal law violations to the SEC.

The firm made an August 20, 2020 request to the individual to notify it of any retention or transfer to others of the 57 files and to delete any retained. The individual’s counsel notified the firm that no sharing of the documents had occurred other than providing them to counsel and to government officials (later identified as the SEC) in connection with possible violations of law. Plaintiffs FirstEnergy and the outside firm filed suit against the individual on September 1, 2020, seeking a temporary restraining order and preliminary injunction to prevent the individual from disseminating trade secrets and confidential information.

The parties agreed to an injunction against the individual’s use or disclosure of the downloaded documents and to their return. However, the agreement permitted the individual’s counsel to retain a copy to defend the litigation and it permitted the individual to “cooperate with the Securities and Exchange Commission or any other governmental agency in their ongoing investigations.” According to the court’s order, counsel for FirstEnergy insisted during negotiation of the injunction to include certain language and refused to proceed without filing on the public docket a letter that identified the individual. This April order held that, “Doing so served no proper purpose.” Describing the filing of the injunction attaching the letter as gratuitous and needless, the order noted no mention of the connection between the individual and any investigation had occurred before the filing of the letter and subsequent news stories in Ohio and across the nation citing the individual’s name.

The order described plaintiffs’ counsels’ statements that the author of the letter and the individual failed to object to its filings as invalid grounds for blaming counsel for the individual, rejecting any claim that making the individual’s name public in connection with investigations of FirstEnergy was a mere “misunderstanding.” The court found that the attachment of the letter “...served no legitimate purpose...” and produced “...the effect of publicly identifying [the individual] as a whistleblower, which has had serious adverse consequences for him, personally and professionally.” The order went on to address implications for FirstEnergy, presumably one of the “clients” referred to in the following quotation:

*Based on this record, the best the Court can say for Plaintiffs' counsel with respect to this filing is that they were negligent **or allowed their clients to use them** to advance improper purposes. In this view, their justifications for filing the letter, though false and unsupported in the record, walk the line of technical compliance with their obligations **while simultaneously advancing the ulterior motives of their clients.** [emphasis added]*

Clearly, the order reaches no conclusions about whether the clients so used the lawyers or had ulterior motives. Moreover, our interests in the matter lie not at all in the conduct of the lawyers per se, but in that of FirstEnergy. In that regard, two issues merit attention:

- Implications for the design and operation of FirstEnergy’s methods treatment of possible whistleblowers
- Whether and if so, what the 57 documents, given their timing and the nature of press reports regarding them, have to do with the matters involving the investigations that we have been asked to examine.

A counterclaim against FirstEnergy Corp. by the individual who downloaded the 57 files became aware of the federal criminal investigation and realized that the firm with which the individual was employed would be tasked with auditing payments related to matters subject to that investigation. The counterclaim states that the individual reviewed FirstEnergy’s instructions for audits to be conducted, finding them in possible violation of federal law. The individual contended that the scope of a 2019 audit was deliberately limited in an unjustified way, and that the individual’s raising of concerns about the audit led to dismissal and to the decision to take 57 files related to the 2019 audit.

We sought to determine whether a connection existed between the vendors included in management’s Vendor Invoice review and the content of the 57 documents eventually provided to the SEC. The delayed response (answered 38 days after our request) stated that its investigation did not occur as a result of or encompass information from the 57 documents, but concerned design and operation of certain controls. Absent further information, such as the document, this response struck us as:

- Warranting further information given the individual’s direct connection between the DOJ Investigation and payments it concerned with the individual’s taking of the files
- If truly unrelated, what other controls activities or issues might exist and their possible implications for JCP&L costs.

The response did not provide the documents for review, but did offer management’s conclusion that the audit did not “evidence accounting irregularities” but rather “provided independent confirmation of FE’s compliance in those areas.” With the audit’s scope challenged and with at least an arguable connection made events involving the DOJ Investigation, we found troubling the decision not to provide the documents, but to summarize the findings.

Another request asked directly for:

- All information alleged to have been downloaded by the individual in connection with his work related to FirstEnergy
- Any other information alleged to have been taken by the individual.

Transparently, the 57 documents must comprise at least a major part of that information, as known by FirstEnergy well before our request. However, the response did not provide them, but referred us to filings on the public contents of the docket of the suit and countersuit (a docket with which company representatives have familiarity). That response was an invitation to spend time learning what those representatives knew - - the documents are not there.

Management provided another non-transparent response to questions about the circumstances surrounding the 57 documents provided to the SEC when we asked for the reasons for the individual's employment termination. The answer avoided the question by simply reporting the obvious facts that the individual was not employed by FirstEnergy and that FirstEnergy did not play a role in the termination. The individual's employer worked under contract with FirstEnergy. That employer used the individual on that FirstEnergy work. FirstEnergy and the employer were co-plaintiffs in a suit designed to prevent the individual's retention and release of documents shared by the individual with the SEC regarding an audit about whose legality he had concerns. FirstEnergy and the employer were both countersued by the individual regarding, at least in part, actions that led to his being known as a whistleblower. It seems doubtful that FirstEnergy is without information regarding a broad range of issues surrounding the individual's employment termination.

Continuing to seek to find meaningful information from which to assess potential significance of the 57 files to our examination, we asked three additional questions, none of which produced useful answers. Those requests sought:

- Information regarding the activity that the individual has alleged as improper
- FirstEnergy's information about reasons for the individual's termination
- What the 57 files contain.

We also sought details on “remediation activities still to be undertaken to address issues disclosed by the DOJ Investigation and the work of board or FE counsel.” Nevertheless, the response claimed that the request was “ambiguous and vague” and the subject of a privileged, internal investigation because that information is protected by the attorney client privilege and work product doctrines.” As to ambiguity and vagueness, the request followed a reference to such remediation activities made only the day before by the FirstEnergy controller in an interview with our team. As to privilege, the request did not ask for any information about the investigation's initiation, conduct, or results, but only management's planned actions status, and expected completion date. The purpose of these objections was apparently to justify management's recasting of the question to limit its response to the “material weakness identified during the fourth quarter of 2020 and FE's other programmatic actions taken to enhance its ethics and compliance program and culture.” Our data request was not so limited; but properly extended to actions to address all weaknesses identified by the Company or brought to its attention by the U.S. Attorney's work leading to the indictments for conduct or omissions in which FirstEnergy executives participated. The response did provide a summary of an extensive list of corrective items related to the reported material weakness, but did not provide the other information requested, specifically:

- Steps taken for those actions completed
- Date of completion of those actions
- Open item status and expected completion dates

- Schedule for all actions designed to test action effectiveness and status of completing each (including date of completion for those completed).

The response addressing other programmatic actions taken to enhance ethics and compliance program and culture was more substantial, setting forth a comprehensive program, and identifying current status and expected completion dates.

The response first objected because the information was protected by attorney/client privilege, and also objected because our term “issues disclosed by the DOJ Investigation” was ambiguous. Management then drastically narrowed the question to which it was willing to respond, limiting it to the single issue of “Tone at the Top.” The response provided two

[REDACTED]. One tracks [REDACTED]

[REDACTED]. The other [REDACTED]

[REDACTED]. Of more concern, the estimated [REDACTED]

The remedial actions listed as addressing the “tone-at-the-top” material weakness identified comprised:

- Establishment of a subcommittee of the FirstEnergy Board Audit Committee, which, with the Board of Directors, assessed the compliance program, provided recommendations and is overseeing the process of changing it
- Creation and filling of a board Vice Chairperson and Executive Director role to play a lead role in enhancing the company’s reputation with external stakeholders
- Appointment of new independent directors to the Board
- Termination of the Chief Executive Officer and appointment of a replacement
- Termination of other members of senior management, including FirstEnergy’s former Chief Executive Officer, for violations of certain company policies and its code of conduct and separation of two senior members of the legal department
- Appointment of a new Chief Legal Officer
- Appointment of a new Chief Ethics & Compliance Officer to oversee the ethics and compliance program and implement enhancements to existing compliance program features
- Board of Directors reinforcement of and executive team recommitment to
 - Setting an appropriate tone the top
 - Demonstrating the company’s core values and behaviors to support an ethical and compliant culture and adherence to financial reporting internal control
 - Increased employee communication and training on the commitment to ethical standards and to the integrity of business procedures, compliance requirements, code of conduct, and other company policies, and the availability and use of the process for reporting suspected of law or code of conduct violations.

Another request asked for similar information regarding the status of remediation activities. This response indicated that Internal Audit had completed in the third quarter of 2020 its review of payments in 2018, 2019 and 2020 to date. Payments identified as improper or insufficiently substantiated went back to 2003. The response stated that no further activities remain to be taken

to provide assurance that the Vendor Invoice payment processing deficiency has been remediated. (Despite the significant incomplete remediation activities documented in the dashboards discussed in the response to DR 460).

We also asked about enhancements or clarifications to existing policies and controls. The response said that FirstEnergy “intends” to update its Level of Signature Authority and “intends” to update the Non-Purchase Order Transaction Policy. The actions were listed as not complete.

We asked for details about plans for regular internal audits of the payment processing process. The response did not indicate plans for regular payment process audits, but did cite regular testing of payment processing SOX controls and “consideration” for internal audits based on Internal Audit’s risk assessment process.

C. Conclusions

1. FirstEnergy has not been forthcoming or transparent in providing information relevant to determining the impacts or implications of the DOJ Investigation for JCP&L. (*See Recommendation #1*)

Management has largely limited the information it provided about circumstances, activities, and events underlying the DOJ Investigation to filings it has made to the sec – which are already public. What we know of value about them comes largely from information made available through investigative and prosecutor efforts undertaken by the U.S. Attorney’s Office for the Southern District of Ohio.

That information makes clear the profound failure of FirstEnergy in providing for organizational consolidation and common management of external affairs for its subsidiaries, including JCP&L. What has been made clear is a form of conduct widely engaged in by or known to now-departed top leadership of FirstEnergy and its executives responsible for external affairs. The conduct makes it appropriate to undertake efforts to determine whether it represents an isolated set of events by persons departed, and under a culture, environment, and controls sufficient to prevent its recurrence. However, making that determination requires FirstEnergy to be forthcoming about more than events and circumstances limited to the Ohio matters exposed by the Deferred Prosecution Agreement and related Statement of Facts.

We do not presume to judge the validity of the objections and privileges that FirstEnergy has asserted in response to our inquiries, but we can say two things clearly:

- Those privileges can be waived and others, unlike FirstEnergy, have often done so over our decades of experience, particularly on matters directly related to the exercise of public service responsibilities and to costs that utility customers bear
- Regardless of the merits of those claims, FirstEnergy in our view has produced as untransparent a view as we have encountered of what it has and has not done wrong and what it has and has not incorrectly or charged to utility customers without the support even it appears to consider sufficient.

FirstEnergy has made statements publicly and to us in the course of our work about its commitment to transparency with reference to the issues under discussion here. To the contrary, however, its

cooperation cannot be characterized so simply. In fact, the terminology use with us is “as transparent as we can be,” which, valid or not, simply requires some term far short of “transparent” to be meaningfully accurate.

2. What is known about the Ohio events reflects a broadly based failure in management of external affairs. (*See Recommendation # 1 from the External Affairs Organizations Chapter*)

FirstEnergy manages external affairs centrally, on behalf of its subsidiaries, including JCP&L. The aftermath of the DOJ Investigation saw elimination of the FirstEnergy CEO, top leadership of external affairs (including regulatory affairs), the two top legal officers, and two senior lawyers - - all connected to actions intended to influence legislative and regulatory matters in ways that led to FirstEnergy Corp.’s agreement to the federal government’s filing of a charge of conspiracy to commit honest services wire fraud. The company admits, accepts, and acknowledges that it is responsible under United States law for the acts as charged and that the facts alleged and further described in the associated Statement of Facts are true and accurate. The failure has been catastrophic, with its known Ohio origins not reliably established as limited to that state.

The organization structure of external affairs following the succession of high level terminations and departures became diffuse and subject to continuing leadership change for a time. We considered it then unsustainable in serving JCP&L well and we do not consider effective the more permanent structure recently created, as explained in the next, *External Affairs Organizations* chapter.

3. FirstEnergy’s use of 501(c)(4) organizations to facilitate payment transfers leading to the Deferred Prosecution Agreement, combined with its inability to provide information about payments to other such entities, produces concern about whether such payments have been limited to the Ohio circumstances and thus whether costs have been assigned or allocated to JCP&L. (*See Recommendation #1*)

We asked for other payments by FirstEnergy entities to 504(c)(4) organizations. Management stated that, it did not have access to such information, and therefore could not provide it to us. Given that surprising gap in company records and the magnitude and consequences of the tens of millions of dollars in payments to the transfer vehicles in the Ohio circumstances, it becomes reasonable to question their use in other states and if used what accounting and operating responsibility for costs has occurred.

4. There are substantial reasons for concluding that costs FirstEnergy has borne in the DOJ investigation and the \$230 million penalty will not be charged to accounts making them recoverable by JCP&L customers, but similar assurances do not exist for costs borne in connection with examinations by state agencies. (*See Recommendation #2*)

The U.S. Attorney’s office has secured a non-recovery commitment for the \$230 million payment required by the Deferred Prosecution Agreement. FirstEnergy has stated that it will not seek recovery of costs associated with federal-level examinations, but appears to consider costs borne in connection with state-level reviews differently. The same logic underlying the U.S. Attorney’s vigilance in preventing customer recovery applies to state level reviews - - costs associated with activity involving criminal charges not contested should not be borne by utility customers.

FirstEnergy has borne considerable legal costs in connection with this audit. For example, it has brought outside counsel to every interview of executives and it has apparently reviewed all board of director documents before we were permitted access to them. The same firm assisted in the DOJ investigation and its engagement with our work has been described as ensuring that privileged and confidential information developed or learned during that representation forms the basis for its engagement here.

Management presumably has spent considerable time on the DOJ Investigation related aspects of our engagement as well.

5. Management has undertaken substantial remediation efforts to address causes of actions and circumstances leading to the Deferred Prosecution Agreement, but not all have been completed. (See Recommendation #3)

The Deferred Prosecution Agreement included an extensive list of remediation actions. Management has also prepared and action list. has completed many, and some remain. We will examine those associated with ethics and compliance and with controls weaknesses in more detail in Phase 2. Ethics and Compliance have been placed under a new executive, following the departure of the predecessor in connection with the matters encompassed by the DOJ Investigation. Phase 2 efforts will also address the disclosure of the identity of the downloader of the 57 documents by counsel.

6. Management’s Vendor Invoice examination unduly focused on a test-year approach and management’s lack of disclosure regarding the means and methods of its execution render it impossible to verify that management has fully addressed the risks of improper or insufficiently substantiated charges to JCP&L. (See Recommendation #4)

From a controls perspective (the material one in our view) whether inappropriate or unsubstantiated cost assignments and allocations affected a particular test year or two is not the correct focus - - it emphasizes effect over cause and can miss sustained or otherwise recurring problems that can have differing effects in differing time periods.

When learning of the Vendor Invoice issue, we sought to determine whether there existed reason to conclude that such problems existed and rose to a level sufficient to identify a controls weakness. We asked management a series of questions designed to learn how it identified the need for the examination it undertook, how it selected the vendors and invoices to review, what steps its examination took, what findings resulted, and how management assessed whether those results indicated error or other concern that had the potential for reaching levels justifying more expansive examination and assessment of likely cost consequences to JCP&L.

The answers disclosed that management had confidence in its investigation but provided no information from which we could develop our own views about what the examination did or did not indicate about potential issues outside the presumably small population of invoices examined. We attempted to describe the importance of validation of issue confinement to the population examined, in hopes that it would induce management to be more forthcoming about the details of its investigation. That did not happen. Outside counsel suggested the performance of our own study instead.

[REDACTED] Even more important (and different) to the BPU’s interests in reporting are the potential consequences for assignment and allocation of costs to JCP&L overall. Those consequences may have been assessed as required by the risks disclosed to and examined by management, but we have not been given the information needed to confirm that.

D. Recommendations

1. Follow developments in continuing federal criminal and administrative and other state proceedings. (See Conclusion #1)

The work of the U.S. Attorney on the Ohio matters clearly continues. The Securities and Exchange Commission, the Federal Energy Regulatory Commission, and other state utility regulatory authorities appear to have examinations of some sort underway. FirstEnergy did not provide information about them in response to our requests. A high potential for “other shoes to drop” thus exists in related matters. To the extent that there are New Jersey regulatory decisions on which such matters, action now thus bears risk of substantial “surprise.” Securing a change in FirstEnergy’s transparency may permit well-informed New Jersey decisions, but continuation of lack of transparency may make developments at other authorities the only effective means for gaining important information.

This approach applies to addressing the circumstances surrounding conduct; [REDACTED] Section 501(c)(4) organizations for a determination of their purposes and accounting.

2. Establish means for precluding the inclusion in JCP&L rates FirstEnergy and JCP&L employee and outside costs associated with state reviews of the implications of conduct related or similar to that encompassed by the DOJ Investigation. (See Conclusion #1)

Management should account for as below the line and demonstrate the appropriate use of such accounting and segregation of all costs related to state-level examinations of conduct arising out of, connected with the DOJ Investigation. FirstEnergy has acknowledged facts that a responsible U.S. Attorney’s Office has found sufficient to justify criminal wire fraud charges. FirstEnergy has also agreed to measures that will in effect settle those charges. State-level examinations intended to examine potential effects of the conduct involved, and any conduct reflecting a similar pattern over the time at issue result from the same circumstances for which the U.S. Attorney has foreclosed all recovery and for which FirstEnergy has denied intent to recover some costs.

JCP&L’s customers should be held harmless for costs of FirstEnergy, operating company, and outside resources incurred to engage in state level efforts (New Jersey or elsewhere) associated with those circumstances and their implications. For such examinations, our engagement being an example, management should ensure designation of the portion of time and expenses spent and incurred in association with those circumstances and their implications.

3. Provide semi-annual reports and presentations to the BPU staff regarding DOJ Investigation remediation measures. (Conclusion # 5)

We found the measures required by the Deferred Prosecution Agreement comprehensive and appropriate. Management has planned and is sufficiently well along in executing its action plans. However, given the severity of the breakdown in external affairs management and the breadth and complexity of the required actions, it remains important to ensure completion of the required and planned steps. Moreover, as Conclusion #1 and Recommendation #1 indicate, concern remains about whether different or more extensive issues may exist.

Twice each year, FirstEnergy management (those responsible for managing execution of the changes) should summarize progress and expected completion schedule for each one not yet fully implemented. For those implemented, management should, under the authority of the most directly responsible executive, provide an assessment of their effectiveness, any gaps in effectiveness noted, and plans to address those gaps. The reports should continue until the BPU has confidence in complete, effective, and sustaining actions to mitigate the threats of and to respond effectively to actions the measures seek to address.

4. Provide validation of the completeness of management’s Vendor Invoice examination or, failing that, require an independent review sufficient to identify and calculate all likely impacts to JCP&L and its customers. (See Conclusion #6)

The most efficient first step remains examination of the details surrounding management’s Vendor Invoice examination sufficient to verify that it adequately addressed the issues brought to its attention and subsequently examined. Providing the information we requested would facilitate that step. Failing that, counsel’s suggestion that the BPU conduct its own detailed examination may prove the only way to provide assurances that JCP&L cost assignment and allocation remain sufficient with respect to the population sampled, and if not, how great are the cost consequences for that population and to what extent similar problems may be producing inappropriate or unsubstantiated charges to JCP&L.

Appendix One

The chapter provided a discussion of many examples of the incomplete nature of management’s responses to our requests for information. This appendix details some of them and describes others.

DOJ Investigation Related

Our request for details of the separation of five discussed in an early interview with a FirstEnergy executive repeated only limited, vague information already public in the 10-K filed with the Securities and Exchange Commission, not the specific reasons requested

Similarly, a request for specific reasons for the separation of the VP Rates and Regulatory Affairs and Acting VP External Affairs produced similarly unhelpful information from an 8-K filing with the Securities and Exchange Commission. Requests for information about [REDACTED] produced similarly unhelpful information. Departed executives were variously listed as “terminated” or “separated,” generating our question for the distinction between the two; management’s answer was not responsive in any meaningful way.

A number of priority requests remained unanswered at all at the time of our drafting of this report, including requests:

- Asking again why senior executives were terminated/suspended - - response due August 19
- For a list of payments processed or approved by the departed executives - - due August 28
- The basis for any basis for a management conclusion that issues arising from actions engaged in by departed officers are not being repeated by people in their organizations that remain - - due September 1.

Vendor Invoices

Vendor Names: We asked for the names of all vendors provided to the FirstEnergy examiners; the response to the DR provided only those for which management charged, assigned, or allocated costs to JCP&L. The lack of this information precluded us from making determinations relevant to assessing the nature and size of risk’ e.g., determining the number of vendors involved, the nature of their goods or services provided, and dollar amounts for their goods and services and for similar types of goods and services.

Examination Scope and Review: We asked for a detailed description of the scope and objectives of the examination made of invoices and other aspects of the relationship with the vendors included in the examination. The response referred to the response to another request, which asked for copies of internal audit reports, investigations, or other activities concerning the Vendor Invoice examination. That response declined to provide any documentation from an Internal Audit acknowledged by the response to be responsive. It provided a general description that did not provide the detail requested here of examination scope and review. The responses to both the direct question and the one to which management referred were both substantially insufficient.

Criteria Applied: We asked for a description of the specific criteria applied in determining whether to classify invoice costs as insufficiently substantiated. The response again referred to another response, which did not provide the detail requested here.

Methods: We asked for a detailed description of activities undertaken to examine and evaluate the propriety of, support for, allocation of, or other potential issues affecting the costs of those vendors borne by any FirstEnergy operating company, which was not provided.

Cumulative Value of Invoices Examined: We asked for the cumulative value of invoices subject to such examination and evaluation. We asked for this information to determine how large the populations of vendors and invoices examined was in relation to the total populations of vendors and invoices, in order to determine whether a meaningful number of vendors and invoices were examined, after considering information provided in all parts of the request. The response excluded those who served non-utility entities, such as FirstEnergy Service Company, the subject of and a payee in matters associated with the Ohio events disclosed in the July 2020 indictments. We sought that information not only to determine common vendors, but to assess the overall size of the populations. Moreover, for example, it is not clear why, if it existed, a high error rate in relation to total FirstEnergy Service Company invoices would not bear on determining the scope and scale of risks that might not be tested as part of the original analysis.

Questionable Amounts Found: We asked for the amounts (by vendor) found to require a change in accounting or allocation. The response by the company provided the information only for JCP&L. This limitation prevented us from examining overall the error rates found by the study and more particularly repeat and large sources of error all of which bear on assessing whether the initial examination gave or should have given reason to expand it to provide meaningful results.

Total Number of FE Vendors: We asked that management approximate the total number of FE vendors (*i.e.*, vendors to any FE entity). The response provided the same information that responded to the portion of the request dealing with the Cumulative Value of Invoices Examined factor, again excluding non-regulated entities. More significantly, it did not provide the total number of vendors to FirstEnergy entities, thus making it impossible to assess the scope of the examination in relation to the total population of vendors and invoices.

Total Value of Invoices by Vendor: We asked that management provide by vendor total yearly values of invoices from vendors identified in the preceding Total Number of FE Vendors factor. As with the Cumulative Value of Invoices Examined factor, the response excluded the information for non-regulated entities. More significantly, it did not provide the total values from all vendors to FirstEnergy entities, thus making it impossible to assess the scope of the examination in relation to the total population of vendors and invoices.

Total Value of Invoices: We asked for an approximation of a single cumulative annual value of invoices from all those vendors identified in the preceding Total Number of FE Vendors factor. As with the Cumulative Value of Invoices Examined factor, the response excluded the information for non-regulated entities. More significantly, it did not provide the total single value accumulating data from all vendors to FirstEnergy entities, thus making it impossible to assess the scope of the examination in relation to the total population of vendors and invoices.

Means for Testing Sufficiency of initial Examination: We asked for a detailed description of the means and methods employed to ensure that the initial examination’s findings did not warrant further examination. Management did not describe them, but simply asserted that its review was sufficient to identify the universe of payments made in violation of policies. Moreover, the response tied this statement not to the accuracy of its accounting, charging, assignment, and allocation of costs to JCP&L, but rather to misstatements in FirstEnergy’s financial statements. Therefore, we have not independent basis for concluding that there is no more than acceptable risk of further inappropriate or inaccurate costs to JCP&L.

Classification of Vendor Invoices: We asked that management classify the total of the invoices into one of the three categories it applied. The answer referred to the presentation made for the BPU and provided at our kickoff meeting, noting the classifications of improper classification, misallocation, and lacking documentation, but did not break data down by the classifications.

Determining Vendors to Examine: We asked how management determined the list of vendors to subject to review. Management objected on the grounds that this request fell outside the scope of the audit (a commonly repeated, largely gratuitous objection followed by substantive response in most cases) and was subject to legal privilege.

Comprehensiveness of Management’s Examination: To test the reasonableness and comprehensiveness of the invoices investigated, we asked several questions about invoices. First, we asked for 2015 to date payments to vendors that equaled or exceeded \$1 million per year for which JCP&L paid all or part and originating from organizations under the President and CEO, Rates and Regulatory Affairs, External Affairs, CFO, Chief Legal Officer and SVP Strategy. The response provided a schedule of 20 payments, none related to those identified as problem vendors. Without useful data from the DOJ Investigation, one cannot verify that that none of the payments in the investigation did not originate in one of those organizations. We also asked for payments from 2015 to date to the extent equal to or greater than \$1 million and for which JCP&L paid all or part and originating under the President or External Affairs.

One would expect every payment in response to this request to have been included in the previous one, because previous request included these two organizations as part of a larger group. However, only two of seven payments listed in the response to the question about this smaller group appeared in the response about the larger group that included them.

More significantly, this response shows a \$20 million payment to a major participant in the money transfers acknowledged by FirstEnergy’s CEO in Statement of Facts made part of a Deferred Prosecution Agreement. The fact that this is the only place that Partners for Progress shows up in the Company’s responses raises questions about the accuracy of the responses provided.

Plans for Further Examination: We asked for a description of any examination and evaluation planned, its current status, its expected completion date, and results to date. The answer stated that, “If FE identifies any other vendor payments that were misallocated to JCP&L, JCP&L will bring forward those amounts.” It did not, however, answer the questions posed, which is whether such plans exist, of what they might consist, or where progress on them stands.

Material Weakness Finding: We issued a request related to a “material weakness” in controls found by FirstEnergy, in at least substantial part arising from actions involving attempts to influence Ohio legislative and regulatory matters. We asked for documentation of material weaknesses found, remediation steps taken to address them, which the response provided. FirstEnergy essentially declined to provide the other information requested, which included documentation of how each such weakness was found, communication about such weaknesses between FirstEnergy and its independent accountants, and a description of how FirstEnergy determined which vendors to include in its Vendor Invoice examination. As it has done repeatedly with respect to questions about the investigations and examinations we have been tasked to review, it declined on the basis of attorney work product and attorney client privilege. It also argued that the requested information (an objection made to a very large number of our requests) lies outside the scope of our audit. The response did note that it had provided non-privileged information about the three areas it declined to address in response to this request, but did not say where, nor was it clear to us where.

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Chapter XIII: External Affairs Organizations

A. Background

This chapter provides the results of our examination of three areas where effective management requires sound management of external affairs.

- *Rate and Regulatory Affairs*
- *Corporate Communications*
- *Investor Relations*

We examined relations with external stakeholders, including customers, regulators, investors, local governments, and media. Important to manage every day, effectively addressing the interests of external stakeholders becomes vital during the leadup and response to disruptive events, like major storms, or dealing with fundamental challenges like those following disclosure of an investigation we discuss later, conducted by a U.S. Attorney’s Office - - termed the “DOJ investigation.”

We address aspects of external affairs performed preparing for and responding to major events, like storms, in the *System Resiliency and Restoration* chapter. The external affairs activities that chapter addresses include setting, updating, and keeping customers timely and accurately informed about estimated times of restoration. That chapter also addresses liaison with public officials for storm approach and recovery. The *Customer Service* chapter describes our review of non-outage-related communications, which play a central role in ensuring an effective customer experience.

Utilities have increasingly recognized the value of providing regulators with more focused and comprehensive pictures of operations, challenges, and opportunities. Dealing with regulators is a recognized function in its own right, apart from technical issues of concern to regulators (*e.g.*, service quality, rate design). The outcomes of regulatory processes play a major role in the success of investor-owned utilities and it takes considerable attention to assure that regulators have what they need (not just information but confidence in those who supply it to them) to do their jobs. But however critical it is, the most fundamental need of any enterprise like JCP&L is to respond first to the needs of its customers. Care must be taken to ensure that regulators are not under-emphasized, but also, that regulatory issues do not dominate strategic thinking. This can be a delicate balance in the context of a longstanding regulatory relationship.

We addressed where and how JCP&L (a) identifies regulatory requirements and policies, (b) constructively influences emerging requirements to minimize adverse effects on service, (c) establishes and communicating to regulators a single voice, clear positions and responsive actions to applicable policies and requirements, and (d) coordinates the often extensive efforts in compliance proceedings or affirmative requests, such as permits or rate filings. As it happens, management’s support for and responsiveness to the needs of this audit engagement proved profoundly revealing about the transparency that FirstEnergy provides about its management and operations for the Board of Public Utilities and demonstrates the willingness and capacity to serve regulatory needs like those our engagement involves.

Keeping the financial community well and currently informed comprises a central element of ensuring full and economical access to financial markets for debt and equity capital. Effective management of financial community relations requires close communication with financial intermediaries, timely releases of accurate information relevant to the financial well-being of FirstEnergy and JCP&L, and ongoing monitoring of capital and debt markets. We addressed two

key links in effective public relations: the flow of timely and full information to stakeholders, and the receipt and due consideration of information (including opinions and recommendations) received from those groups that are affected by JCP&L's operations.

Yet another set of important stakeholders that are addressed as part of the broad definition of external relations are businesses, both existing and prospective business customers. We will also assess the effectiveness of JCP&L's business and economic development function and how it works to help fulfill JCP&L's corporate goals and objectives.

B. Findings

1. Impacts of Executive and Senior Management Departures

An extensive series of terminations and separations of key Akron-based executives and senior managers (explained and detailed in *External Affairs - - The DOJ Investigation* chapter, responsible for managing external affairs centrally for its operating companies, began in October 2020 and continued through the first half of 2021. FirstEnergy dismissed in late October 2020 the Senior Vice President, External Affairs then leading FirstEnergy's external affairs functions. FirstEnergy dismissed the CEO to whom this external affairs lead reported at the same time and for related circumstances. This was not the end of actions to secure the removal of external affairs leadership at the FirstEnergy level. Next came the May 27, 2021 separation of the FirstEnergy Vice President, Rates and Regulatory Affairs, and Acting Vice President, External Affairs. The *DOJ Investigation* chapter describes these and other changes in more detail.

Significant change in the design of the FirstEnergy organizations responsible for external affairs and for rates and regulatory affairs came, along with the filling of new and restructured executive and senior management positions. Changes made by August 2021 separated external affairs and rates and regulatory affairs responsibilities to place them under two senior executive officers: FirstEnergy's CFO (for the Rates & Regulatory Affairs group) and its Senior Vice President, Operations (for the External Affairs group).

FirstEnergy's structure for managing external affairs remained in flux as top level FirstEnergy departures continued, and for some time thereafter. Management of external affairs, with the CFO assuming responsibility for Rates & Regulatory Affairs, will eventually operate under a vice president yet to be named. Pending that appointment, a group described as State Rates teams, a Transmission Rates team, and a Load Forecasting team all continued to report separately to the CFO, as they had since the spate of executive departures extending from October 2020 through early 2021. The remainder of the external relations functions came to fall under the Senior Vice President, Operations. Those functions included Regional, State, and Federal Affairs, Economic Development, and a group labeled as State and Federal Regulatory Affairs. What the August reorganization announcement called State Rates appears to continue as a series of Rates & Regulatory Affairs groups organized by region, each headed by a director. One of those teams and its director are dedicated to JCP&L matters. Management has also reported the move of the Economic Development group to a Customer Experience organization newly created in September 2021.

FirstEnergy described in August 2021 the move of External Affairs to the Operations organization as one “to ensure our efforts with stakeholders at the regional, state and federal level are accomplished in close cooperation with the operational strategy across our service area.”

2. JCP&L External Affairs Organization

A JCP&L Vice President, External Affairs, reporting to JCP&L’s President, had responsibility for managing local external affairs in the utility’s region until August 2021. The group then became part of the FirstEnergy External Affairs organization described below. This organization has included eight regionally-based external affairs representatives, and another group of 20, consisting predominately of customer account specialists, working with commercial and industrial customers and supervised by a Manager, Customer Accounts. The JCP&L External Affairs organization did not previously change in structure or resources since at least 2017. During the group’s operation under the direction of JCP&L leadership, the FirstEnergy-wide External Affairs organization provided coordination and support. The JCP&L External Affairs staff located in New Jersey will continue to provide assistance during storms, staff county OEMs to relay information back to JCP&L, and help designate county and municipal priorities.

3. Present FirstEnergy External Affairs Organization

FirstEnergy has for some time managed external affairs on a system-wide basis for its operating companies, now including JCP&L as of August 2021. Its External Affairs organization appears to have stabilized by August 2021. While operating on behalf of all the FirstEnergy operating companies, FirstEnergy External Affairs assigns individuals or groups to responsibilities for individual operating companies to perform many of its functions.

FirstEnergy now employs an External Affairs organization operating, based on executive structure changes announced in August 2021 under a Vice President External Affairs, who in turn reports to the Senior Vice President, Operations. This organization includes groups responsible for system-wide management (including for JCP&L) of regional, state, and federal affairs. It also has, as described below a state regulatory affairs role involving it routinely with the BPU and matters before or under consideration by it. The functions performed by the FirstEnergy Service Company External Affairs department have included:

- Federal Government Affairs: relationships and advocacy for FirstEnergy’s policy positions with Congress, the White House, and federal executive agencies, and work with trade associations and energy-sector and other business allies
- State Government Affairs: relationships and activities with state Governors’ office, legislatures, and agencies affecting the electric industry where FirstEnergy utilities operate
- Economic Development (since moved to the Customer Experience organization along with a number of other functions, as described in Chapter X, *Customer Service*): support to attract new business development and to retain and grow existing businesses in the FirstEnergy serving areas
- State & Federal Regulatory Affairs: relationships with public utility regulatory authorities in New Jersey, Ohio, Pennsylvania, West Virginia, and Maryland and with the Federal Energy Regulatory Commission (FERC), also interacting with other regulatory stakeholders and trade associations

- Regional External Affairs: relationships and interactions with local and regional officials including mayors, city councils, city service directors, county elected officials, local chambers, schools, municipalities, and emergency management agencies in Ohio, Pennsylvania, West Virginia and Maryland. (uniquely within FirstEnergy, JCP&L had until August 2021 performed these functions internally through its own External Affairs group. The FirstEnergy Director, Regional External Affairs, directs 6 managers whose 34 or so reports perform for the other FirstEnergy operating companies similar to those JCP&L handles internally.

The August 2021 organization change announcement highlighted the move of External Affairs' Policy & Support group to fall under a separate vice president (for Compliance and Regulatory Services) reporting to the FirstEnergy Senior Vice President, Operations. This group has responsibility for development and advocacy of energy policy positions at PJM and FERC, federal and state policy positions coordination, administration of FirstEnergy's Political Action Committee (FEPAC) and general support for the corporate External Affairs group. As noted, Economic Development moved in September 2021, now reporting to the Senior Vice President, Customer Experience and continuing to perform the functions described later in this chapter.

Corporate Affairs & Community Involvement moved from External Affairs in November 2020. This group manages community investments through FirstEnergy and the FirstEnergy Foundation.

4. Regulatory Affairs

One organization, operating under the Vice President, External Affairs has responsibility for state regulatory authority matters, including those under the jurisdiction of the BPU. A single FirstEnergy Director, State & Federal Regulatory Affairs heads this group. Its resources include Senior Advisors, Advisors, and Consultants assigned to each state. A Senior Advisor, New Jersey Regulatory Affairs position (reporting to the Director, State & Federal Regulatory Affairs) serves as liaison to the BPU, focusing on "broader policy issues, stakeholder processes, and information sharing and communicating with Commissioners.

FirstEnergy employs an entirely separate regulatory group, Rates & Regulatory Affairs, which also assigns resources on a state basis and which also has responsibility for BPU matters. The New Jersey portion of this organization responsible for JCP&L matters operates under the New Jersey Director, Rates & Regulatory Affairs. Management distinguishes its responsibilities from the State & Federal Regulatory Affairs group described immediately above, stating that this second group has responsibility for routine interaction with the BPU Staff, focusing particularly on rates, tariffs, and regulatory filings.

Not only do these groups, both with responsibility for JCP&L regulatory matters, operate separately, they now report through separate FirstEnergy lines of authority. The first group (Rates & Regulatory Affairs) will report to a Vice President Rates & Regulatory Affairs, when the position gets filled. The directors responsible for all states have each been reporting directly to the FirstEnergy CFO, following the late 2020 and early 2021 terminations and departures that caused profound dislocation in leadership of the functions involved. The second group (State & Federal Regulatory Affairs) reports through a Vice President, External Affairs, who in turn reports to the FirstEnergy Senior Vice President, Operations, a position lateral to that of the CFO.

Yet a third group with significant state regulatory authority operates under a separate top executive. A group of attorneys assigned to state regulatory matters reports to a managing attorney who in turn reports to the FirstEnergy Senior Vice President and General Counsel. FirstEnergy appears to assign this group of attorneys, at least in significant part, by state.

The following chart shows the organization under the FirstEnergy CFO (also a senior vice president), pending the naming of someone to fill the vice president position. The CFO’s direct reports have included the following who have had regulatory affairs roles:

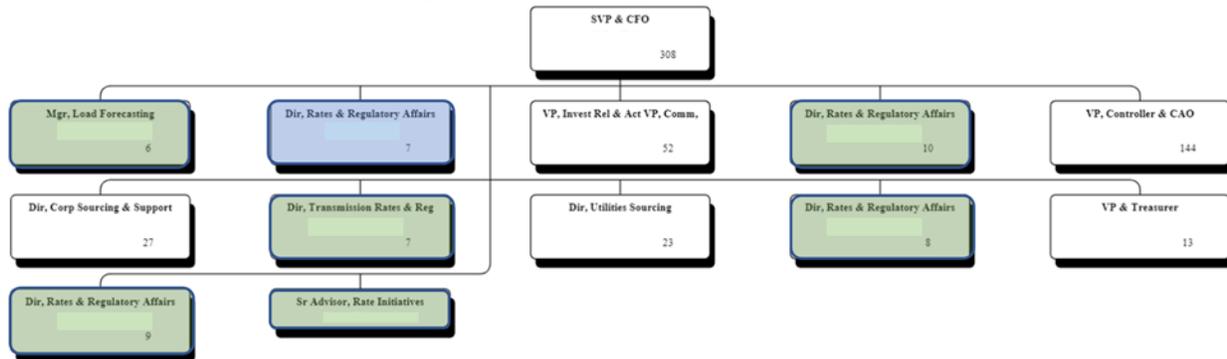
- Four state-based Directors of Rates and Regulatory Affairs, including one for New Jersey (highlighted in blue in the chart)
- Senior Advisor, Rate Initiatives
- Director, Transmission Rates and Regulatory.

In addition to the New Jersey-based Director, Regulatory Affairs, the chart highlights (in green) other functions often aligned under a rates and regulatory group in the industry and which management here has identified as such. The CFO heads a large number of other groups as well (those not highlighted in the chart):

- Load Forecasting
- Sourcing
- Investor Relations
- Communications
- Controller
- Treasury

Total staffing of the highlighted functions has totaled 48, including 7 assigned to New Jersey.

Provisional FirstEnergy Rate and Regulatory Affairs Functions Structure



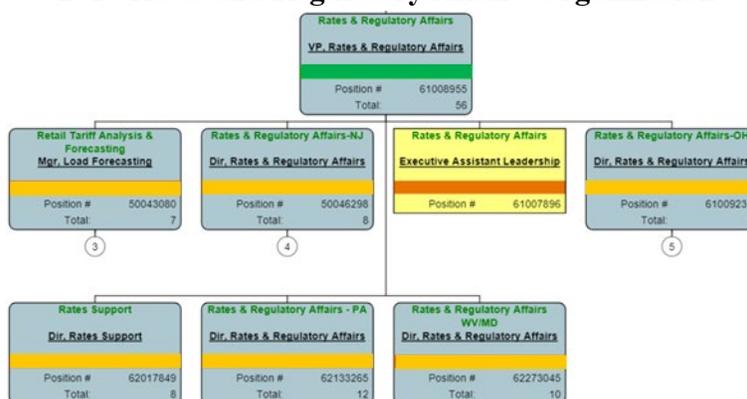
The responsibilities of these rate and regulatory groups include:

- Rate Preparation
- Revenue Requirements
- Regulatory Finance
- Cost Allocation
- Rate Design
- Regulatory Communications
- Pricing and Tariff Services

The state-based directors charge all time to the jurisdictions which the CFO has assigned them, using exception-time reporting for assignments to assist other directors. The Directors responsible for to Transmission and Load Forecasting and the Senior Advisor, Rate Initiatives charge time to the jurisdictions as they serve them.

The current structure reflects a fundamental change from the organization (shown in the next chart) that existed in 2017, when the functions all reported to a Vice President, Rates & Regulatory Affairs. Staffing then totaled 56 - - 8 more than exist today. At that time New Jersey resources totaled 8 - - 1 more than exists today.

2017 Rates and Regulatory Affairs Organization



5. External Affairs Costs

The next table shows the costs for JCP&L External Affairs. Given issues associated with the FirstEnergy-level investigations that have focused on abuses involving external affairs, we tracked costs for this function back to 2015.

JCP&L External Affairs Costs

Description	Year								Period Change
	2015	2016	2017	2018	2019	2020	2021E	2021A	
Salaries, Pensions, Benefits	\$ 1,375,482	\$ 1,492,372	\$ 1,498,939	\$ 1,115,539	\$ 1,171,164	\$ 1,460,084	\$ 1,611,138	\$ 805,569	
Outside Services Employed	\$ 925	\$ 1,098	\$ 175	\$ 246	\$ 971	\$ 6,433	-\$ 1,766	(\$ 883)	
Other	\$ 140,731	\$ 141,644	\$ 146,182	\$ 110,646	\$ 118,471	\$ 104,762	\$ 106,996	\$ 53,498	
Total	\$ 1,517,138	\$ 1,635,114	\$ 1,645,296	\$ 1,226,431	\$ 1,290,606	\$ 1,571,279	\$ 1,716,368	\$ 858,184	
Change from Prior Year		\$ 117,976	\$ 10,182	-\$ 418,865	\$ 64,175	\$ 280,673	\$ 145,089	\$ 199,230	
		7.8%	0.6%	-25.5%	5.2%	21.7%	9.2%	13.1%	

Salaries, Pensions, and Benefits: FERC Accounts 920, 926

Outside Services Employed: FERC Account 923

Other: Taxes Other Than Income (408.1), Office Supplies & Expenses (921), General Advertising (930.1), Miscellaneous (930.2)

These costs have remained essentially flat, after accounting for inflation. As the chart demonstrates, employee costs comprise over 90 percent of total costs, and outside services costs have been nominal. Taxes and office costs make up nearly all of the “Other” costs. JCP&L did not charge, assign, or allocate any of these costs to other FirstEnergy entities.

JCP&L considers the costs of government affairs activities recoverable, except to the extent that they comprise “direct costs for lobbying, charitable contributions and other cost that are accounted for “below-the-line.” The next table shows moderate External Affairs costs accounted for as below the line.

“Below-the-Line” External Affairs Costs

External Affairs Group	Year					
	2019		2020		2021	
	Total	JCP&L	Total	JCP&L	Total	JCP&L
Economic Development					\$3,200	
State Regulatory Affairs	\$603,444		\$799,579		\$340,706	
External Affairs - Sr VP			\$0		\$1,185	\$43
Federal Government Affairs			\$1,347	\$175	-\$621	-\$88
Market Policy			\$269,968	\$38,092	-\$145,413	-\$20,518
Local Affairs & Econ Devel			\$87,890	\$16,224	-\$5,056	-\$933

Directly-incurred JCP&L amounts recorded below the line for recent years have been:

- 2019: \$304,897
- 2020: \$466,490
- 2021: \$209,392

We also examined other sources and amounts of costs directly incurred by or allocated to JCP&L. The next table summarizes them from 2015 through 2020.

Total JCP&L “Below-the-Line” Costs Since 2015

2015				2016			
FERC Acct	Description	Source Company	Amount	FERC Acct	Description	Source Company	Amount
426.10	Donations	JCP&L	\$141,296	426.10	Donations	JCP&L	\$146,420
		Other	\$63			Other	\$0
		426.10 Total	\$141,359			426.10 Total	\$146,420
426.20	LifeInsurance	FE Service Co.	\$7,098	426.20	LifeInsurance	FE Service Co.	-\$643,789
		JCP&L	\$43,532			JCP&L	-\$51,018
		Other	\$78			Other	\$0
		426.20 Total	\$50,708			426.20 Total	-\$694,806
426.30	Penalties	FE Service Co.	\$11,264	426.30	Penalties	FE Service Co.	\$18,240
		JCP&L	\$598,360			JCP&L	-\$608,489
		Other	\$1,526			Other	\$0
		426.30 Total	\$611,150			426.30 Total	-\$590,249
426.4	Certain Civic, Political & Related Activities	JCP&L	\$87,604	426.4	Certain Civic, Political & Related Activities	JCP&L	\$85,192
		Other	\$1,897			Other	\$0
		426.40 Total	\$89,501			426.40 Total	\$85,192
426.50	Other Deductions (Transmission Adjustments)	FE Service Co.	\$1,717,375	426.50	Other Deductions (Transmission Adjustments)	FE Service Co.	\$1,420,775
		JCP&L	-\$1,701,435			JCP&L	-\$1,199,324
		Other	\$6,723			Other	\$0
		426.50 Total	\$22,663			426.50 Total	\$221,451
2015 TOTAL			\$915,381	2016 TOTAL			-\$831,993
2017				2018			
FERC Acct	Description	Source Company	Amount	FERC Acct	Description	Source Company	Amount
426.10	Donations	JCP&L	\$189,511	426.10	Donations	JCP&L	\$180,098
		Other	\$0			Other	\$0
		426.10 Total	\$189,511			426.10 Total	\$180,098
426.20	LifeInsurance	FE Service Co.	-\$821,933	426.20	LifeInsurance	FE Service Co.	\$105,721
		JCP&L	-\$64,725			JCP&L	-\$11,026
		Other	\$0			Other	\$0
		426.20 Total	-\$886,658			426.20 Total	\$94,695
426.30	Penalties	FE Service Co.	\$43,200	426.30	Penalties	FE Service Co.	\$25,920
		JCP&L	\$2,034			JCP&L	\$0
		Other	\$0			Other	\$0
		426.30 Total	\$45,234			426.30 Total	\$25,920
426.4	Certain Civic, Political & Related Activities	JCP&L	\$52,166	426.4	Certain Civic, Political & Related Activities	JCP&L	\$67,267
		Other	\$0			Other	\$0
		426.40 Total	\$52,166			426.40 Total	\$67,267
426.50	Other Deductions (Transmission Adjustments)	FE Service Co.	\$232,484	426.50	Other Deductions (Transmission Adjustments)	FE Service Co.	\$492,612
		JCP&L	\$27,931,907			JCP&L	-\$255,727
		Other	\$0			Other	\$0
		426.50 Total	\$28,164,392			426.50 Total	\$236,885
2017 TOTAL			\$27,564,645	2018 TOTAL			\$604,865
2019				2020			
FERC Acct	Description	Source Company	Amount	FERC Acct	Description	Source Company	Amount
426.10	Donations	JCP&L	\$215,126	426.10	Donations	JCP&L	\$187,254
		Other	\$0			Other	\$0
		426.10 Total	\$215,126			426.10 Total	\$187,254
426.20	LifeInsurance	FE Service Co.	-\$1,313,871	426.20	LifeInsurance	FE Service Co.	-\$1,541,761
		JCP&L	\$83,314			JCP&L	\$154,016
		Other	\$0			Other	\$0
		426.20 Total	-\$1,230,557			426.20 Total	-\$1,387,745
426.30	Penalties	FE Service Co.	\$12,521	426.30	Penalties	FE Service Co.	\$47
		JCP&L	\$31,435			JCP&L	\$0
		Other	\$0			Other	\$0
		426.30 Total	\$43,956			426.30 Total	\$47
426.4	Certain Civic, Political & Related Activities	JCP&L	\$56,844	426.4	Certain Civic, Political & Related Activities	JCP&L	\$546,199
		Other	\$0			Other	\$0
		426.40 Total	\$56,844			426.40 Total	\$546,199
426.50	Other Deductions (Transmission Adjustments)	FE Service Co.	\$440,553	426.50	Other Deductions (Transmission Adjustments)	FE Service Co.	\$571,886
		JCP&L	\$400,706			JCP&L	-\$3,238,463
		Other	\$0			Other	\$0
		426.50 Total	\$841,259			426.50 Total	-\$2,666,577
2019 TOTAL			-\$73,373	2020 TOTAL			-\$3,320,821

The next table summarizes FirstEnergy-level external affairs department costs and the shares borne by JCP&L and others. The amounts borne by JCP&L have fallen moderately even before considering inflation. Its share of the costs relative to the other operating companies has also fallen somewhat. The share of costs borne by non-utility operations remained steady as well. Compared to budgets, actual costs have generally been no higher, and in most years lower.

Corporate-Level External Affairs Costs

Entity	2015	2016	2017	2018	2019	2020	15-20Δ
<i>Total</i>	\$ 21,526,811	\$23,132,885	\$24,826,973	\$24,075,003	\$20,557,925	\$20,829,117	-\$697,694
<i>FE</i>	Δ	7.5%	7.3%	-3.0%	-14.6%	1.3%	-3.2%
<i>JCP&L</i>	\$ 1,306,055	\$1,327,655	\$1,450,918	\$1,292,829	\$824,025	\$1,064,918	-\$241,137
<i>Share</i>	%	6.1%	5.7%	5.8%	5.4%	4.0%	-1.0%
	Δ	1.7%	9.3%	-10.9%	-36.3%	29.2%	-15.7%
<i>Other</i>	\$ 10,352,628	\$10,218,430	\$10,314,180	\$10,085,720	\$9,575,385	\$9,850,380	-\$502,248
<i>Op Cos</i>	%	48.1%	44.2%	41.5%	41.9%	46.6%	-0.8%
	Δ	-1.3%	0.9%	-2.2%	-5.1%	2.9%	-1.7%
<i>Non</i>	\$ 9,868,128	\$11,586,800	\$13,061,875	\$12,696,454	\$10,158,494	\$9,913,819	\$45,691
<i>Reg</i>	%	45.8%	50.1%	52.6%	52.7%	49.4%	1.8%
	Δ	17.4%	12.7%	-2.8%	-20.0%	-2.4%	3.8%

Functional Breakdown of Corporate-Level External Affairs Costs

External Affairs Group	2015	2016	2017	2018	2019	2020	15-20Δ
<i>Local Affairs</i>	\$2,564,354	\$4,123,527	\$4,753,096	\$5,065,965	\$5,426,570	\$5,474,442	113.5%
<i>State Legislative Affairs</i>	\$2,502,620	\$3,954,971	\$4,432,218	\$4,917,286	\$4,211,224	\$3,806,049	52.1%
<i>Federal Government Affairs</i>	\$2,175,032	\$2,632,484	\$3,079,428	\$2,946,982	\$2,196,559	\$2,453,479	12.8%
<i>External Affairs Billing</i>	\$8,171,222	\$5,882,470	\$4,498,533	\$3,858,451	\$2,095,727	\$2,318,217	-71.6%
<i>State Regulatory Affairs</i>	\$1,803,178	\$853,647	\$1,055,639	\$1,362,254	\$1,622,822	\$1,999,195	10.9%
<i>Economic Development</i>	\$1,529,130	\$1,880,566	\$1,864,631	\$1,712,302	\$1,753,331	\$1,858,061	21.5%
<i>Market Policy</i>	\$1,654,513	\$2,125,958	\$2,171,920	\$1,591,448	\$1,254,748	\$1,244,631	-24.8%
<i>Local Affairs & Econ Devel</i>	\$356,692	\$605,602	\$1,560,914	\$1,207,176	\$921,880	\$959,868	169.1%
<i>External Affairs - Sr VP</i>	\$274,350	\$515,728	\$887,353	\$851,580	\$940,200	\$713,951	160.2%
<i>State & Market Policy VP</i>	\$495,721	\$557,933	\$523,240	\$561,560	\$134,863	\$1,224	-99.8%
Total	\$21,526,811	\$23,132,885	\$24,826,973	\$24,075,003	\$20,557,925	\$20,829,117	-3.2%

Corporate External Affairs Charges to Operating Utilities

External Affairs Group	2015	2016	2017	2018	2019	2020	15-20Δ
<i>Local Affairs</i>	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
<i>State Legislative Affairs</i>	93.5%	95.9%	96.2%	96.6%	96.4%	97.1%	3.7%
<i>Federal Government Affairs</i>	89.2%	88.7%	90.2%	98.2%	98.2%	95.2%	6.0%
<i>External Affairs Billing</i>	18.9%	25.5%	19.8%	17.4%	0.3%	5.3%	-13.6%
<i>State Regulatory Affairs</i>	86.0%	62.3%	58.6%	45.9%	65.6%	60.4%	-25.6%
<i>Economic Development</i>	1.9%	1.2%	1.7%	3.5%	1.8%	4.6%	2.7%
<i>Market Policy</i>	89.5%	91.5%	89.8%	90.3%	90.0%	85.9%	-3.7%
<i>Local Affairs & Econ Devel</i>	81.1%	81.1%	81.0%	81.1%	80.5%	81.5%	0.5%
<i>External Affairs - Sr VP</i>	90.6%	90.4%	89.8%	90.3%	90.0%	85.9%	-4.7%
<i>State & Market Policy VP</i>	90.6%	90.4%	89.8%	90.3%	90.0%	85.9%	-4.7%
Total	11.6%	14.8%	18.2%	15.6%	14.0%	12.2%	0.6%

The next table shows the breakdown of the FE-level external affairs costs borne by JCP&L.

Accounting for FirstEnergy External Affairs Costs to JCP&L

FERC Account		2015	2016	2017	2018	2019	2020
921	Office Supplies & Expenses	\$65,873	\$64,232	\$65,608	\$63,624	\$49,042	\$0
923	Outside Services	\$836,998	\$820,559	\$894,359	\$584,296	\$362,523	\$493,854
426.5	Excess Over Just & Reasonable	\$87,807	\$157,418	\$218,233	\$492,612	\$304,897	\$466,490
107	Construction Work in Progress	\$315,377	\$285,447	\$272,718	\$152,298	\$107,584	\$104,574

The next table shows that, with three exceptions, FirstEnergy charged the vast majority of each function’s costs to its operating companies.

Corporate External Affairs Charges to Operating Utilities

External Affairs Group	2015	2016	2017	2018	2019	2020	15-20Δ
Local Affairs	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
State Legislative Affairs	93.5%	95.9%	96.2%	96.6%	96.4%	97.1%	3.7%
Federal Government Affairs	89.2%	88.7%	90.2%	98.2%	98.2%	95.2%	6.0%
External Affairs Billing	18.9%	25.5%	19.8%	17.4%	0.3%	5.3%	-13.6%
State Regulatory Affairs	86.0%	62.3%	58.6%	45.9%	65.6%	60.4%	-25.6%
Economic Development	1.9%	1.2%	1.7%	3.5%	1.8%	4.6%	2.7%
Market Policy	89.5%	91.5%	89.8%	90.3%	90.0%	85.9%	-3.7%
Local Affairs & Econ Devel	81.1%	81.1%	81.0%	81.1%	80.5%	81.5%	0.5%
External Affairs - Sr VP	90.6%	90.4%	89.8%	90.3%	90.0%	85.9%	-4.7%
State & Market Policy VP	90.6%	90.4%	89.8%	90.3%	90.0%	85.9%	-4.7%
Total	11.6%	14.8%	18.2%	15.6%	14.0%	12.2%	0.6%

6. Rates and Regulatory Affairs Costs

The next table summarizes recent rate and regulatory costs.

Corporate and JCP&L Rates & Regulatory Costs

		Total FirstEnergy					
Total FirstEnergy	Item	2019	2020		2021	Δ	
		Budget	\$11,948,167	\$13,749,154	15.1%	\$14,166,567	18.6%
	Actual	\$10,391,019	\$11,054,652	6.4%			
	Variance	-\$1,557,148	-\$2,694,501		not yet available		
		-13.0%	-19.6%				
		JCP&L					
JCP&L Dedicated	Budget	\$1,914,062	\$2,460,511	28.5%	\$2,295,617	19.9%	
	Actual	\$2,331,220	\$2,370,793	1.7%	not yet available		
Corporate	Budget	\$379,045	\$670,949	77.0%	\$921,320	143.1%	
	Actual	\$877,019	\$819,769	-6.5%	not yet available		
Subtotal	Budget	\$2,293,106	\$3,131,460	36.6%	\$3,216,937	40.3%	
	Actual	\$3,208,239	\$3,190,562	-0.6%	not yet available		
Comfort Partners	Budget	\$3,412,913	\$4,915,410	44.0%	\$4,915,410	44.0%	
	Actual	\$2,614,456	\$2,637,709	0.9%	not yet available		
Total	Budget	\$5,706,020	\$8,046,870	41.0%	\$8,132,347	42.5%	
	Actual	\$5,822,695	\$5,828,272	0.1%	not yet available		
		JCP&L Share of Total FirstEnergy					
Excludes Comfort Partners	Budget	19.2%	22.8%		22.7%		
	Actual	30.9%	28.9%		not yet available		

A number of Corporate Rates and Regulatory Affairs groups (Transmission, Load Forecasting, and Senior Advisor, Rate Initiatives) perform activities on a common basis across the FirstEnergy operating companies. The next table summarizes their recent costs.

Costs of Corporate-Wide Rate/Regulatory Groups

Total FirstEnergy					
Item		2019	2020	Δ	2021
Transmission	Budget	\$4,216,606	\$3,829,264	-9.2%	\$3,963,160
	Actual	\$3,661,404	\$3,775,347	3.1%	
Rates Administration	Budget	\$2,415,972	\$2,573,043	6.5%	\$2,985,801
	Actual	\$2,290,625	\$2,931,723	28.0%	
JCP&L Share (dollars)					
Transmission	Budget	\$1,248,782	\$1,377,519	10.3%	\$1,457,468
	Actual	\$1,290,784	\$1,360,587	5.4%	
Rates Administration	Budget	\$400,085	\$397,792	-0.6%	\$461,605
	Actual	\$379,327	\$453,244	19.5%	
JCP&L Share (percent)					
Transmission	Budget	29.6%	36.0%	6.4%	37%
	Actual	35.3%	36.0%	0.8%	
Rates Administration	Budget	16.6%	15.5%	-6.6%	15%
	Actual	16.6%	15.5%	-6.6%	

7. Economic Development

FirstEnergy employs a single organization to coordinate economic development activities and initiatives for all of its operating utilities. An Akron, Ohio based director heads the organization and manages a staff of seven Economic Development Consultants assigned to and located at operating company locations. The organization and its staffing has remained fairly stable for 20 years or so, with two principal changes in the past five years. Management eliminated a number of corporate-level positions and it eliminated the separate JCP&L Economic Development Consultant. A single such consultant, based in York, Pennsylvania now has responsibility for JCP&L and the eastern Pennsylvania region that utility affiliate Metropolitan Edison serves.

The economic development team members also develop expertise regarding the circumstances, expectations, and needs of particular business types (e.g., data centers and food processing) with whom the territorially-based members consult as the need arises. The Economic Development Consultant for JCP&L coordinates with other local JCP&L resources to bring their expertise to bear in candidate identification and pursuit. Primary Examples include:

- External Affairs, whose personnel service as a principal interface with county and local officials
- Customer Accounts, which has representatives who work major business accounts.

The organization also uses a variety of outside resources to assist in exploring and pursuing specific opportunities to bring attractive businesses to the region JCP&L serves. They include, for example, to provide economic analyses of potential customer additions or to assist in location of addressing real estate aspects of potential sites for potential customers. They also include firms whose information systems provide rosters of available properties, fiber optics capabilities, and key information about local workforce skills and availability. The group has recently developed a new web site and has participated in the U.S. Department of Commerce’s “Select USA.” This annual event most recently drew 3,000 virtual attendees and has historically brought together over 1,200 business investors from some 80 international markets with economic developers from almost all U.S. states and territories. Management reported that scaled back PES&G activities leave JCP&L as the only remaining state utility particularly active in economic development.

A unitary set of goals and objectives applies across the FirstEnergy footprint; *i.e.*, separate ones do not exist for New Jersey. The group operates on the basis of targeting yearly additions of 100 business customers from a 500 or so list of candidates it seeks to keep active. The next table shows overall the progress made in the past three years overall and in New Jersey specifically.

Success in attracting new business customers lags in the JCP&L region, as compared with others served by FirstEnergy’s utilities. It lies outside the main North-South corridor connecting the large metropolitan centers between New York and Washington, D.C. and points further north and south. This makes the JCP&L region more attractive for businesses offering tourism and services, with pharma still a major source of potential growth. Movement out of the immediate New York City metro area following COVID-19 has produced an influx of home-based workers. The area, particularly at its western edge, has seen growth in its distribution system.

Management provides financial support to Choose New Jersey. This non-profit, privately-funded organization seeks to stimulate job creation and attract capital investment to the state. It markets New Jersey domestically and internationally, and with support from State agencies and private partners like JCP&L provides assistance to companies in establishing operations in the state.

The next tables shows total costs of the FirstEnergy level organization and the portion charged to New Jersey and the amounts incurred directly at JCP&L..

FirstEnergy and JCP&L Economic Development Expenditures

FirstEnergy-Level

	2018	2019	2020
Total	\$1,712,302	\$1,753,331	\$1,858,061
JCP&L	\$11,454	\$7,925	\$19,722

JCP&L Directly Incurred

Year	Budget	Actual	Variance	Δ
2019	\$20,535	\$4,250	(\$16,285)	
2020	\$20,535	\$4,845	(\$15,690)	0.0%
2021	\$20,535			0.0%

FirstEnergy’s economic development goals focus on encouraging capital investment across the FirstEnergy serving region. FirstEnergy particularly addresses enterprises who compete in markets other than New Jersey, focusing on manufacturing, research and development, corporate headquarters, data centers, and distribution centers market. Management has set targets of announcing 100 development projects its efforts have influenced and generating of 500 qualified business leads, leading to a goal of developing at least \$3 billion in capital investment, 8,000 new jobs; and 200 MW of new load. It has not broken these targets and goals down by operating company.

Tactics focus on interaction with regional and local agencies and organizations:

- Yearly visits by FirstEnergy’s lead (the service company’s Director of Economic Development) each lead state organization for economic development in all five states served
- Visits by the service company’s Economic Development staff annually to the more than 100 county-level economic development organizations in the FirstEnergy serving areas
- Active staff participation and leadership roles in each of state professional economic development organizations
- Staff participation in in regional economic development organizations

- Provision of economic information major regional and local economic development organizations at least three times per year
- Director meetings with each of the ten operating company presidents and with each of the eight members of FirstEnergy’s senior executive team.

Economic Development produced a strategy for 2020. Its significant accomplishments during the year included:

- Development of a web site
- Development with other departments of a “FirstSites” strategy designed to promote “pad-ready” sites; *e.g.*, by validating the adequacy of existing utility infrastructure and zoning and demonstrating the presence of a willing site seller at a known price.
- Completing in partnership with other company groups a “Maximizing Distribution Assets” initiative designed to identify ways to improve utilization of distribution circuits for economic development projects; producing an Economic Development Investment Tool (EDIT) that uses electronic mapping information to help guide distribution planning and to provide developers with capacity information.

FirstEnergy’s Development Department group subscribes the Location One Information System (“LOIS”), through which JCP&L and the other operating companies provide a list of available industrial sites, shareable with “Choose New Jersey” and economic development organizations. Choose New Jersey, a privately-funded, non-profit organization that seeks to stimulate job creation and attract capital investment to the state, marketing New Jersey through the combined efforts of its staff and a network of State agencies and private partners. Its services include: market assessments, customized business proposal responses, site selection assistance, information about state resources, public relations support, and introductions to public-private partnerships. The organization cites assistance to 303 companies, 19,340 new and retained jobs, and \$6.2 billion in capital investment in the ten years it has operated.

The Economic Development Group uses a subscription to Impact Factor Plus to assist communities in performing economic impact analysis of potential development projects. It also makes use of a model from Regional Economic Model Inc. (REMI) to support detailed economic impact studies. Economic Development has also partnered with the WE Upjohn Institute for Employment Research and Juniper Solutions to enable economic and workforce research and to address real estate and site selection issues. Since 2019, FirstEnergy Economic Development has a subscription to Jobs EQ Chmura Research which provides access to a broad scope of workforce availability information.

A subscription to Moody’s Economy.com provides for FirstEnergy’s service territories access to economic data specific to its location, including New Jersey, which Economic Development shares with state and local economic development entities. A subscription with a fiber locator service enables Economic Development to provide data regarding fiber availability at potential development sites.

The next table shows that FirstEnergy has met its goal of achieving 100 announced projects per year, but with a particularly low share of them in New Jersey. Management cites a number of factors as limiting the ability to find greater success in New Jersey:

- As compared with PES&G, JCP&L’s service territory lies outside the New York – Philadelphia commercial corridor
- JCP&L’s comparatively small industrial load (10 percent) in a state that has promoted smart growth, land preservation, and investment in existing industrial urban areas
- The company’s focus on energy-intensive development prospects makes 69 kV and above service important, making JCP&L’s backbone 34.5 kV system a constraint
- Challenges in extending electric infrastructure in New Jersey
- The high cost of doing business in New Jersey (reportedly the 6th highest according to Moody’s)
- Less active and well-funded local economic development organizations, as compared with other FirstEnergy serving areas.

Economic Development Projects

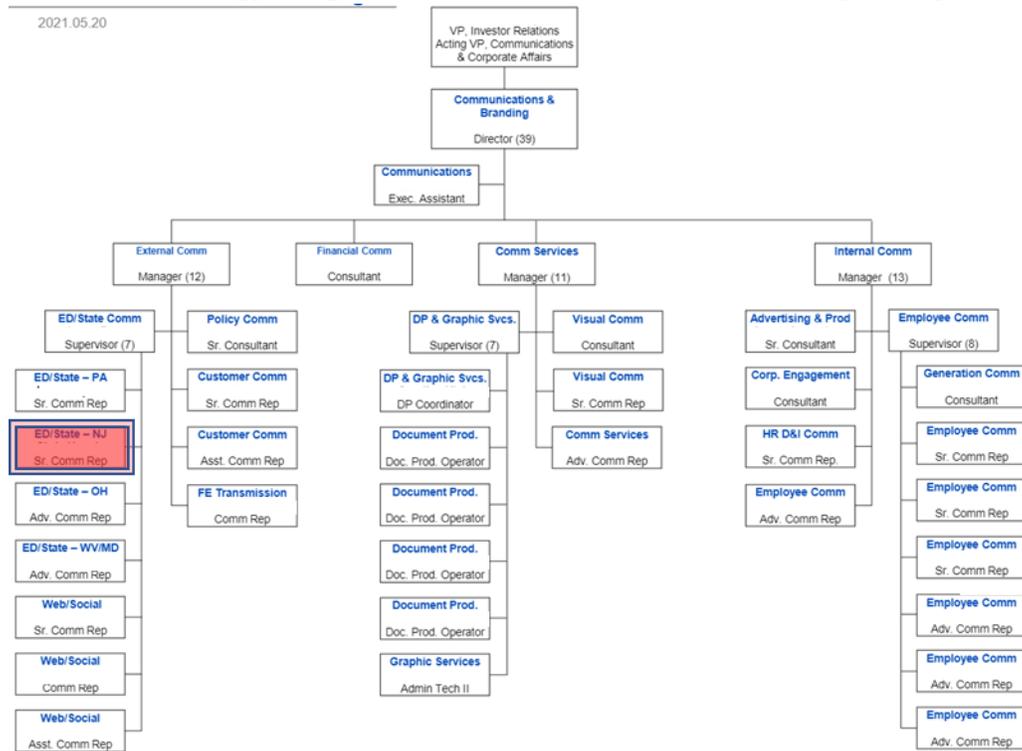
Year	Total FE	New Jersey
2016	105	3
2017	110	2
2018	108	0
2019	104	1
2020	110	2

8. *Communications*

The next table shows the current organization of FirstEnergy’s Communications and Branding group, which provides communications services to the 10 electric distribution companies and to the parent. An Acting Vice President heads the 40-person organization, while also serving (as described elsewhere in this chapter) as the head of Investor Relations. The group consists of three main arms, which focus on external communications, internal (employee) communications, and production services (*e.g.*, documents, graphics, visuals). All of the group’s personnel report through a Director. The group’s personnel serve across operating utility boundaries, but dedicates a Senior Commercial Representative to external communications in New Jersey operations (highlighted in the chart), with similar assignments for Pennsylvania, Ohio, and for West Virginia and Maryland combined.

The organization changed in 2018 as part of a corporate-wide organizational initiative. It replaced three directors (for the same three arms now existing) with one and reduced the level of the heads of those three arms from director to manager.

FirstEnergy Corporate Communications and Branding Group



The External Communications arm handles media relations, including

- Interviews - - print, radio and television media
- News releases, fact sheets, and other material
- Social media content - - Facebook and Twitter accounts for operating utility.

The Internal Communications arm manages communications with employees, including:

- The FirstEnergy Today portal/intranet site
- A weekly email (Employee Update) to employees
- A bi-weekly newsletter (Dispatch)
- Company-wide Town Hall Teams meetings
- A monthly publication highlighting safety achievements (Safety Milestones)
- A monthly newsletter (Together) featuring employee volunteer activities, fundraisers, and other charitable events and donations by the FirstEnergy Foundation and FirstEnergy Corp
- Periodic video segments (FE-TV)
- Leadership video messages
- Print, radio, digital and TV advertising.

The Communications Services arm has responsibility for:

- Print production - - FirstEnergy annual report, Strategic Plan, Climate Report, and FirstEnergy Utilities Strategic Plan
- Executive speechwriting and written testimony
- Power point and presentation support
- Speakers bureau.

A fourth arm, Financial and Web Communications, handles media relations related to financial topics and activities, writing earnings calls and financial analyst meeting scripts, and updating the FirstEnergy website.

The current reputational issues facing FirstEnergy have had a strong influence on the goals and objectives of the group, summarized as:

- Supporting efforts to “achieve a culture of compliance, repair our reputation, and rebuild trust among key stakeholders”
 - Promoting a value- and behavior-based senior leadership “voice”
 - Informing employees about measures to develop a culture of compliance
 - Communicating progress to external stakeholders
- Working with Customer Service on more consistent messaging and promoting customer tools and services
 - Leadership role in CX Engaged customer experience program\
 - Seeking new opportunities to deliver information to customers
 - Enhancing customer social media experience, particularly during storms
- Promoting a business environment seeking diverse employees, inclusion, innovativeness, and positioning for success
 - Working with an outside consultant to develop more effective diversity and inclusion messaging
 - Integrating diversity and inclusion messaging with broader communications strategy
 - Promoting initiatives and groups that promote positive change in FirstEnergy communities
- Developing coronavirus-related communications
- Delivering effective public safety campaign materials.

Communications and Branding engages in a broad range of FirstEnergy-wide external communications programs. Examples include:

- Information about infrastructure projects to service reliability
- Annual tree-trimming programs
- Charitable giving and community support (*e.g.*, United Way, STEM grants, Harvest for Hunger, other employee activities)
- Assistance programs available
- Diversity & Inclusion programs and awards
- Power Systems Institute utility worker training program
- Summer and winter system readiness inspections
- Storm preparation efforts and storm-outage updates
- Stop.Look.Live safety campaign
- Support for JCP&L employee “Green Team” environmental programs (*e.g.*, tree planting).

External Affairs group also interacts with local municipalities and community organization through personal meetings, phone calls and emails. These communications address matters that

include planned projects in particular communities, information about community involvement programs, and outage restoration updates.

Systems available to support the group’s efforts include a Microsoft platform for communicating externally. The platform includes Outlook, Teams, Incomm Conferencing (for storm calls to government officials), VMobile/Microsoft Dynamics (CRM), Survey Monkey (for post-storm surveys). External Affairs also promotes use of JCP&L’s social media platforms to learn about company activities and programs.

The next table summarizes recent Communications and Branding costs.

Communications and Branding Costs

Year	Budget	Actual	Variance	Δ
2019	\$32,564,185	\$31,182,743	(\$1,381,442)	
2020	\$27,528,475	\$22,084,592	(\$5,443,883)	-15.5%
2021	\$23,229,788			-15.6%

9. Investor Relations

The current organization responsible for investor relations services operates at the FirstEnergy level and it consists of the following positions under the Vice President of Investor Relations (who also serves as the Vice President of Communications):

- Senior Advisor
- Two Consultants
- One Analyst
- One Administrative Assistant.

This vice president also temporarily became the Acting Vice President of a separate organization, Communications & Corporate Affairs from the end of 2020 until mid-2021 when Corporate Affairs began to report to FirstEnergy’s Senior Vice President, Operation. The only change other than this role combination since 2017 consists of the elimination of one analyst position.

The Investor Relations group’s primary responsibility lies in providing services to the sell- and buy-side analysts, fixed income investors and rating agencies. The group:

- Communicates financial and operational strategy to external stakeholders
- Publishes the FirstEnergy FactBook and Quarterly Strategic and Financial Highlights
- Prepares for quarterly earnings results announcements.

The following list summarizes the group’s current goals, which include substantial additions (from the prior year) to address factors that have impaired FirstEnergy’s credit ratings and reputation:

- Providing clear and timely updates to the investment community
- Participating in conferences, roadshows and investor calls intended to attract and retain investors
- Seeking to reduce the Price-to-Earnings (“P/E”) multiple

- Improving disclosures that seek better investment community understanding of FirstEnergy and its businesses
- Maintaining strong relationships with the rating agencies
- Rebuilding trust and providing governance updates
- Providing updates through monthly calls or management meetings
- Working with the rating agencies to create a path for moving from negative to stable or positive credit outlooks
- Regaining investment grade credit ratings
- Conducting in-person management meetings with the rating agencies.

The next table shows changes in budgeted and actual costs since 2019. Costs through part of June 2021 appeared to generally track budget.

Investor Relations O&M Costs

Year	Budget	Actual	Variance	Δ
2019	\$1,458,838	\$1,606,825	\$147,987	
2020	\$1,538,074	\$1,559,400	\$21,326	5.4%
2021	\$1,583,750			3.0%

FirstEnergy cited the following as formal communications programs and vehicles regularly used in maintaining productive relations with the financial community, all occurring at the FirstEnergy level:

- Forms 10-K, 10-Q, and 8-K, as required by the U.S. Securities and Exchange Commission
- Earnings Releases and Earnings Calls offering and providing a forum for discussing quarterly and annual financial results and matters of interest to the financial community
- Quarterly documents available on its Investor Relations website, including its FactBook, Strategic & Quarterly Financial Highlights, Non-SEC registrant financial statements, and debt-related schedules
- Ad-hoc inclusion on the web site of special documents; for example, industry conference presentations or investor letters
- Regular meetings with and non-public five-year financial forecasts or presentations to the rating agencies.

C. Conclusions

- 1. The delegation of responsibility for management of local external affairs to JCP&L management has been effective; we do not see benefit in changing its reporting to place it at the FirstEnergy level. (See Recommendation #1)**

The JCP&L external affairs organization had until August 2021 operated directly under a vice president reporting to JCP&L's President. That structure kept responsibility for managing local relationships close to where those relationships operate. The organization has operated with a reasonably sized staff, producing stable costs in recent years. Moving it to the FirstEnergy level

and into an organization that has exhibited great turmoil and created extreme turmoil and disruption for FirstEnergy is not beneficial.

2. Structurally, with the exception of utility regulatory affairs, we did not find reason to question FirstEnergy’s overall means for aligning responsibility for external affairs, but its refusal to provide substantial information about the matters addressed in the previous chapter makes it impossible to perform a full assessment of effectiveness.

As the first conclusion states, we found the assignment of responsibility for local external affairs to JCP&L effective, and as the next one addresses, a compelling need exists to find a way to do more of the same for regulatory affairs. Beyond these matters, FirstEnergy’s large number of companies and multi-state operations makes its overall alignment of most external affairs functions logical. We did not generally find concern about cost levels, again excepting regulatory affairs. However, we cannot assess any potential structural, organizational, or resource alignment contributors to the recent problems (detailed in the previous chapter) without reasonably informed consideration of their root causes. Management has foreclosed that consideration by its lack of transparency (also discussed in the previous chapter) in providing information about those root causes and their potential extent and implications.

3. FirstEnergy’s management of regulatory affairs for JCP&L suffers major structural flaws and has demonstrated a significant level of ineffectiveness during the course of our engagement. (See Recommendation #1)

The *Introduction* chapter of this report, supported by additional detail from other report chapters, particularly the immediately preceding and the *Financial Risks and Consequences of Parent and Affiliate Operations* chapters, highlight the many instances of slow, argumentative, and unresponsive answers to requests for information relevant to and necessary for provision to the BPU of a report addressing the matters for which the BPU engaged us. Those instances reflect an extraordinary lack of support, applying experience we have gained over more than three decades performing more than 400 engagements for utility regulators across more than 40 states and several jurisdictions in North America. Management has also sought to introduce barriers to communicating candidly with personnel, from executives to field workers.

We did not find JCP&L personnel at all uncooperative, as chapters addressing the operations functions at the core of its responsibilities demonstrate. The same is not the case for FirstEnergy personnel. It appeared that FirstEnergy regulatory personnel assigned to JCP&L and JCP&L management worked hard to get our questions answered. Unfortunately, their efforts simply did not produce satisfactory results, although the absence of those efforts would likely have made bad results worse.

Many FirstEnergy groups appear to play roles in managing regulatory relations in New Jersey. They include Rate and Regulatory Affairs, State & Federal Regulatory Affairs, and the legal group assigned to support regulatory matters. This split introduces unneeded and unhelpful duplication, needs for coordination, and probably confusion in where responsibility lies for effectively responding to needs of authorities like the BPU. It does not help, although it appears to be intended to have done so, to have split top executive oversight of the first two groups, involving three separate top executives in managing regulatory matters and presumably in working to resolve issues surrounding the “tough ones.”

That split suggests that top management views regulatory affairs management as involving two separate disciplines - - operations and finance. In fact it is neither; best practice recognizes management of regulatory affairs as its own discipline.

Some have made a split approach work - - FirstEnergy clearly has not. Moreover, beyond the three organizations now sharing the regulatory affairs load (the two whose names themselves highlight the overlap and the legal group responsible for regulatory legal matters) another “force” clearly plays a substantial and perhaps dominate role. The very structure of the board of directors and the overpowering influence of counsel engaged in defense of matters arising from the DOJ Investigation show that fear of or at least defense of litigation drives decisions about providing information to the BPU as much or more than normally applicable considerations in managing utility regulatory relations well, stably, and cooperatively.

We do not question the priorities FirstEnergy appears to have established in light of the problems that beset it from that direction. We observe only that they clearly have heightened the degree to which JCP&L’s regulatory function has failed to meet normal utility practice.

There may well be more at stake than the division of responsibility FirstEnergy has created in managing utility regulatory relations, but ending it is a necessary first step. Doing so, in our view, will also create a sounder basis for avoiding repetition of the circumstances that have made litigation consequences so strong an influencer of its decisions about such relations.

4. FirstEnergy operates a strong and generally effective program for encouraging development, but its results have produced far fewer successfully developed projects in JCP&L’s service territory. (See Recommendation #2)

FirstEnergy focuses to a greater extent than we have frequently seen on development of projects that will bring growth consistent with public policies in the regions it serves and promote cost effective load additions to its system. FirstEnergy operates its program for encouraging development at modest overall costs, which have remained stable. The program provided attention to New Jersey, but successful developments have been rare there in contrast to what management has produced in the remainder of the areas FirstEnergy serves.

5. FirstEnergy operates through an effective and appropriately staffed Communications and Branding group.

We found a reasonably typical organization structure, staffing, and use of outside resources to provide communications services across FirstEnergy, including JCP&L. The organization is structured and operates in a manner that secures timely and sufficient knowledge of JCP&L’s circumstances and needs and that responds to them effectively. JCP&L leadership and management works with Communications and Branding to keep it informed of local needs and to provide input into areas of particular JCP&L needs, gaps in meeting them, and means for addressing them.

6. We found costs of the communications functions stable.

7. FirstEnergy employs an effective organization for and conducts investor relations effectively.

The organization is small and has remained so. Assigning other functions to the executive who heads it promotes efficiency. Our review (subject to what we learn in our more detailed review of Finance in Phase 2) of its activities showed them sufficiently comprehensive and timely.

8. The costs of the investor relations function have remained low and stable in recent years.

D. Recommendations

1. Return to JCP&L's lead officer responsibility for New Jersey external affairs. (See Conclusion #1)

Central control of external affairs has produced major problems for FirstEnergy. Moving responsibility away from JCP&L and to an organization subject to recent turmoil and change and without a history demonstrating that it has fundamentally changed (not just in structure and leadership) but in operation as well cannot be seen to benefit New Jersey.

2. Consolidate responsibility for rate and regulatory affairs under a senior legal executive. (See Conclusion #3)

Doing so will provide a single source for coordinating regulatory activities and for providing a perspective on regulatory relationship needs and consequences. Regulatory needs are not a function of either financial or operating needs and sometimes lie in tension with those needs when those responsible for top-level management of them take to short-range a view. Both the aftermath of the Ohio events and this engagement demonstrate that.

Our requests have produced objections, interpretations, incompleteness or other problems in great numbers. Moreover, they have produced excessive delay as communications have flowed from our sources at JCP&L through whatever processes and offices have been needed to execute on response needs. The litigation and investigation lens through which so much clearly must pass have no doubt heightened the issues we have experienced. By how much we cannot tell, but what is clear is that New Jersey regulatory needs have come second very often.

However, we view the litigation and investigation lens less as cause per se and more as a reflection of culture and attitude, both of which need material change. Again, we do not see the problem as arising at the level of the JCP&L or the regulatory people with whom we dealt directly. Rather, we see the issue as both residing and solvable at the senior FirstEnergy level, by creating:

- A top level voice empowered and expected to be offer perspectives complementing, not repeating, those of other senior executive at the table where major decisions get made
- An organization with a single leader and the resources needed to gain from regulators the information and insights needed to be effective in working with them and in executing what needs to be done to be responsive and timely.

Preferably this role should be filled with a person operating laterally to the top legal officer, but one with whom that officer has an open and confidence producing relationship. A second choice would be to place the new executive under the top legal officer. In either event, the new executive

should have the resources now split between the two separated regulatory organizations and the legal resources needed to provide legal guidance when applicable to regulatory matters.

The large number of FirstEnergy operating companies also warrants the division of responsibility among several vice presidential positions responsible for more than one state, dedicating to each a lead resources (one of them legal) who can draw as needed on resource pools to meet the needs of the state(s) to which they are assigned. Recognizing that implementing this recognition would require change across state lines, a less efficient but acceptable alternative would involve:

- Creating a position similar to or expanding the responsibilities of JCP&L’s Vice President, External Affairs
- Assigning to that position the resources from the two FirstEnergy regulatory groups and legal group needed to function without assistance other than assurance of overall coordination and consistency across the system.

3. Conduct a focused study of means for cost effectively improving development program success in JCP&L’s serving region. (See Conclusion #4)

We do not question the reasons management has offered for its comparatively much lower number of successful development projects in New Jersey. However, the notable success of the program overall and the value that responsible and cost-effective new development can bring for JCP&L and its customers make it important to ensure maximization of effective efforts in New Jersey. Management has cited a number of public policy issues along with economic and demographic factors. These factors make it appropriate for management to provide a forum for dialogue with a broad range of state and local leaders and stakeholders about the benefits of sound development, measures that have proven successful elsewhere, unique factors that apply in JCP&L’s serving region, and measures that can bring the company, public policy leaders, and stakeholders further together in bringing desirable and cost effective development to this region.

We emphasize that success in other serving areas rather than criticism of efforts in New Jersey underlies this recommendation.