Exhibit JC-4

IN THE MATTER OF THE PETITION OF JERSEY CENTRAL POWER & LIGHT FOR APPROVAL OF JCP&L'S ENERGY EFFICIENCY AND CONSERVATION PLAN INCLUDING ENERGY EFFICIENCY AND PEAK DEMAND REDUCTION PROGRAMS (JCP&L EE&C)

BPU DOCKET NO. _____

DIRECT TESTIMONY

OF

BRENDON J. BAATZ

Gabel Associates, Inc.

On Behalf Of
Jersey Central Power & Light

September 25, 2020

JERSEY CENTRAL POWER & LIGHT
DIRECT TESTIMONY OF
BRENDON J. BAATZ

I. INTRODUCTION

Q. Please state your name, business address, and position.

A. My name is Brendon J. Baatz and my business address is 417 Denison Street, Highland Park, New Jersey, 08904. I am presently employed as a Vice President at Gabel Associates, Inc., an energy, environmental, and public utility consulting firm.

Q. Please summarize your professional experience and educational background.

A. I have been employed with Gabel Associates since March of 2018. While at Gabel Associates, I have worked for a range of public and private clients on various issues in the utility industry. The issues include retail and wholesale electric rate design, renewable energy project cost benefit analysis, and electric vehicle utility policy. I have also worked extensively on energy efficiency program design, policy, and cost benefit analysis for several clients, including gas and electric utilities.

Prior to my employment with Gabel Associates, I managed the utility program at the American Council for an Energy Efficient Economy ("ACEEE"). There I focused on various issues related to utility-sector energy efficiency programs, including efficiency program design, state policies, and regulatory issues affecting energy efficiency, including electric and gas rate design. While at ACEEE I published numerous reports on energy efficiency programs and policy, and also regularly spoke at conferences on related issues. I also testified in various proceedings on these issues during that time.

Prior to my employment with ACEEE, I was employed with the Federal Energy Regulatory Commission ("FERC"). During my employment with FERC my primary

responsibilities were the review and analyses of electric utility cost of service studies in wholesale transmission and electric power rate cases. I also worked on other litigated issues while at FERC including but not limited to transmission capacity reservation rights, municipal power contracts, and formula rate structure and protocols. Prior to my employment with FERC, I held positions with the Maryland Public Service Commission ("PSC") as an energy analyst and the Indiana Office of Utility Consumer Counselor ("OUCC") as a utility analyst. While at the Maryland PSC, I worked on the EmPOWER Maryland programs focusing on program design, avoided cost development, and other policy issues. While working at the OUCC, I testified on a variety of utility issues including but not limited to rate design, renewable energy credit compensation, and utility petitions for construction. I also represented the agency in several oversight boards for utility energy efficiency programs.

I hold a Master of Public affairs degree from Indiana University Bloomington and a Bachelor of Science in political science from Arizona State University. I have continued my education through attendance of various seminars and conferences. I have also completed formal training in rate design, cost of service, depreciation, and other utility regulatory matters.

My resume is attached as Exhibit BJB-1.

Q. Have you previously testified before the New Jersey Board of Public Utilities ("Board" or "BPU")?

A. Yes. I previously testified in Docket Nos. GR18080860 and GR20070503.

Q. What is the purpose of your direct testimony in this case?

A. The purpose of my testimony is to present the cost effectiveness analysis conducted on the Jersey Central Power and Light ("JCP&L") proposed three-year energy efficiency portfolio.

Q. Are you sponsoring any schedules in connection with your direct testimony?

A. Yes. I am presenting the following schedules, which have been prepared by me or under my direction and supervision, and are accurate and complete to the best of my knowledge and belief. These schedules contain information responsive to the Minimum Filing Requirements ("MFRs") as referenced in the MFR Index attached to the Petition as Exhibit A and as approved by the Board in its June 10, 2020 Order in Docket Nos. QO19010040, QO19060748, and QO10791004 ("June 10 Order'). The schedules attached include:

(a) Exhibit BJB-1 – Baatz Resume

(b) Exhibit BJB-2 – Cost Effectiveness Results

(c) Exhibit BJB-3 –Energy Efficiency Program Cost Benefit Analysis Workpapers (Confidential)

(d) Exhibit BJB-4 – Emissions Avoided Results

(e) Exhibit BJB-5 – Economic Development and Job Creation Analysis Results

(f) Exhibit BJB-6 –Cost to Achieve Results

(g) Exhibit BJB-7 –Energy Savings Target Development Schedule

II. <u>COST EFFECTIVENESS ANALYSIS OF JCP&L EE&C PLAN</u>

Q. Did you conduct cost effectiveness analysis of the program portfolio in the JCP&L Plan?

A. Yes. I prepared the cost-benefit analysis ("CBA") which calculates and details the results of the six tests prescribed in the MFRs as required by the Board. This entailed developing a model which analyzed measure-specific details and computed the estimated costs and savings of each program for use in the New Jersey Cost Test ("NJCT"), the Total Resource Cost ("TRC") test, the Participant Cost test ("PCT"), the Program Administrator Cost ("PAC") test, the Ratepayer Impact Measure ("RIM") test, and the Societal Cost test ("SCT"). This testimony presents the methodology and results of the six CBA tests required by the Board's MFRs for the Company's energy efficiency program results for the plan period of July 1, 2021 through June 30, 2023. These results allow the BPU to evaluate the projected performance of the program offerings proposed for this time period.

Q. Please describe the CBA tests required by the Board's MFRs.

A. In the June 10 Order, the Board updated the energy efficiency MFRs. Section V.a. in the updated MFRs, states:

> The utility shall conduct a benefit-cost analysis of the programs and portfolio using the New Jersey Cost Test, Participant Cost Test, Program Administrator Cost Test, Ratepayer Impact Measure Test, Total Resource Cost Test, and Societal Cost Test that assesses all program costs and benefits from a societal perspective i.e., that includes the combined financial costs and benefits realized by the utility and the customer. The utility may also provide any additional benefit-cost analysis that it believes appropriate with supporting rationales and documentation.

Each test listed above is designed to provide a different perspective on the cost-effectiveness of the proposed programs. The six cost effectiveness tests prescribed by the Board provide the following perspectives for decision makers:

- New Jersey Cost Test – The New Jersey Cost Test is the primary cost effectiveness test for energy efficiency programs in New Jersey. The test measures net costs of the program as a resource option based on total costs, similar to the total resource

cost test, but also includes additional benefits to address specific state policy considerations in New Jersey, like the social cost of avoiding carbon dioxide emissions.

- Societal Cost Test – The Societal Cost Test measures the net costs of a program as a resource option based on the total costs of the program, including both the participants' and the utility's costs. The Societal Test differs from the total resource test in that it includes the effects of societal impacts such as environmental impacts to the economy, excludes tax credit benefits, and uses a different (societal) discount rate.
- Total Resource Cost Test – The Total Resource Cost Test measures the net costs of a program as a resource option based on the total costs, including both the participant and the utility costs of the program.
- Participant Cost Test – The Participant Cost Test is the measure of the quantifiable benefits and costs from the perspective of program participants. Since many customers do not base their decision to participate in a program entirely on quantifiable variables, this test is not a complete measure of the benefits and costs of a program to a customer.
- Program Administrator Cost Test – The Program Administrator Cost Test measures the net costs of a program as a resource option based on the costs incurred by the program administrator or utility (including incentive costs) and excluding any net costs incurred by the participant. The benefits are similar to the TRC benefits. Costs include the total program costs. This test measures the net economic impact of investing in energy efficiency programs from the perspective of the utility.

- Ratepayer Impact Measure Test – The Ratepayer Impact Measure test measures what happens to customer rates due to changes in utility revenues and operating costs caused by the program.

In aggregate, these tests provide the Board with multiple viewpoints of the benefits and costs associated with the programs.

Q. Please describe your approach to assessing cost effectiveness using the six tests described above.

A. I completed all six tests using guidance from the Board's August 24, 2020 Order Adopting the First New Jersey Cost Test ("August 24 Order") and the California Standard Practice Manual.[1,2] The August 24 Order provided specific guidance on how to estimate costs and benefits of programs, including assumptions on line losses and discount rate, for the New Jersey Cost Test. I applied the Board's guidance on the development of specific benefits and costs to all tests conducted. For the Societal Cost Test, I included additional benefits that were not included in the August 24 Order. For those benefits, I relied on industry best practice methods.

Q. Did you evaluate JCP&L's portfolio of programs being proposed using the six CBA tests required in the MFRs?

A. Yes, I evaluated program cost effectiveness for all six tests. The results of this analysis are presented in Schedule BJB-2. The supporting workpapers for the cost benefit analysis are attached as Exhibit BJB-3.

[1] New Jersey Board of Public Utilities. *Order Adopting the First New Jersey Cost Test.* Docket Nos. QO19010040 and QO20060389. August 24, 2020.
[2] California Public Utilities Commission. 2001. *California Standard Practice Manual: Economic Analysis of Demand-Side Programs and Projects.*
cpuc.ca.gov/uploadedFiles/CPUC_Public_Website/Content/Utilities_and_Industries/Energy_-_Electricity_and_Natural_Gas/CPUC_STANDARD_PRACTICE_MANUAL.pdf

Q. Please summarize your conclusions.

A. The CBA shows the JCP&L portfolio is cost effective under the New Jersey Cost Test. Under the New Jersey Cost Test, the three-year portfolio resulted in net benefits of $685 million and a cost benefit ratio of 3.5. This implies that for every dollar JCP&L spends on energy efficiency programs, customer will receive $3.48 in benefits.

The portfolio also produced significant environmental and health benefits. I estimate that the energy savings produced by the JCP&L Plan will reduce carbon dioxide ("CO_2") emissions by 4.3 million tons, sulfur dioxide ("SO_2") emissions by 2,814 tons, and nitrogen oxide ("NO_X") emissions by 2,239 tons.[3] The portfolio also will provide significant economic development benefits. I estimate the portfolio will add $981 million to the New Jersey GDP and create 8,996 job-year equivalents over the life of the measures.[4]

Q. Did you also review the JCP&L cost to achieve values in relation to the Board's proposed guidelines from the June 10th Order?

A. Yes. The JCP&L sector level cost to achieve values are shown in Exhibit BJB-6. The JCP&L sector cost to achieve is within the guidelines suggested by the Board.

I. COST-BENEFIT ANALYSIS ASSUMPTIONS

Q. What types of cost benefit analyses did you prepare?

A. I prepared an analysis for each of the six CBA tests required by the Board's MFRs.

Q. What methodology did you use to undertake these calculations?

[3] The results of the emissions avoided analysis are shown in Exhibit BJB-4.
[4] The results of the economic development benefits analysis are shown in Exhibit BJB-5.

A. I relied on methodology outlined in the Board's August 24 Order and the California Standard Practice Manual.[5,6] Within the CBA tests, there are a wide range of costs and benefits used to characterize program integrity, some of which are applicable in conducting certain tests but not others. Table 1 shows a list of specific costs and benefits and the tests they apply to:

[5] New Jersey Board of Public Utilities. *Order Adopting the First New Jersey Cost Test.* Docket Nos. QO19010040 and QO20060389. August 24, 2020.
[6] California Public Utilities Commission. 2001. *California Standard Practice Manual: Economic Analysis of Demand-Side Programs and Projects.*
cpuc.ca.gov/uploadedFiles/CPUC_Public_Website/Content/Utilities_and_Industries/Energy_-_Electricity_and_Natural_Gas/CPUC_STANDARD_PRACTICE_MANUAL.pdf

Table 1: Costs and Benefits Utilized in CBA Tests

	NJCT	SCT	TRC	PCT	PAC	RIM
Program Benefits						
Avoided Wholesale Electric Energy	x	x	x		x	x
Avoided Electric Ancillary Services	x	x	x		x	x
Avoided Wholesale Electric Capacity	x	x	x		x	x
Avoided Wholesale Natural Gas	x	x	x		x	x
Demand Reduction Induced Price Effect	x	x	x		x	x
Avoided RPS REC Purchases		x			x	x
Avoided Wholesale Volatility		x			x	x
Avoided T&D	x	x	x		x	x
Avoided Retail Electric and Gas Costs				x		
Customer Rebates and Incentives				x		
Utility Lost Revenues						x
Non-Energy Benefits 5% Adder	x					
Low-Income Benefit 10% Adder	x					
Avoided Emissions Impacts (CO_2)	x	x				
Avoided Emissions Impacts (SO_2 & NO_X)		x				
Economic Development Benefits		x				
Program Costs						
Incremental Costs	x	x	x			
Participant Costs				x		
Administration Costs	x	x	x		x	x
Customer Rebates and Incentives					x	x
Utility Lost Revenues						x

Q. Please describe the Program Benefits shown in Table 1.

A. The following sections describe the benefits and calculation approach.

1. Avoided Wholesale Electric Energy Costs

The avoided wholesale electric energy costs benefit represents the wholesale electric market purchases that would be avoided as a result of reductions in energy usage associated with the programs. Consistent with the New Jersey Cost Test guidance document, this value was estimated using the three year average of historic PJM energy

prices for the JCP&L zone.[7] The prices were then forecasted using a blend of basis adjusted energy market forward trading prices for PJM-Western Hub, the most liquidly traded zone in PJM, and forecasted prices from the Energy Information Administration ("EIA") in its newest (currently 2020) Annual Energy Outlook generation reference case for the PJM/East region.[8] Values were calculated for on- and off-peak prices on a monthly basis. All values were adjusted to account for marginal line losses on the JCP&L and PJM systems, and sales and use tax.

2. Avoided Electric Ancillary Services Costs

The avoided electric ancillary services costs benefit represents the wholesale electric ancillary service market purchases that would be avoided as a result of reductions in energy usage associated with the programs. Consistent with the New Jersey Cost Test guidance document, this value was estimated using the three-year average of historic PJM ancillary service prices based upon data from PJM's Independent Market Monitor.[9] The prices were then forecasted using the electric energy forecast described above.

3. Avoided Wholesale Electric Capacity Costs

The avoided wholesale electric capacity costs category captures the wholesale reduction in PJM capacity as a result of the reductions in electric demand associated with the programs. I used actual cleared PJM Eastern Mid-Atlantic Area Council ("EMAAC")

[7] New Jersey Board of Public Utilities. *Order Adopting the First New Jersey Cost Test.* Docket Nos. QO19010040 and QO20060389. August 24, 2020. *p. 12*

[8] United States Energy Information Administration. Annual Energy Outlook 2020. Table 54. Electric Power Projections by Electricity Market Module Region (Reference Case, PJM/East Region). eia.gov/outlooks/aeo/data/browser/#/?id=62-AEO2020&region=5-10&cases=ref2020&start=2018&end=2050&f=A&linechart=ref2020-d112119a.130-62-AEO2020.5-10&map=&ctype=linechart&sourcekey=0.

[9] Monitoring Analytics, LLC. *2019 State of the Market Report for PJM.* Section 10 Ancillary Services. Table 10-4. History of ancillary service costs per MWh of load: 1999 through 2019. monitoringanalytics.com/reports/PJM_State_of_the_Market/2019/2019-som-pjm-sec10.pdf

Locational Deliverability Area ("LDA") prices where available. Clearing prices were forecasted based upon a baseline of the average of the previous three delivery year clearing prices. Prices were escalated based upon a regression forecast of how capacity prices have increased over time. All values were adjusted to account for marginal line losses on the JCP&L and PJM systems, PJM's Forecast Pool Requirement ("FPR") to account for avoided reserve requirements, and sales and use tax.

4. Demand Reduction Induced Price Effect Benefits (Electric & Gas)

The demand reduction induced price effects ("DRIPE") price suppression (also known as merit order benefits) is a benefit that captures the reduction in wholesale electric and natural gas market prices to all customers, not just participants, as a result of energy efficiency. Wholesale electric and natural gas markets are fundamentally supply and demand based – therefore, downward movement in the electric or natural gas demand curve as a result of reduced consumption should result in less expensive generation resources being dispatched for electricity, and less expensive natural gas delivered. If either market "clears" at a lower price, the associated reductions in market prices flow through to all customers.

Both electric energy and capacity DRIPE benefits were estimated using a univariate regression model. This approach is consistent with the NJCT guidance document.[10]

5. Avoided Wholesale Natural Gas Costs

The avoided wholesale natural gas costs category captures wholesale natural gas market purchases that would be avoided as a result of reduction in energy usage associated with the programs.

[10] New Jersey Board of Public Utilities. *New Jersey Cost Test.* August 24, 2020. Page 15-16. bpu.state.nj.us/bpu/pdf/boardorders/2020/20200824/8A%20-%20ORDER%20New%20Jersey%20Cost%20Test.pdf

The value of avoided natural gas costs is estimated using New York Mercantile Exchange ("NYMEX") forward trading prices for Henry Hub adjusted for transportation to Texas Eastern Transmission Pipeline (Tetco) M3 delivery point. The underlying Henry Hub supply forecast was combined with the Tetco M3 basis to determine the avoided cost projection. All values were adjusted to account for average losses and sales and use tax. This approach is consistent with the prescribed method in the New Jersey Cost Test guidance document.[11]

6. Avoided RPS REC Purchase Costs

The avoided Renewable Portfolio Standard ("RPS") Renewable Energy Certificates ("RECs") purchase cost estimates the reduced volume of RECs that must be purchased by New Jersey's electric retail suppliers as a result of energy efficiency electricity reductions. The New Jersey RPS sets the total volume requirement of RECs that must be purchased as a percentage of retail load. A reduction in retail load due to energy efficiency will reduce the total number of RECs required to be purchased.

Forecast market prices for New Jersey Class I RECs, Class II RECs and solar renewable energy credits ("SRECs") (legacy, transition, successor) were used based upon an internal supply-demand analysis and compliance costs for the three New Jersey REC markets.

7. Avoided Wholesale Volatility Costs (Electric & Gas)

The avoided wholesale volatility cost category estimates the value of avoiding risk of wholesale purchases. Wholesale electric and natural gas prices are inherently risky as they are market-based and not fixed in price or volume. Large fluctuations in prices expose

[11] *Ibid* page 13.

customers and retail suppliers to risks that ultimately are priced into retail rates. Energy efficient measures and practices amount to a purchase of energy service which does not contain the price volatility implicit in the price of electricity and natural gas. By reducing the overall energy purchases of customers, customers are exposed to less fuel volatility. In this regard, energy efficiency can be viewed as an energy resource that does not contain the price volatility embedded in purchases from the electric and gas supply systems.

The risk avoidance benefit of energy efficiency was applied as a price adder to the cost of electricity and natural gas (only in the SCT). The price adder was determined based upon a review of studies and regulatory decisions. While there is some variation among the studies, a conservative premium based on these precedents equal to 10% of electric and natural gas costs was assumed.[12]

8. Avoided T&D Costs

The value of avoided transmission and distribution costs was estimated using the methods prescribed in the NJCT guidance document. For transmission, the most recent Network Integrated Transmission Service ("NITS") rate for the JCP&L service territory was used.[13] For distribution, the value was estimated in the manner prescribed by the Board

[12] For studies reviewed, please see Baatz et al. Estimating the Value of Energy Efficiency to Reduce Wholesale Energy Price Volatility. American Council for an Energy-Efficient Economy; aceee.org/research-report/u1803. Stanton et al. Net Metering in Mississippi. Synapse Energy Economics. Appendix A. synapse-energy.com/sites/default/files/Net%20Metering%20in%20Mississippi.pdf; Hornby et al. Avoided Energy Supply Costs in New England: 2013 Report. Synapse Energy Economics. pp 5-22. publicservice.vermont.gov/sites/dps/files/documents/Energy_Efficiency/AESC%20Report%20-%20With%20Appendices%20Attached.pdf; 2013 Integrated Resource Plan. Rocky Mountain Power. pacificorp.com/content/dam/pacificorp/doc/Energy_Sources/Integrated_Resource_Plan/2013IRP/PacifiCorp-2013IRP_Vol1-Main_4-30-13.pdf and pacificorp.com/content/dam/pacificorp/doc/Energy_Sources/Integrated_Resource_Plan/2013IRP/PacifiCorp-2013IRP_Vol2-Appendices_4-30-13.pdf; Bolinger et al. Quantifying the Value that Energy Efficiency and Renewable Energy Provide As a Hedge Against Volatile Natural Gas Prices. Lawrence Berkley National Labs. aceee.org/files/proceedings/2002/data/papers/SS02_Panel5_Paper02.pdf; Is Fixed Price Energy a Good Deal? Walden Labs. waldenlabs.com/is-fixed-price-energy-a-good-deal; EEU Avoided Costs for the 2016-2017 Time Period. P. 17 – number 6. puc.vermont.gov/sites/psbnew/files/doc_library/order-re-eeu-avoided-cost-2016-2017.pdf.

[13] PJM Annual Transmission Revenue Requirements and Rates. pjm.com/-/media/markets-ops/settlements/network-

in the NJCT guidance document. This required estimating the total distribution charges that would have been paid by program participants in the absence of the program and then subtracting the total distribution charges the customer paid after the implementation of the energy efficiency measures.[14]

9. Avoided Retail Electric and Natural Gas Costs

The avoided retail electric and natural gas cost categories captures the actual bill savings to participants of the programs. A key benefit of energy efficiency is reduced consumption by participants which results in reduced utility costs.

Avoided retail electric costs were calculated based upon the electric charges and applicable rate classes in JCP&L's Tariff for Electric Service. This method results in a "price to compare" analysis, as only portions of the tariff which would be offset as a result of the programs are included in the analysis. By way of example, customers will not offset any of the monthly fixed service charge, so that avoiding that charge was not included in the retail electric savings analysis. Each charge was escalated, by component, to account for separate escalation rates for distribution and supply charges. Charges related to electric delivery and transmission were assumed to escalate at 2.0% per year and electric energy and capacity supply charges were escalated in a manner consistent with the wholesale market escalations explained above.

Avoided retail natural gas costs were calculated based on the natural gas charges and applicable rate classes available in New Jersey Natural Gas's Tariff for Gas Service. This method results in a "price to compare" type analysis, as only portions of the tariff

integration-trans-service-june-2020.ashx?la=en

[14] New Jersey Board of Public Utilities. *New Jersey Cost Test.* August 24, 2020. Page 13. bpu.state.nj.us/bpu/pdf/boardorders/2020/20200824/8A%20-%20ORDER%20New%20Jersey%20Cost%20Test.pdf

which would be offset as a result of the programs are included in the analysis. By way of example, customers will not offset any of the monthly fixed service charge, so that avoiding that charge was not included in the retail natural gas savings analysis. Each charge was escalated, by component, to account for separate escalation rates for distribution and supply charges. Charges related to natural gas delivery were escalated at 2.0% per year while natural gas supply charges were escalated in a manner consistent with the wholesale market escalations explained above.

10. Customer Rebates and Incentives

The customer rebate and incentive cost category capture the direct rebate incentives provided to participants of the programs. Depending on perspective, customer rebates and incentive costs can either be a benefit to a program (to participants) or a cost to programs (to the utility and ultimately, ratepayers). This benefit is only realized in the participant cost test, as that test singles out the experience of a participant in the programs. The time-value of money associated with the provision of loans to participations is also a benefit to customers (and costs to the utility and ultimately, ratepayers), and is captured as a benefit in the PCT, and as a cost in the PAC and RIM tests.

11. Avoided Emissions Damages

The avoided emissions damages category captures the economic value (also known as the avoided social cost) of reductions in CO_2, NO_x, and SO_2. Energy efficiency programs displace power plant emissions which cause negative impacts, also known as damages. I did not include any other criteria air pollutants or greenhouse gases.

To estimate the displaced CO_2, I relied on the electric emissions factor of 1,374 pounds per MWh and natural gas emission factor of 11.7 pounds per therm, per the NJCT

guidance document.[15] The avoided damages for CO_2 were estimated using the "Social Cost of Carbon for Regulatory Impact Analysis - Under Executive Order 12866" produced by the Interagency Working Group on Social Cost of Greenhouse Gases, United States Government.[16] This benefit was included in the NJCT and SCT.

I also estimate the economic value of the avoided SO_2 and NO_X emissions from the programs. While not included in the NJCT, the economic value of avoiding these emissions is substantial and reflected in the SCT. To estimated displaced SO_2 and NO_X emissions, I relied on the non-baseload tons per MWh estimate from the most recent eGrid data release (currently eGRID2018 released in March 2020).[17] I then de-escalated these rates over time based upon emissions rates from the most recent EIA Annual Energy Outlook (currently 2020) for the PJM/East region.[18] The de-escalation is intended to reflect the likely shift away from fossil based generation towards clean energy resources. To estimate the avoided damages from SO2 and NO_X, I relied on the February 2018 Technical Support Document Estimating the Benefit per Ton of Reducing PM2.5 Precursors from 17 Sectors by the U.S. Environmental Protection Agency Office of Air and Radiation Office of Air Quality

[15] New Jersey Board of Public Utilities. *New Jersey Cost Test.* August 24, 2020. Page 17. bpu.state.nj.us/bpu/pdf/boardorders/2020/20200824/8A%20-%20ORDER%20New%20Jersey%20Cost%20Test.pdf

[16] Interagency Working Group on Social Cost of Greenhouse Gases, United States Government. 2016 Technical Support Document: -Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis -Under Executive Order 12866. August 2016. epa.gov/sites/production/files/2016-12/documents/sc_co2_tsd_august_2016.pdf

[17] United States Environmental Protection Agency. Emissions and Generation Resource Integrated Database (eGRID). Released 1/28/2020, Revised 3/9/2020. epa.gov/energy/emissions-generation-resource-integrated-database-egrid

[18] United States Energy Information Administration. Annual Energy Outlook 2020. Table 54. Electric Power Projections by Electricity Market Module Region (Reference Case, PJM/East Region). eia.gov/outlooks/aeo/data/browser/#/?id=62-AEO2020&region=5-10&cases=ref2020&start=2018&end=2050&f=A&linechart=ref2020-d112119a.108-62-AEO2020.5-10~ref2020-d112119a.156-62-AEO2020.5-10~ref2020-d112119a.157-62-AEO2020.5-10~ref2020-d112119a.158-62-AEO2020.5-10~&map=&ctype=linechart&sourcekey=0.

Planning and Standards.[19] This source was used and approved by the Board[20] in the Evaluation of New Jersey Solicitation for offshore wind renewable energy credits ("OREC") for Offshore Wind Capacity Framework for Evaluation of Impacts.[21]

12. Economic Development Benefits

Energy efficiency programs can be a powerful tool for local economic development and job creation. While cost effective energy efficiency programs provide many other benefits including reduced utility system costs, lower emissions, and lower bills for program participants, the job creation and local economic growth benefits are critical as states begin to recover from the COVID-19 pandemic.

Economic benefits are created by energy efficiency programs in two significant ways. First, economic benefits are created through the direct implementation of the programs, which are driven by the additional program spending and associated impacts in industries directly receiving dollars. Second, benefits are also created through the ripple effects on the economy of customer bills savings. Energy efficiency programs create significant bill savings, which increase disposable income for residents and businesses. The spending of this increased disposable income stimulates the economy, providing ripple effects in many sectors of the economy.

I estimated the economic development benefits using IMPLAN, a widely used industry standard input/output model. IMPLAN and similar input output models have been

[19] United States Environmental Protection Agency. 2018. Technical Support Document: Estimating the Benefit per Ton of Reducing PM2.5 Precursors from 17 Sectors. epa.gov/sites/production/files/2018-02/documents/sourceapportionmentbpttsd_2018.pdf.

[20] In the Matter of the Board of Public Utilities Offshore Wind Solicitation for 1,100 MW – Evaluation of the Offshore Wind Applications. Docket No. QO18121289. bpu.state.nj.us/bpu/pdf/boardorders/2019/20190621/6-21-19-8D.pdf

[21] Levitan & Associates, Inc. *Evaluation of New Jersey Solicitation for ORECs for Offshore Wind Capacity Framework for Evaluation of Impacts*. bpu.state.nj.us/bpu/pdf/boardorders/2019/20190621/6-21-19-8D%20-%20Public%20Version%20-%20Levitan%20NJ%20OREC%20Final%20Report.pdf

presented to the Board numerous times, including instances by its own consultants and by consultants to Rate Counsel. IMPLAN is also one of the input output models suggested by the Board for evaluation of offshore wind investments. Finally, input/output modeling is required under the Offshore Wind Economic Development Act ("OWEDA") for offshore wind projects submitting for ORECs.[22]

I estimated the economic impacts by imputing the projected program spending and bill savings into IMPLAN. For program spending, I used a program by program approach to break out materials and labor, mapping spending into specific industries within IMPLAN. For bill savings, I mapped the increased disposable income to households by income level and to relevant commercial industries. Finally, to capture the negative economic impacts of higher rates and bills from the cost recovery associated with the programs, I offset the increased disposable income by the projected increase in bills driven by program costs. Collectively, these three steps provide a comprehensive estimate of economic impacts and job creation.

13. Non-Energy and Low-Income Adders

I applied a 5% adder to avoided energy benefits to address non-energy benefits, including comfort, health, and safety. I also applied a 10% adder to avoided energy benefits to address low-income non energy benefits, including reduced arrearages and other low-income specific benefits. The low-income adder was in addition to the 5% non-energy benefit adder. Both adders are consistent with the prescribed method in the New Jersey Cost Test guidance document.[23]

[22] N.J.A.C. 14: § 14:8-6.5 Application Requirements. nj.gov/bpu/pdf/boardorders/2018/20180917/9-17-18-8G.pdf
[23] New Jersey Board of Public Utilities. *New Jersey Cost Test.* August 24, 2020. Page 18. bpu.state.nj.us/bpu/pdf/boardorders/2020/20200824/8A%20-%20ORDER%20New%20Jersey%20Cost%20Test.pdf

Q. Please describe the Program Costs listed in Table 1 above.

A. The program costs include:

1. Incremental Costs

The incremental cost category captures the incremental cost of participating in the programs. This cost is calculated based upon the difference between the efficient measure costs assumed to install energy efficiency technologies and processes and the base measure cost assumed that a participant would otherwise pay without access to the proposed program.

2. Participant Costs

The participant cost category captures the incremental cost of participating in the programs paid by participants. This category includes both incremental costs paid by participants for the non-subsidized portion of energy efficiency costs, as well as loan repayments for programs offering financing.

3. Program Administration Costs

The program administration cost category captures the cost of administering the energy efficiency programs by JCP&L. These include costs for marketing, outside services, utility administration, inspections and quality control, and evaluation. These costs were developed based on JCP&L's previous experience delivering similar programs and guidance from the Board in the June 10 and August 24 orders.

4. Customer Rebate and Incentives Cost

The customer rebate and incentive cost category capture the direct rebate incentives provided to participants of the programs. These costs were developing through a

coordinated approach with other New Jersey utilities, but also based on existing programs in New Jersey and other jurisdictions for similar measures.

5. Utility Lost Revenues

An associated cost is the reallocated distribution costs category which captures the value of any distribution costs being avoided by participants that must be collected from the balance of ratepayers. These are not direct program costs and represent the transfer between existing ratepayer subsectors. This cost is also known as lost utility costs or lost revenues.

Utility lost revenues were calculated based upon the individual rate charges which currently contribute to supporting distribution costs. In addition, the utility lost revenues also include tariff surcharges and riders which do not contribute to distribution costs but would likely be reallocated to ratepayers at large. Utility lost revenues do not include any supply related costs, as New Jersey's electric and natural gas utilities are deregulated, and avoided supply costs resulting from energy efficiency are not currently borne by ratepayers.

Q. What assumptions did you use for measure-level energy savings?

A. All measure level assumptions were provided by JCP&L. These are also available in Appendix C, Table C-2 of the JCP&L EE&C Plan.

Q. Were the costs and benefits evaluated on a nominal or present value basis?

A. For the purposes of each of the CBA tests, all costs and benefits were evaluated on a present value basis. The NJCT and SCT both relied on a 3% societal discount rate as prescribed by the Board in the August 24 Order.[24] The TRC, PCT, PAC, and RIM tests relied on the JCP&L weighted average cost of capital of 7.47% (post-tax) to discount costs and benefits.

[24] New Jersey Board of Public Utilities. *New Jersey Cost Test.* August 24, 2020. Page 13. bpu.state.nj.us/bpu/pdf/boardorders/2020/20200824/8A%20-%20ORDER%20New%20Jersey%20Cost%20Test.pdf

Q. What net to gross assumption did you make in conducting the cost benefit analysis?

A. Consistent with Board guidance, I used a 1.0 net-to-gross factor for all programs and measures.[25]

Q. Please describe how the JCP&L energy savings target was developed.

A. The JCP&L energy savings target is based on guidance from the Board in the June 10 Order. In the Order, Staff recommends that "the average usage for the purposes of compliance be calculated based on the average of retail sales for the most recent three-year years relative to the program year for which the target is applicable."[26] Accordingly, the savings target for each program year is based on an average of the three prior years. For program year one, which runs from July 1, 2021 through June 30, 2022, the savings target is based on the average of the actual sales in 2018-2019 and forecasted sales for 2020. For program year two, the savings target is developed based on the average of actual sales in 2019, and forecasted sales in 2020-2021. The program year three target was based upon forecasted sales for 2021-2023. The baseline developed through this approach was then multiplied by the energy savings target percentages in the June 10 Order to determine the MWh goals. The target development is detailed in Exhibit BJB-7.

III. CONCLUSIONS

Q. Please summarize your testimony and recommendations to the Board.

A. The JCP&L 2021-2023 Energy Efficiency and Conservation Program is a cost-effective portfolio of energy efficiency programs that achieve the state policy goals of the Board. The programs provide energy savings opportunities to all customers in the JCP&L service

[25] New Jersey Board of Public Utilities. *Order Directing the Utilities to Establish Energy Efficiency and Peak Demand Reduction Programs.* Docket Nos. QO19010040, QO19060748, and QO10791004. June 10, 2020.
[26] *See* June 10 Order at page 19.

territory and ensure low-to-moderate income customers have equal opportunity to realize program benefits. The portfolio also puts JCP&L on a trajectory to meet the program year five energy savings target mandated in the Clean Energy Act.

The CBA shows that the JCP&L program portfolio is cost effective under the New Jersey Cost Test with a cost benefit ratio of 3.5 and net benefits of $685 million. These results indicate that the programs will provide significant benefits to all JCP&L customers, while improving environmental quality and stimulating economic development. I recommend the Board approve the JCP&L program portfolio as proposed.

Q. Does this conclude your testimony?

A. Yes.

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Brendon Baatz has nearly ten years of experience working directly on issues related to the electric and gas utility industry. His primary areas of expertise include electric cost of service and rate design, energy efficiency program design, energy efficiency policy, cost benefit analysis, utility regulatory strategy, stakeholder engagement, integrated resource planning, electric vehicle policy, and renewable energy technology and policy.

Mr. Baatz is an internationally recognized expert in rate design and energy efficiency policy. He has published peer reviewed papers and spoken on a variety of topics at trade events and conferences. Mr. Baatz is also a sought-after expert witness in litigated cases before regulatory commissions. He has appeared before commissions in Arizona, Colorado, Indiana, Maryland, New Jersey, New York, Oklahoma, Pennsylvania, and Washington D.C.

Professional Experience

Gabel Associates Inc. Highland Park, NJ
Vice President 2018-Present

- Support and advise clients on a variety of energy and regulatory issues including retail and wholesale electric rate design, energy efficiency policy and program design, cost benefit analysis, resource planning, and renewable energy project development.
- Lead consultant to the solar industry in New York Reforming the Energy Vision (REV) regulatory process on rate design for mass market customers.
- Provide ongoing consulting services to multiple gas and electric utilities on energy efficiency program design, cost benefit analysis, avoided cost development, strategic guidance, and program delivery in New Jersey.
- Advise various wholesale energy market clients, including power plant project developers and operators on regulatory issues such as retail ratemaking, wholesale ratemaking, RTO governance, FERC rulemakings, and other relevant issues.
- Provide technical expert testimony for various clients in regulatory matters before state energy commissions. Have testified in Arizona, Colorado, Indiana, Maryland, New Jersey, New York, Oklahoma, Pennsylvania, and Washington D.C

American Council for an Energy-Efficient Economy Washington, D.C.
Senior Manager, Utilities Program 2014-2018

- Oversaw and coordinated ACEEE's efforts related to utility sector energy efficiency programs. Served as project manager and lead author for research projects involving utility sector energy efficiency programs, business models, best practices, rate design, and other topics.
- Provided technical assistance for utilities and other energy efficiency implementation partners such as state government agencies on a variety of regulatory policy and best practice program topics.
- Filed testimony and formal comments before state regulatory commissions on issues related to energy efficiency programs, integrated resource planning, rate design, and other issues related to the best practices and policies for implementing energy efficiency.

Federal Energy Regulatory Commission — Washington, D.C.
Energy Industry Analyst — 2013–2014

- Served as a technical expert in litigated cases before the Federal Energy Regulatory Commission on behalf of the FERC trial staff. Issues examined included: wholesale energy rates, transmission rates, Open Access Transmission Tariff interpretation, transmission capacity rights, cost allocation for various customer classes, formula rate mechanics and protocols, electric cost of service, interruptible load, rate design, and regional transmission organization functionality and governance.

Maryland Public Service Commission — Baltimore, MD
Energy Analyst — 2012–2013

- Reviewed and analyzed utility filings for EmPOWER Maryland statewide energy efficiency, conservation, and demand response programs. Presented results of research before the Commission. Worked closely with the Agency energy efficiency evaluation contractor to develop evaluation policies that reduced costs for Maryland ratepayers while ensuring integrity of the evaluation process.

Indiana Office of Utility Consumer Counselor — Indianapolis, IN
Utility Analyst — 2011–2012

- Served as a technical expert witness in utility cases before the Indiana Utility Regulatory Commission on behalf of utility ratepayers in the State of Indiana. Developed agency position through analyses of relevant utility applications, petitions, testimony, schedules, and exhibits. Served as agency representative in collaborative demand side management oversight boards for electric and gas utilities.

Education

Master of Public Affairs, Environmental Policy Analysis, Indiana University Bloomington, 2010

BS, Political Science and Sociology, Arizona State University, 2007

Selected Research Publications

B. Baatz, G. Relf, and S. Nowak. 2018. The Role of Energy Efficiency in a Distributed Energy Future. The Electricity Journal, Vol. 31, Issue 10. doi.org/10.1016/j.tej.2018.11.004.

B. Baatz, J. Barrett, and B. Stickles. 2018. Estimating the Value of Energy Efficiency to Reduce Wholesale Energy Price Volatility. Washington, DC: ACEEE. aceee.org/research-report/u1803.

B. Baatz, G. Relf, and M. Kelly. 2017. Consequences of Large Customer Opt Out: An Ohio Example. The Electricity Journal, Vol. 30, Issue 9. doi.org/10.1016/j.tej.2017.10.002.

B. Baatz. 2017. Rate Design Matters: The Intersection of Residential Rate Design and Energy Efficiency. Washington, DC: ACEEE. aceee.org/research-report/u1703.

B. Baatz and J. Barrett. 2017. Maryland Benefits: Examining the Results of EmPOWER Maryland through 2015. Washington, DC: ACEEE. aceee.org/research-report/u1701.

B. Baatz and A. Gilleo. 2016. Big Savers: Experiences and Recent History of Program Administrators Achieving High Levels of Electric Savings. The Electricity Journal, Vol. 29, Issue 8. doi.org/10.1016/j.tej.2016.09.009.

B. Baatz. 2015. Everyone Benefits: Practices and Recommendations for Utility System Benefits of Energy Efficiency. Washington, DC: ACEEE. aceee.org/everyone-benefits-practices-and-recommendations.

S. Nowak, B. Baatz, A. Gilleo, M. Kushler, M. Molina, and D. York. 2015. Beyond Carrots for Utilities: A National Review of Performance Incentives for Energy Efficiency. Washington, DC: ACEEE. aceee.org/beyond-carrots-utilities-national-review.

Selected Expert Witness Regulatory Cases

Elizabethtown Gas; New Jersey Board of Public Utilities; July 31,2020 (Docket No. GR20070503). Client: Elizabethtown Gas. Issues: cost benefit analysis for energy efficiency true up filing.

Tucson Electric Power Company; Arizona Corporate Commission (Docket No. E- 01933A-19-0028); October 11, 2019. Client: Southwest Energy Efficiency Partnerships Issues: performance-based ratemaking, energy efficiency program cost recovery, time of use rate design, electric vehicle rate design.

Black Hills Colorado Electric; Public Utilities Commission of Colorado (Proceeding No. 18A-0676E), January 22, 2019. Client: Pueblo County, Colorado. Issue: time of use pilot proposal, low income bill analysis.

Oklahoma Gas and Electric Company; Oklahoma Corporate Commission (Cause No. PUD 201800140); April 22, 2019. Client: Oklahoma Energy Results. Issues: prudence of environmental cost recovery for aged coal units, integrated resource planning assessment.

Lancaster Solid Waste Management Authority; Federal Energy Regulatory Commission (Docket No. ER19-342); November 14, 2018. Client: Lancaster Solid Waste Management Authority. Issue: reactive power ratemaking.

Elizabethtown Gas; New Jersey Board of Public Utilities (Docket No. GR18080860); August 8, 2018. Client: Elizabethtown Gas. Issues: cost benefit analysis for energy efficiency true up filing.

Duquesne Light Company; Pennsylvania Public Utility Commission (Docket R-2018-3000124); June 25, 2018. Client: Keystone Energy Efficiency Alliance, Natural Resources Defense Council, and Clean Air Council. Issues: submetering for multifamily buildings, time of use rates, rate design.

Tucson Electric Power Company; Arizona Corporate Commission (Docket No. E- 01933A-15-0322); June 24, 2016. Client: Southwest Energy Efficiency Partnerships Issues: rate design, prepaid electricity.

PECO Electric Company; Pennsylvania Public Utility Commission (Docket R-2015-2468981); June 23, 2015. Client: Keystone Energy Efficiency Alliance, Natural Resources Defense Council, and Clean Air Council. Issues: rate design, revenue decoupling.

PPL Electric Corporation; Pennsylvania Public Utility Commission (Docket R-2015-2469275); June 23, 2015. Client: Keystone Energy Efficiency Alliance, Natural Resources Defense Council, and Clean Air Council. Issues: rate design, revenue decoupling.

Northern Indiana Public Service Company; Indiana Utility Regulatory Commission (Cause 44012); October 20, 2011. Representing Indiana Office of Utility Consumer Counselor. Issues: environmental control upgrades, alternate scenario economic analysis.

Indianapolis Power and Light Company; Indiana Utility Regulatory Commission (Cause 43623 DSM-5); April 26, 2012. Representing Indiana Office of Utility Consumer Counselor. Issue: energy efficiency performance incentive reconciliation.

Indianapolis Power and Light Company; Indiana Utility Regulatory Commission (Cause 44018); August 22, 2011. Representing Indiana Office of Utility Consumer Counselor. Issue: renewable energy feed in tariff design.

Indiana Michigan Power Company; Indiana Utility Regulatory Commission (Cause 44034); August 12, 2011. Representing Indiana Office of Utility Consumer Counselor. Issue: renewable energy credit benefit allocation.

Indiana Gas Company, Inc. and Indiana Gas and Electric Company; Indiana Utility Regulatory Commission (Cause 44019); May 20, 2011. Representing Indiana Office of Utility Consumer Counselor. Issue: revenue decoupling.

Jersey Central Power and Light
Energy Efficiency and Conservation Program
Cost Benefit Results Summary

Exhibit BJB-2

Total Resource Cost Test (TRC)		Res	C&I	Total Portfolio	Efficient Products	Existing Homes	Home Energy Education and Management	Multifamily	Direct Install	Energy Solutions for Business	Home Optimization & Peak Demand Reduction
BENEFITS											
1 Avoided Wholesale Electric Energy and Electric Ancillary Costs		$ 81,451,893	$ 83,474,961	$ 166,281,560	$ 76,555,817	$ 3,667,034	$ 1,229,043	$ 1,270,588	$ 15,342,359	$ 68,132,602	$ 84,118
2 Avoided Wholesale Electric Capacity Costs		$ 7,751,760	$ 22,866,861	$ 31,408,466	$ 6,661,345	$ 878,164	$ 212,251	$ 167,760	$ 5,129,735	$ 17,737,127	$ 622,085
3 Avoided Wholesale Natural Gas Costs		$ (3,008,451)	$ (1,515,820)	$ (3,781,689)	$ (8,594,427)	$ 5,585,976	$ -	$ 564,621	$ -	$ (1,515,820)	$ 177,961
4 Avoided RPS REC Purchase Costs		$ 41,730,105	$ 55,597,007	$ 98,230,130	$ 38,523,428	$ 2,431,474	$ 775,202	$ 849,185	$ 10,232,200	$ 45,364,806	$ 53,834
5 Avoided Wholesale Volatility Costs		$ 8,619,520	$ 10,482,600	$ 19,390,834	$ 7,462,273	$ 1,013,117	$ 144,129	$ 200,297	$ 2,047,209	$ 8,435,391	$ 88,416
6 Electric Energy and Capacity Demand Reduction Induced Price Effects (DRIPE)		$ 20,856,455	$ 38,824,825	$ 60,800,677	$ 18,844,707	$ 1,548,306	$ 463,442	$ 378,576	$ 8,194,061	$ 30,630,764	$ 740,822
7 Avoided Transmission and Distribution Costs		$ 121,042,206	$ 141,925,660	$ 266,557,610	$ 104,774,099	$ 14,086,419	$ 2,181,688	$ 2,801,233	$ 34,719,215	$ 107,206,445	$ 788,512
Total Benefits	***1+2+3+4+5+6+7***	**$ 278,443,487**	**$ 351,656,094**	**$ 638,887,587**	**$ 244,227,242**	**$ 29,210,491**	**$ 5,005,755**	**$ 6,232,258**	**$ 75,664,779**	**$ 275,991,315**	**$ 2,555,748**
COSTS											
8 Incremental Costs		$ 52,662,717	$ 129,933,572	$ 185,094,445	$ 38,991,489	$ 13,671,228	$ -	$ 1,568,621	$ 9,385,332	$ 120,548,239	$ 929,536
9 Administration Costs		$ 44,173,427	$ 26,401,367	$ 75,786,170	$ 25,157,780	$ 15,361,623	$ 3,654,024	$ 3,306,233	$ 7,250,174	$ 19,151,193	$ 1,905,144
Total Costs	***8+9***	**$ 96,836,144**	**$ 156,334,938**	**$ 260,880,615**	**$ 64,149,269**	**$ 29,032,851**	**$ 3,654,024**	**$ 4,874,853**	**$ 16,635,506**	**$ 139,699,432**	**$ 2,834,680**
Benefit Cost Ratio	**(1+2+3+4+5+6+7)/(8+9)**	**2.9**	**2.2**	**2.4**	**3.8**	**1.0**	**1.4**	**1.3**	**4.5**	**2.0**	**0.9**

Participant Cost Test (PCT)		Res	C&I	Total Portfolio	Efficient Products	Existing Homes	Home Energy Education and Management	Multifamily	Direct Install	Energy Solutions for Business	Home Optimization & Peak Demand Reduction
BENEFITS											
10 Avoided Retail Electric Costs		$ 342,401,336	$ 337,184,953	$ 685,332,262	$ 321,473,727	$ 15,424,621	$ 5,502,988	$ 5,371,200	$ 72,016,850	$ 265,168,103	$ 374,772
11 Avoided Retail Natural Gas Costs		$ (9,423,842)	$ (4,440,586)	$ (11,438,908)	$ (27,141,450)	$ 17,717,607	$ -	$ 1,801,221	$ -	$ (4,440,586)	$ 624,300
12 Program Incentive Costs		$ 49,114,171	$ 59,356,334	$ 111,151,671	$ 28,426,305	$ 20,687,866	$ -	$ 1,751,672	$ 15,016,532	$ 44,339,803	$ 929,494
13 Time-Value of Loan Repayments		$ (715,985)	$ (382,372)	$ (1,104,656)	$ (442,286)	$ (273,699)	$ -	$ (6,299)	$ (23,033)	$ (359,339)	$ -
Total Benefits	***10+11+12+13***	**$ 381,375,679**	**$ 391,718,330**	**$ 783,940,370**	**$ 322,316,295**	**$ 53,556,396**	**$ 5,502,988**	**$ 8,917,794**	**$ 87,010,349**	**$ 304,707,981**	**$ 1,928,566**
COSTS											
14 Lifetime Participant Costs				$ 190,344,123	$ 41,182,944	$ 14,685,565	$ -	$ 1,600,097	$ 9,540,103	$ 122,405,879	$ 929,536
Total Costs	***14***	**$ -**	**$ -**	**$ 190,344,123**	**$ 41,182,944**	**$ 14,685,565**	**$ -**	**$ 1,600,097**	**$ 9,540,103**	**$ 122,405,879**	**$ 929,536**
Benefit Cost Ratio	**(10+11+12+13)/14**	**n/a**	**n/a**	**4.1**	**7.8**	**3.6**	**n/a**	**5.6**	**9.1**	**2.5**	**2.1**

Program Administrator Cost Test (PAC)		Res	C&I	Total Portfolio	Efficient Products	Existing Homes	Home Energy Education and Management	Multifamily	Direct Install	Energy Solutions for Business	Home Optimization & Peak Demand Reduction
BENEFITS											
15 Avoided Wholesale Electric Energy and Electric Ancillary Costs		$ 81,451,893	$ 83,474,961	$ 166,281,560	$ 76,555,817	$ 3,667,034	$ 1,229,043	$ 1,270,588	$ 15,342,359	$ 68,132,602	$ 84,118
16 Avoided Wholesale Electric Capacity Costs		$ 7,751,760	$ 22,866,861	$ 31,408,466	$ 6,661,345	$ 878,164	$ 212,251	$ 167,760	$ 5,129,735	$ 17,737,127	$ 622,085
17 Avoided Wholesale Natural Gas Costs		$ (3,008,451)	$ (1,515,820)	$ (3,781,689)	$ (8,594,427)	$ 5,585,976	$ -	$ 564,621	$ -	$ (1,515,820)	$ 177,961
18 Avoided RPS REC Purchase Costs		$ 41,730,105	$ 55,597,007	$ 98,230,130	$ 38,523,428	$ 2,431,474	$ 775,202	$ 849,185	$ 10,232,200	$ 45,364,806	$ 53,834
19 Avoided Wholesale Volatility Costs		$ 8,619,520	$ 10,482,600	$ 19,390,834	$ 7,462,273	$ 1,013,117	$ 144,129	$ 200,297	$ 2,047,209	$ 8,435,391	$ 88,416
20 Electric Energy and Capacity Demand Reduction Induced Price Effects (DRIPE)		$ 20,863,894	$ 38,832,415	$ 60,815,064	$ 18,862,896	$ 1,537,556	$ 463,442	$ 377,131	$ 8,194,061	$ 30,638,354	$ 741,624
21 Avoided Transmission and Distribution Costs		$ 121,042,206	$ 141,925,660	$ 266,557,610	$ 104,774,099	$ 14,086,419	$ 2,181,688	$ 2,801,233	$ 34,719,215	$ 107,206,445	$ 788,512
Total Benefits	***15+16+17+18+19+20+21***	**$ 278,450,927**	**$ 351,663,683**	**$ 638,901,973**	**$ 244,245,431**	**$ 29,199,741**	**$ 5,005,755**	**$ 6,230,814**	**$ 75,664,779**	**$ 275,998,905**	**$ 2,556,550**
COSTS											
22 Administration Costs		$ 44,173,427	$ 26,401,367	$ 75,786,170	$ 25,157,780	$ 15,361,623	$ 3,654,024	$ 3,306,233	$ 7,250,174	$ 19,151,193	$ 1,905,144
23 Program Rebate Costs		$ 49,114,171	$ 59,356,334	$ 111,151,671	$ 28,426,305	$ 20,687,866	$ -	$ 1,751,672	$ 15,016,532	$ 44,339,803	$ 929,494
24 Time-Value of Loan Repayments		$ (715,985)	$ (382,372)	$ (1,104,656)	$ (442,286)	$ (273,699)	$ -	$ (6,299)	$ (23,033)	$ (359,339)	$ -
Total Costs	***22+23+24***	**$ 92,571,613**	**$ 85,375,329**	**$ 185,833,185**	**$ 53,141,799**	**$ 35,775,790**	**$ 3,654,024**	**$ 5,051,606**	**$ 22,243,673**	**$ 63,131,657**	**$ 2,834,637**
Benefit Cost Ratio	**(15+16+17+18+19+20+21)/(22+23+24)**	**3.0**	**4.1**	**3.4**	**4.6**	**0.8**	**1.4**	**1.2**	**3.4**	**4.4**	**0.9**

Ratepayer Impact Measure Test (RIM)		Res	C&I	Total Portfolio	Efficient Products	Existing Homes	Home Energy Education and Management	Multifamily	Direct Install	Energy Solutions for Business	Home Optimization & Peak Demand Reduction
BENEFITS											
25 Avoided Wholesale Electric Energy and Electric Ancillary Costs		$ 81,451,893	$ 83,474,961	$ 166,281,560	$ 76,555,817	$ 3,667,034	$ 1,229,043	$ 1,270,588	$ 15,342,359	$ 68,132,602	$ 84,118
26 Avoided Wholesale Electric Capacity Costs		$ 7,751,760	$ 22,866,861	$ 31,408,466	$ 6,661,345	$ 878,164	$ 212,251	$ 167,760	$ 5,129,735	$ 17,737,127	$ 622,085
27 Avoided Wholesale Natural Gas Costs		$ (3,008,451)	$ (1,515,820)	$ (3,781,689)	$ (8,594,427)	$ 5,585,976	$ -	$ 564,621	$ -	$ (1,515,820)	$ 177,961
28 Avoided RPS REC Purchase Costs		$ 41,730,105	$ 55,597,007	$ 98,230,130	$ 38,523,428	$ 2,431,474	$ 775,202	$ 849,185	$ 10,232,200	$ 45,364,806	$ 53,834
29 Avoided Wholesale Volatility Costs		$ 8,619,520	$ 10,482,600	$ 19,390,834	$ 7,462,273	$ 1,013,117	$ 144,129	$ 200,297	$ 2,047,209	$ 8,435,391	$ 88,416
30 Electric Energy and Capacity Demand Reduction Induced Price Effects (DRIPE)		$ 20,856,455	$ 38,824,825	$ 60,800,677	$ 18,844,707	$ 1,548,306	$ 463,442	$ 378,576	$ 8,194,061	$ 30,630,764	$ 740,822
31 Avoided Transmission and Distribution Costs		$ 121,042,206	$ 141,925,660	$ 266,557,610	$ 104,774,099	$ 14,086,419	$ 2,181,688	$ 2,801,233	$ 34,719,215	$ 107,206,445	$ 788,512
Total Benefits	***25+26+27+28+29+30+31***	**$ 278,443,487**	**$ 351,656,094**	**$ 638,887,587**	**$ 244,227,242**	**$ 29,210,491**	**$ 5,005,755**	**$ 6,232,258**	**$ 75,664,779**	**$ 275,991,315**	**$ 2,555,748**
COSTS											
32 Administration Costs		$ 44,173,427	$ 26,401,367	$ 75,786,170	$ 25,157,780	$ 15,361,623	$ 3,654,024	$ 3,306,233	$ 7,250,174	$ 19,151,193	$ 1,905,144
33 Program Rebate Costs		$ 49,114,171	$ 59,356,334	$ 111,151,671	$ 28,426,305	$ 20,687,866	$ -	$ 1,751,672	$ 15,016,532	$ 44,339,803	$ 929,494
34 Re-allocated Distribution Costs		$ 114,570,720	$ 127,427,315	$ 245,118,774	$ 99,188,730	$ 13,385,560	$ 1,996,430	$ 2,675,448	$ 31,460,919	$ 95,966,396	$ 445,291
35 Time-Value of Loan Repayments		$ (715,985)	$ (382,372)	$ (1,104,656)	$ (442,286)	$ (273,699)	$ -	$ (6,299)	$ (23,033)	$ (359,339)	$ -
Total Costs	***32+33+34+35***	**$ 207,142,333**	**$ 212,802,644**	**$ 430,951,959**	**$ 152,330,529**	**$ 49,161,350**	**$ 5,650,454**	**$ 7,727,054**	**$ 53,704,591**	**$ 159,098,053**	**$ 3,279,928**
Benefit Cost Ratio	**(25+26+27+28+29+30+31)/(32+33+34+35)**	**1.3**	**1.7**	**1.5**	**1.6**	**0.6**	**0.9**	**0.8**	**1.4**	**1.7**	**0.8**

Societal Cost Test (SCT)		Res	C&I	Total Portfolio	Efficient Products	Existing Homes	Home Energy Education and Management	Multifamily	Direct Install	Energy Solutions for Business	Home Optimization & Peak Demand Reduction
BENEFITS											
36 Avoided Wholesale Electric Energy and Electric Ancillary Costs		$ 107,784,883	$ 112,701,017	$ 222,304,723	$ 101,421,213	$ 5,014,020	$ 1,349,650	$ 1,725,288	$ 21,054,254	$ 91,646,762	$ 93,536
37 Avoided Wholesale Electric Capacity Costs		$ 10,932,457	$ 32,504,739	$ 44,405,693	$ 9,414,770	$ 1,269,749	$ 247,938	$ 241,816	$ 7,411,019	$ 25,093,720	$ 726,681
38 Avoided Wholesale Natural Gas Costs		$ (4,168,493)	$ (1,978,797)	$ (5,183,284)	$ (11,800,883)	$ 7,632,389	$ -	$ 766,240	$ -	$ (1,978,797)	$ 197,766
39 Electric Energy and Capacity Demand Reduction Induced Price Effects (DRIPE)		$ 28,026,678	$ 54,020,983	$ 83,436,771	$ 25,327,769	$ 2,172,813	$ 526,096	$ 523,654	$ 11,622,842	$ 42,398,142	$ 865,455
40 Natural Gas Demand Reduction Induced Price Effects (DRIPE)		$ 10,041	$ 10,109	$ 19,484	$ 20,877	$ (10,835)	$ -	$ (1,556)	$ -	$ 10,109	$ 890
41 Avoided RPS REC Purchase Costs		$ 53,338,466	$ 55,597,007	$ 109,838,490	$ 50,131,789	$ 2,431,474	$ 775,202	$ 849,185	$ 10,232,200	$ 45,364,806	$ 53,834
42 Avoided Wholesale Volatility Costs		$ 11,454,885	$ 14,322,696	$ 26,152,713	$ 9,903,510	$ 1,391,616	$ 159,759	$ 273,334	$ 2,846,527	$ 11,476,169	$ 101,798
43 Avoided Transmission and Distribution Costs		$ 156,162,893	$ 185,036,223	$ 345,761,358	$ 134,965,580	$ 18,820,731	$ 2,376,582	$ 3,724,013	$ 46,023,423	$ 139,012,800	$ 838,229
44 Avoided CO_2 Emissions Damages		$ 112,362,597	$ 120,451,970	$ 235,608,920	$ 99,138,406	$ 11,659,598	$ 1,564,592	$ 2,513,900	$ 22,720,418	$ 97,731,552	$ 280,453
45 Avoided SO_2 + NOx Emissions Damages		$ 126,276,747	$ 134,318,037	$ 262,994,933	$ 116,993,590	$ 7,639,821	$ 1,643,336	$ 2,241,391	$ 25,178,034	$ 109,140,003	$ 158,758
46 Job and Energy Savings Economic Value-Added Multiplier Benefits		$ 301,727,214	$ 455,243,760	$ 769,214,869	$ 254,128,664	$ 42,100,944	$ 5,497,606	$ 8,355,921	$ 97,403,360	$ 357,840,400	$ 3,887,974
Total Benefits	***36+37+38+39+40+41+42+43+44+45+46***	**$ 903,908,367**	**$ 1,162,227,744**	**$ 2,094,554,671**	**$ 789,645,286**	**$ 100,122,319**	**$ 14,140,762**	**$ 21,213,187**	**$ 244,492,077**	**$ 917,735,667**	**$ 7,205,373**
COSTS											
47 Incremental Costs		$ 55,336,856	$ 137,903,354	$ 195,920,059	$ 40,767,518	$ 14,569,338	$ -	$ 1,662,411	$ 10,051,106	$ 127,852,249	$ 1,017,437
48 Administration Costs		$ 46,580,833	$ 27,954,932	$ 80,099,644	$ 26,452,286	$ 16,218,956	$ 3,909,591	$ 3,495,083	$ 7,688,695	$ 20,266,237	$ 2,068,796
Total Costs	***47+48***	**$ 101,917,690**	**$ 165,858,286**	**$ 276,019,703**	**$ 67,219,804**	**$ 30,788,295**	**$ 3,909,591**	**$ 5,157,494**	**$ 17,739,800**	**$ 148,118,486**	**$ 3,086,234**
Benefit Cost Ratio	**(36+37+38+39+40+41+42+43+44+45+46)/(47+48)**	**8.9**	**7.0**	**7.6**	**11.7**	**3.3**	**3.6**	**4.1**	**13.8**	**6.2**	**2.3**

New Jersey Cost Test (NJCT)		Res	C&I	Total Portfolio	Efficient Products	Existing Homes	Home Energy Education and Management	Multifamily	Direct Install	Energy Solutions for Business	Home Optimization & Peak Demand Reduction
BENEFITS											
49 Avoided Wholesale Electric Energy and Electric Ancillary Costs		$ 107,784,883	$ 112,701,017	$ 222,304,723	$ 101,421,213	$ 5,014,020	$ 1,349,650	$ 1,725,288	$ 21,054,254	$ 91,646,762	$ 93,536
50 Avoided Wholesale Electric Capacity Costs		$ 10,932,457	$ 32,504,739	$ 44,405,693	$ 9,414,770	$ 1,269,749	$ 247,938	$ 241,816	$ 7,411,019	$ 25,093,720	$ 726,681
51 Avoided Wholesale Natural Gas Costs		$ (4,168,493)	$ (1,978,797)	$ (5,183,284)	$ (11,800,883)	$ 7,632,389	$ -	$ 766,240	$ -	$ (1,978,797)	$ 197,766
52 Electric Energy and Capacity Demand Reduction Induced Price Effects (DRIPE)		$ 28,037,514	$ 54,010,875	$ 83,438,164	$ 25,327,769	$ 2,183,648	$ 526,096	$ 525,210	$ 11,622,842	$ 42,388,033	$ 864,565
53 Avoided Transmission and Distribution Costs		$ 156,162,893	$ 185,036,223	$ 345,761,358	$ 134,965,580	$ 18,820,731	$ 2,376,582	$ 3,724,013	$ 46,023,423	$ 139,012,800	$ 838,229
54 Avoided CO_2 Emissions Damages		$ 112,362,597	$ 120,451,970	$ 235,608,920	$ 99,138,406	$ 11,659,598	$ 1,564,592	$ 2,513,900	$ 22,720,418	$ 97,731,552	$ 280,453
55 Non-Energy Benefits (5%)		$ 14,937,463	$ 19,113,703	$ 34,536,333	$ 12,966,422	$ 1,746,027	$ 225,013	$ 349,128	$ 4,305,577	$ 14,808,126	$ 136,039
56 Low-Income Benefits (10%)		$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total Benefits	***49+50+51+52+53+54+55+56***	**$ 426,049,312**	**$ 521,839,729**	**$ 960,871,907**	**$ 371,433,278**	**$ 48,326,163**	**$ 6,289,872**	**$ 9,845,598**	**$ 113,137,532**	**$ 408,702,197**	**$ 3,137,268**
COSTS											
57 Incremental Costs		$ 55,336,856	$ 137,903,354	$ 195,920,059	$ 40,767,518	$ 14,569,338	$ -	$ 1,662,411	$ 10,051,106	$ 127,852,249	$ 1,017,437
58 Administration Costs		$ 46,580,833	$ 27,954,932	$ 80,099,644	$ 26,452,286	$ 16,218,956	$ 3,909,591	$ 3,495,083	$ 7,688,695	$ 20,266,237	$ 2,068,796
Total Costs	***57+58***	**$ 101,917,690**	**$ 165,858,286**	**$ 276,019,703**	**$ 67,219,804**	**$ 30,788,295**	**$ 3,909,591**	**$ 5,157,494**	**$ 17,739,800**	**$ 148,118,486**	**$ 3,086,234**
Benefit Cost Ratio	**(49+50+51+52+53+54+55+56)/(57+58)**	**4.2**	**3.1**	**3.5**	**5.5**	**1.6**	**1.6**	**1.9**	**6.4**	**2.8**	**1.0**

Jersey Central Power and Light Exhibit BJB-3
Energy Efficiency and Conservation Program
CBA Workpapers

*Confidential - will be provided after execution of NDA

Jersey Central Power and Light Exhibit BJB-4
Energy Efficiency and Conservation Program
Economic Development and Job Creation Results Summary

Table BJB-2.1 Nominal Economic Impacts of JCP&L EE&C Portfolio

Program	Value Added to GDP (NPV$)	Value Added to GDP (Nominal$)
Home Optimization & Peak Demand Reduction	198,311,518	321,862,148
Efficient Products	36,299,016	49,256,857
Existing Homes	5,285,565	5,640,522
Home Energy Education and Management	6,847,791	10,226,819
Direct Install	73,325,753	127,537,557
Energy Solutions for Business	272,456,219	462,941,999
Multifamily	3,756,540	3,954,735
Total Portfolio	596,282,401	981,420,637

Table BJB-2.2 Anticipated Job Creation Impacts of JCP&L EE&C Portfolio

Program	Total Direct Jobs	Total Indirect & Induced Jobs	Total Jobs
Home Optimization & Peak Demand Reduction	201	2,625	2,827
Efficient Products	122	115	237
Existing Homes	30	26	56
Home Energy Education and Management	33	48	81
Direct Install	639	560	1,199
Energy Solutions for Business	2,573	2,016	4,589
Multifamily	16	-8	8
Total Portfolio	3,614	5,381	8,996

Jersey Central Power and Light Exhibit BJB-5
Energy Efficiency and Conservation Program
Emissions Avoided Results Summary

Subprogram	CO_2 Emissions Reduction (tons)	SO_2 Emissions Reduction (tons)	NOx Emissions Reduction (tons)
Efficient Products	1,837,556	1,277	907
Existing Homes	212,175	63	141
Home Energy Education and Management	30,892	18	15
Multifamily	45,985	22	27
Direct Install	415,125	267	217
Energy Solutions for Business	1,797,355	1,166	928
Home Optimization & Peak Demand Reduction	5,491	1	4
Total	**4,344,579**	**2,814**	**2,239**

Jersey Central Power and Light Exhibit BJB-6
Energy Efficiency and Conservation Program
Cost to Achieve Results

Sector	Total
Residential	0.325
Commerical and Industrial	0.395
Multi-Family	1.238

Jersey Central Power and Light
Energy Efficiency and Conservation Program
JCP&L EE Target Development

Exhibit BJB-7

Sales Data Type	Year	Sales (kWh)	Baseline (kWh)	Program Year	Goal (%)	Goal (MWh)
Actual	2018	20,785,610,806				
Actual	2019	19,927,808,262				
Forecast	2020	19,572,733,517				
Forecast	2021	19,286,067,889	20,095,384,195	1	0.50%	100,477
Forecast	2022	19,494,281,861	19,595,536,556	2	0.74%	145,007
Forecast	2023		19,451,027,756	3	0.97%	188,675

Jersey Central Power and Light Exhibit BJB-8
Energy Efficiency and Conservation Program
Quantitative Performance Indicators

QPI Metric	Program Year 1	Program Year 2	Program Year 3
Annual Energy Savings (kWh)	139,244,824	194,442,032	232,379,606
Annual Demand Savings (kW)	7,832	9,903	12,915
Lifetime Energy Savings (kWh)	1,967,635,847	2,517,284,882	2,798,243,934
Lifetime of Persisting Demand Savings (kW)	108,671	132,110	141,540
NPV of UCT Net Benefits ($)	131,242,986	157,534,160	164,291,642
Low-Income Lifetime Savings (kWh)	5,625,000	9,375,000	11,250,000
Small Business Lifetime Savings (kWh)	60,966,565	274,349,542	304,832,825