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September 4, 2020

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VIA EMAIL

Aida Camacho-Welch, Secretary
Board of Public Utilities
44 South Clinton Ave., 9th Floor
P.O. Box 350
Trenton, NJ 08625-0350

Re: In the Matter of the Petition of Public Service Electric and Gas Company for Approval of its Clean Energy Future - Electric Vehicle and Energy Storage ("CEF-EVES") Program on a Regulated Basis
BPU Docket No. EO18101111

Dear Secretary Camacho-Welch:

This firm represents Electrify America, LLC ("Electrify America"). On August 3, 2020 Electrify America filed a Motion for Leave to Intervene (the "Motion") in the referenced matter. The Motion is pending before Commissioner Chivukula.

On behalf of Electrify America we are submitting herewith the Prepared Direct Testimony and Schedules of Jigar J. Shah on Behalf of Electrify America.

Due to the current health emergency, we are making this filing electronically only, and serving copies on the service list electronically.

Respectfully,

COZEN O'CONNOR, PC

Ira G. Megdal

By: Ira G. Megdal

IGM/kn
Enclosure
cc: Attached Service List (via email with enclosure)

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BEFORE THE
STATE OF NEW JERSEY
BOARD OF PUBLIC UTILITIES

IN THE MATTER OF THE PETITION OF PUBLIC SERICE ELECTRIC AND GAS COMPANY FOR APPROVAL OF ITS CLEAN ENERGY FUTURE-ELECTIC VEHICLE AND ELECTRIC STORAGE ("CEF-EVES") PROGRAM ON A REGULATED BASIS	:	BPU DOCKET NO.: EO18101111

PREPARED DIRECT TESTIMONY AND SCHEDULES OF JIGAR J. SHAH ON BEHALF OF ELECTRIFY AMERICA, LLC.

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September 4, 2020

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I. INTRODUCTION AND SUMMARY

Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A. My name is Jigar J. Shah. My business address is 2003 Edmund Halley Drive, 2nd Floor, Reston, Virginia 20191.

Q. BY WHOM ARE YOU EMPLOYED AND IN WHAT POSITION?

A. I am employed by Electrify America, LLC ("Electrify America"), a wholly-owned subsidiary of Volkswagen Group of America, Inc. I am the Manager for Distributed Energy and Grid Services at Electrify America.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A. The purpose of my testimony is to present Electrify America's response to testimony filed by Public Service Electric and Gas Company ("PSE&G" or the "Company") in this docket, insofar as it seeks approval of the electric vehicle ("EV") portion of the Company's proposed CEF-EVES program. I respond to the Company's testimony regarding the proposal submitted by Karen Reif and to the rate design testimony submitted by Stephen Swetz. I also discuss Electrify America's support for public electric vehicle fast-charging rate structures that encourage the development and operation of such infrastructure, in particular direct current fast charging ("DCFC") facilities. Electrify America's positions are in accord with, and support the public policy of the State of New Jersey.

Q. PLEASE SUMMARIZE YOUR RESPONSIBILITIES AND QUALIFICATIONS.

A. As the Manager for Distributed Energy and Grid Services, I am responsible for optimizing Electrify America's energy portfolio. I have a Bachelor of Science degree in Electrical and Computer Engineering, with a minor in Business, from Cornell University, and a Master of Engineering degree in Electrical Engineering from Princeton University.

Prior to my role at Electrify America, I was a Principal Consultant at West Monroe Partners advising utility clients on smart grid modernization topics, rate structures, and energy storage. Previously, I was a Senior Researcher at Envision Energy focused on wind farm (plant level) controls and analytics to lower the levelized cost of renewable energy, and an Edison Engineer at General Electric Global Research focused on wind turbine control systems and distributed energy resource ("DER") controls, including for electric vehicle fleet charging to minimize demand charge costs. I have journal publications and filed patent applications in the fields of electric vehicle charging, vehicle-grid integration, and renewable energy.

Q. PLEASE SUMMARIZE YOUR TESTIMONY.

A. My testimony starts by providing an overview of Electrify America's charging network and how fast-charging networks enable mass-market adoption of electric vehicles ("EV"). I discuss Electrify America's positions on how the EV subprograms of PSE&G's proposal will affect the market for fast charging EV installations in New Jersey in general and in PSE&G's service area, specifically. I explain how PSE&G's demand charges are already adversely affecting that market; how the rate impact from Mr. Swetz's Technology Innovation Charge ("TIC") proposal will only compound these effects; and how utility-owned and operated DCFC may be detrimental to the public policy of this State. I will also discuss how Mr. Swetz's TIC proposal will only exacerbate a PSE&G rate structure that already makes the development of DCFC in New Jersey challenging and suggest modifications to the PSE&G programs and to the rate design that will be beneficial to the development of DCFC.

The public policy with which Electrify America is in accord is clearly expressed in the New Jersey Energy Master Plan (the "Master Plan")[1] and in the recently enacted Clean Energy Act (the "Clean Energy Act" or the "Act"). P.L.2018, ch.17, *codified at* N.J.S.A. 48:3-87.8 *et seq.*

Q. WHAT POLICIES ARE EXPRESSED IN THE MASTER PLAN AND THE CLEAN ENERGY ACT INSOFAR AS IT RELATES TO EVS?

A. The Master Plan makes it a priority to decarbonize the transportation sector by supporting the deployment of 330,000 light-duty electric vehicles on the road by 2025, pursuant to the State Zero-Emission Vehicle Program Memorandum of Understanding. In order to reach this goal, the State of New Jersey seeks to deploy electric vehicle charging infrastructure throughout the state, encourage electric vehicle adoption, and increase consumer and fleet owner awareness and acceptance of electric vehicles, among other initiatives. The Master Plan explains certain benefits of the electrification of the transportation sector, including that it is one of the most cost effective ways of meeting New Jersey's 80x50 carbon emissions reduction target—which is New Jersey's obligation to reduce its greenhouse gas emissions to 24.1 million metric tons of carbon dioxide equivalent by 2050 pursuant to the Global Warming Response Act of 2007 (N.J.S.A. 26:2C-37, *et seq*.). Specifically, electrified transportation is less polluting than conventional transportation, and it can provide grid benefits such as better utilizing the distribution grid, reducing peak load, and providing power back to the grid. The Master Plan additionally provides that utilities should establish Integrated Distribution Plans to expand and enhance the location and amount of electric vehicle charging on the electric distribution system. The Master Plan suggests piloting and implementing a modified rate

1 *See* https://nj.gov/emp/docs/pdf/2020_NJBPU_EMP.pdf ("Master Plan").

design to manage electric vehicle charging and support demand response programs. Further, the Master Plan encourages incentives for electric vehicle infrastructure and the utilization of electric vehicles in low-income communities to address environmental justice.

The Clean Energy Act requires the Board of Public Utilities (the "Board" or "BPU") in consultation with PJM Interconnection, LLC ("PJM") "to consider whether implementation of renewable electric energy storage systems would promote the use of electric vehicles in the State and the potential impact on renewable energy production in the State." In explaining the requirement to adopt quantitative performance indicators to take into account public utilities' energy efficiency measures, the Act requires the Board to take into account the growth in the use of electric vehicles, microgrids, and distributed energy resources. Therefore, the Master Plan and Act both encourage the development of electric vehicle usage in the State of New Jersey and seek to incentivize utilization of electric vehicles and creation of associated charging stations. It should be noted that the State of New Jersey, including the Department of Environmental Protection and the Board have also made it a priority to reduce range anxiety which entails having sufficient charging stations and infrastructure available. This has been frequently addressed in remarks by, *inter alia*, President Fiordaliso.

Q. ARE THERE PRINCIPLES THAT GUIDE YOUR TESTIMONY AND RECOMMENDATIONS?

A. Yes, the nascent nature of the public charging network which will grow to meet the goals of the Master Plan and the Clean Energy Act requires a rate structure that will encourage investment in that network. Our investment decisions for the State of New Jersey are calibrated pursuant to our analysis that is set forth in Electrify America's Cycle 2

National ZEV Investment Plan.[2] Electrify America consistently advocates that fixed charges and demand charges, and in particular those without a causal connection to the marginal cost to serve DCFC infrastructure, present a barrier to expanded DCFC investment and therefore widespread transportation electrification. As detailed later in my testimony, independent analysis has demonstrated that charges based on peak monthly or annual demand impose an extraordinary financial burden on public DC fast charging station operators, especially those operators who provide service in lower utilization markets. For the State of New Jersey to attain its climate goals, it is critically important that the utility rates result in fuel costs that are both:

- Substantially below gasoline even for those without access to charging at home (a necessary step to bring the total cost of EV ownership below the cost of an internal combustion engine vehicle), and
- Equitable between those who have access to home charging and those who do not. That equity is possible if rates paid by public DC fast charging stations are comparable in cost to the costs paid by consumers charging at home.

In urban areas such as those that constitute a substantial portion of PSE&G's service area, significant barriers to home charging exist, and they are greater for low-income residents, as detailed later in my testimony. In order to provide fairness and equity, while driving widespread EV adoption, the price of power delivery from a utility to a public charging station should not exceed the price to deliver power to a charging station in one's home.

Q. ARE YOU SPONSORING ANY SCHEDULES AS PART OF YOUR TESTIMONY?

2 *See* https://www.electrifyamerica.com/assets/pdf/Cycle%202%20National%20ZEV%20Investment%20Plan%20-%20Public%20Version%20vF.50bb1fe0.pdf ("Cycle 2 Plan").

A. Yes. A current resume detailing my qualifications is attached as Schedule JS-1. Also attached as Schedule JS-2 is a copy of a spreadsheet demonstrating the impact of demand charges for DCFC in PSE&G's service area for a 1% load factor.

Q. WHAT ARE YOUR RECOMMENDATIONS?

A. As supported in greater depth later in my testimony, I make the following recommendations for the Board:

- Given the adverse effects of PSE&G's existing demand charges, do not exacerbate the situation by adding the TIC to customers such as Electrify America - that is, public charging stations should be exempted from the TIC;
- Approve a modified Public DC Fast Charging Make-Ready incentive program that allows EVSE infrastructure companies flexibility to develop infrastructure that meets customer needs without an onerous solicitation process or data sharing obligations that may introduce technology integration, privacy, cybersecurity, and administrative burdens;
- Approve a marginal cost, permanent EV rate or incentive that provides effective utility rates for electricity delivered to public charging stations that are commensurate with if not lower than those for residential charging in order to create equitable incentives for adopting electric transportation between those that have access to charging at home and those that do not;
- While I recognize that a thorough rate restructuring cannot be accomplished in this proceeding, it should be accomplished in a PSE&G base rate proceeding. In this proceeding, however, the deleterious effects of the existing rate structure can be ameliorated through properly designed incentives;

- Implement sufficient incentives now which address undue barriers to the private sector investing in the build out of a competitive EV charging marketplace in New Jersey, and defer consideration of ratepayer subsidized, utility-owned and operated charging infrastructure until after those incentives have been put into place and have taken effect;
- Insure that Electrify America and other early investors in New Jersey can participate in any EV incentive program designed to assist in continuing EV charging station development in PSE&G's service area and throughout New Jersey; and
- Take other steps to equitably grow the EV market in New Jersey; and which will allow the charging industry to provide DCFC charging services to customers – especially low-income customers without the ability to charge at home – at a reasonable cost far below the cost of gasoline, consistent with the New Jersey's policy goals.

II. OVERVIEW OF ELECTRIFY AMERICA

Q. PLEASE DESCRIBE ELECTRIFY AMERICA'S OPERATIONS ACROSS THE NATION AND WITHIN THE STATE OF NEW JERSEY.

A. Electrify America, a wholly-owned subsidiary of Volkswagen Group of America headquartered in Reston, Virginia, is investing $2 billion over ten years in zero-emissions vehicle ("ZEV") infrastructure, education and awareness, and access efforts to support the increased adoption of ZEV technology in the United States. This $2 billion will be invested in $500 million 30-month "Cycles" through 2026.

To date, Electrify America has built a nationwide network of ultra-fast direct current EV charging stations across over 450 locations and with over 2,000 individual

DC fast chargers in total that are already open for public use. In the State of New Jersey, Electrify America has 49 individual DC fast chargers commissioned and operational across nine locations, with over an additional 15 locations in various stages of design, permitting, construction, or commissioning.

Electrify America is deploying DCFC stations along major highway corridors in New Jersey and to date has commissioned three highway charging stations in the State from its first Cycle of investment. All of these stations offer 350 kW electric vehicle chargers, the most powerful public DCFC available on the market today.

These chargers can enable recharging speeds close to gasoline fueling for EVs, with the 350 kW stations able to charge capable EVs at 20 miles of range per minute. In addition, Electrify America has committed significantly to building charging stations in the New York-Newark-Jersey City Metropolitan Statistical Area (MSA) and the Philadelphia-Camden-Wilmington MSA, and to date, Electrify America has commissioned six charging stations in New Jersey within these metro areas, which offer a mix of 50 kW, 150 kW, and Level 2 charging.

Electrify America opened its first New Jersey ultra-fast charging station in Bridgewater, New Jersey in May 2019. Electrify America has nine charging locations energized in New Jersey to date, eight of which are in PSE&G's service area in Somerdale, Cherry Hill, East Brunswick, Bridgewater, Fairfield, Kearny, Elizabeth, and Clifton. Electrify America anticipates that it will continue to grow within PSE&G's service territory. However, Electrify America plans to invest in New Jersey in part on the

expectation that the utility rates and incentives will be structured to support investment, consistent with State Policy.[3]

Through extensive research and stakeholder outreach as outlined in Electrify America's ZEV investment plans[4,] Electrify America recognizes this fast-charging customer experience is crucial to enabling mass-market consumers to adopt EVs, especially for long-distance travel and in metropolitan areas where a large segment of the population may not have access to workplace or home charging. In addition, all Electrify America stations are designed for universal customer access through the inclusion of credit card readers, and both non-proprietary fast-charging connector protocols: SAE Combo and CHAdeMO. Electrify America owns and operates the charging stations and is the customer of record for electric service.

As a matter of national strategy, Electrify America employs a data-driven process to plan its investments over 30-month investment cycles. In 2019, Electrify America released its Cycle 2 Plan, which identified markets for concentrated charging station investments based on four quantitative metrics. The plan explained that one of the four quantitative metrics – the utility environment – was included as a critical factor in Electrify America's investment decisions because "an EV-focused utility environment, with utility infrastructure support (such as make-readies), DCFC specific energy rates, and lower or non-existent demand charges, can have a significant impact on the economics of the station. … Metro areas where these same conditions are not as positive,

3 *Id.* at 43.

4 https://www.electrifyamerica.com/our-plan

especially those with high demand peak charges, can make the economics of owning and operating DCFC stations over the long-term particularly challenging."[5]

Support from the utility sector is critical to ensuring that New Jersey meets its ambitious targets for transportation electrification, including the goals of 330,000 plug-in vehicles registered and 400 DC fast chargers deployed in the state by 2025.

Q. PLEASE DESCRIBE ELECTRIFY AMERICA'S POSITION ON THE ROLE OF PUBLIC DCFC INFRASTRUCTURE TO PROMOTE TRANSPORTATION ELECTRIFICATION AND THE GOALS OF NEW JERSEY PUBLIC POLICY.

A. To understand the role of public DCFC infrastructure, it is important to recognize driving trends generally and those applicable to electric vehicles. According to the Federal Highway Administration's 2017 National Household Travel Survey, 95 percent of vehicle trips were less than 30 miles from their origin. With most trips occurring close to home, it is not surprising that most DCFC charging sessions also occur close to home. In their 2017 study "Survey and Consumer Motivations to DC Fast Charge," Michael Nicholas and Gil Tal from University of California Davis showed that a majority of DCFC events for Chevy Bolt drivers were recorded within 8 miles of home. Nicholas and Tal's study "Transitioning to Longer Range Battery Electric Vehicles" (2017) shows Tesla drivers have similar charging behavior, albeit with a wider driving radius, averaging 29 miles from home for most charging sessions.

Further, we expect that buyer demographics will continue to evolve as a significant number of residents of multiunit dwellings ("MUD") purchase EVs. In today's market, few owners of MUD buildings are willing to install chargers.[6] Placing DCFCs in

5 *See* Cycle 2 Plan at 41.

6 *See* Cycle 2 Plan at 37.

sections of metro areas with high MUD density is a solution to addressing the need of future EV drivers that live in MUDs.[7]

In our analysis of investment needs, Electrify America has also calculated a projected gap in charging capacity in 2022. In this review, we examined the demand for public charging in a metropolitan area by looking at the number of EVs projected to be in operation by 2022, the average daily vehicle miles traveled as collected by the Federal Highway Administration, the composition of single-family and multi-unit homes from U.S. Census Bureau data, the assumptions for vehicle efficiency, and the portion of charging occurring at homes.[8] These metrics, which we rely on in part in making investment decisions, strongly suggest that the installation of DCFC chargers in dense urban areas remains a pivotal if not primary solution to meet the goals of the Master Plan and the Clean Energy Act and overcome a potential barrier to the adoption of electric vehicles.[9]

Q. HOW DO DEMAND CHARGES ADVERSELY AFFECT ELECTRIFY AMERICA'S ABILITY TO PROMOTE TRANSPORTATION ELECTRIFICATION IN THE STATE OF NEW JERSEY?

A. High-powered chargers, such as those operated by Electrify America and other public charging station operators, can be expensive to operate if a utility has in place a rate structure with significant demand charges or a demand-based subscription equivalent that is applicable to DCFCs. A 2019 study by the Great Plains Institute found that 150 kW chargers do not break even under more than half of utility rate schedules, even at

7 Cycle 2 Plan at 37.

8 Cycle 2 Plan at 40.

9 Cycle 2 Plan, at 37.

utilization rates of 10 charges per day, due primarily to demand charges.[10] The same study found that 350 kW chargers face even more difficult economics, breaking even only under utility rates that substantially reduce or eliminate demand charges. In some markets, demand charges can account for as high as 90 percent of electricity costs.[11] These costs represent an obstacle to additional private sector investment in EV charging infrastructure.

A single charging session can expose an EV charging company to significant demand-related charges in order to offer a high-power, customer-friendly charging experience. This problem is exacerbated when coincident high-powered charging occurs at multi-charger locations, and in particular when a high demand incident results in a charge that is repeatedly imposed on the charging company in subsequent months. Demand charges are more easily managed directly by large, commercial businesses which have significant load factors. However, demand charges create a disproportionate impact on lower-load-factor services such as EV charging station operators serving the general public. Fundamentally, this creates a disparate impact for electric customers subscribing to the same rate.

Demand charge frameworks create a disincentive for investments in customer-friendly high-powered charging, and induce investments towards low-powered (and thus significantly slower) charging where such demand charges can be somewhat managed without curtailing charging sessions.

10 *See* Great Plains Institute, 2019. "Overcoming Barriers to Expanding Fast Charging Infrastructure in the Midcontinent Region." Available at: https://scripts.betterenergy.org/reports/GPI_DCFC_Analysis_July_2019.pdf

11 Rocky Mountain Institute, 2017. "EVgo Fleet and Tariff Analysis." Available at: https://rmi.org/wp-content/uploads/2017/04/eLab_EVgo_Fleet_and_Tariff_Analysis_2017.pdf

Q. PLEASE DESCRIBE ELECTRIFY AMERICA'S PERSPECTIVE ON BARRIERS TO TRANSPORTATION ELECTRIFICATION FROM PSE&G'S CURRENT AND PROPOSED RATE STRUCTURE

A. As outlined in Electrify America's Cycle 2 Plan, access to affordable, fast, ubiquitous public charging is a critical component to transportation electrification in the State of New Jersey.

However, PSE&G's rate structure combined with its current proposal in this docket could have a profound effect on Electrify America's investment in New Jersey. Specifically, Electrify America notes that a single 30-minute coincident charging event from multiple vehicles can result in expensive demand charges regardless of the level of customer activity or the volume of electricity delivered throughout a given PSE&G billing cycle. For example, PSE&G's combined summer demand charges under its rate schedules LPL and BGS-CIEP, the rate schedules that it assigns to Electrify America at $33.5672/kW[12] can cause in excess of $60,000 in demand charges in a single month from just 30-minutes of coincident charging at our East Brunswick, NJ location, which has eight 150 kW chargers and two 350 kW chargers, for a total interconnected load of 1900 kW or 1.9 MW. Similar impacts can be expected at the other eight current and the prospective Electrify America installations in PSE&G's service area.

This unreasonable burden discourages EVSE infrastructure investment generally, but it is particularly discouraging to those investing in the fastest, most consumer-friendly charging stations that focus on high-power charging. Electrify America urges the Board to have utilities minimize demand charges and fixed service costs, while allowing recovery of only the marginal cost to serve. The Board should not allow riders or other

12 PSE&G Tariff effective June 1, 2020; Includes LPL Summer Demand Charge of $8.9495/kW + BGS-RSCP (<500 kW) / CIEP Capacity Charge of $5.6474/kW or $11.6828/kW + BGS Transmission Charge of $12.9349/kW (https://nj.pseg.com/aboutpseg/regulatorypage/-/media/6A04206002AF417EA4857F50778FE6A0.ashx)

non-bypassable surcharges associated with historical infrastructure costs and unrelated programs in excess of this marginal cost recovery.

We emphasize that the effective $/kW-hour utility charges for all public charging infrastructure should be comparable to effective rates for residential charging in each utility to best meet fairness and environmental justice concerns. Furthermore, such rates should be guaranteed for a reasonable horizon, such as 10 years, to ensure that investment is economically viable for EVSE infrastructure companies.

While all such goals may not be accomplished within the current proceeding, my proposal in this testimony will drive toward achieving the goal of meeting New Jersey policy.

III. PSE&G'S RATE PROPOSAL

Q. HOW WILL PSE&G RATES TO ELECTRIFY AMERICA AFFECT RESIDENTS IN NEW JERSEY?

A. New Jersey residents will be more and more dependent upon public charging stations in the near-term and long-term future, and consequently fuel costs to public charging stations will take on increasing importance. It is recognized that current electric vehicle adoption is concentrated within households that have access to charging at home,[13] but even then may be limited to a non-primary vehicle given the lack of public charging infrastructure. New Jersey's environmental equity public policy goals are frustrated by the fact that lower-income Americans are much more likely to rent their homes than wealthier Americans. According to analysis of Census data by CityLab, "households earning less than $50,000 per year have a homeownership rate of around 45 percent,

13 *See* https://www.energy.gov/eere/electricvehicles/vehicle-charging

while nearly 80 percent of households earning more than $50,000 own."[14] Builders in New Jersey have also been adding multi-unit dwellings — apartments, condos, townhouses — at a faster pace for several years.[15]

Because it is more difficult, if not impossible, to install a home charger at a rental property or multi-unit dwelling, these trends create a significant challenge to EV adoption in New Jersey, and they accentuate the critical importance of providing available, convenient, and ultrafast EV charging in New Jersey to populations that cannot easily install a home charger.

Q. HOW DO YOU UNDERSTAND PSEG'S RATE PROPOSAL IN THIS MATTER?

A. Mr. Swetz describes the rate proposal as follows: "PSE&G is proposing to recover the revenue requirements associated with the direct costs of the CEF-EV Program. The CEF-EV Program direct costs include all costs related to CEF-EV Program capital expenditures, AFUDC, and operations and maintenance costs including the administrative costs of running the Program. These costs would be partially offset by the revenues derived from the CEF-EV Program, including, but not limited to, CEF-EV charging revenue associated with Company owned chargers and revenues derived through the PJM frequency regulation market associated with the battery component associated with certain CEF-EV chargers. In addition, if the Company can derive any additional revenue in the future from the CEF-EVES Program, all net proceeds will be credited to ratepayers as a reduction to revenue requirements." (certain references omitted).

Q. TO WHAT RATE CLASSES WOULD THESE CHARGES BE MADE?

14 https://www.citylab.com/life/2018/08/who-rents-their-home-heres-what-the-data-says/566933/

15 August 2, 2020. *Real Estate Market Update* reports that 60% of all new housing starts in 2020 in NJ were in the rental sector.

A. According to Mr. Swetz: "PSE&G proposes to recover the net revenue requirements associated with the Electric Vehicle and Energy Storage Programs via two components of a new Technology Innovation Charge ("TIC") to the Company's Tariff for Electric Service, i.e., the Clean Energy Future Electric Vehicle component ("CEF-EVC") and the Clean Energy Future-Energy Storage component ("CEF-ESC"). The CEF-EVC and CEF-ESC are proposed to be applicable to all electric rate schedules on an equal cents per kilowatt-hour basis in the same manner as currently utilized for all electric components of the GPRC." (certain references omitted).

Q. WHAT DO YOU UNDERSTAND THE EFFECT OF THIS PROPOSAL TO BE?

A. All rate classes would pay for the EV and Energy Storage components of PSE&G's proposed program.

Q. WHAT IS YOUR VIEW OF THIS PROPOSAL?

A. By requiring a DCFC company such as Electrify America to pay to incentivize installation of EV equipment and storage, one is defeating the stated purpose of the proposal.

Q. WHAT IS YOUR RECOMMENDATION?

A. Public EV charging infrastructure should be exempt from the TIC.

IV. COMMENTS ON THE EV SUBPROGRAM PROPOSALS

Q. DOES ELECTRIFY AMERICA SUPPORT THE MAKE-READY PROPOSAL IN THE PUBLIC DC FAST CHARGING SUBPROGRAM?

A. Yes. Electrify America broadly supports the framework of utility and EVSE participation, under which utilities such as PSE&G would be responsible for the "wiring and backbone infrastructure" to support public DCFC locations, and EVSE infrastructure companies would be "primarily responsible for installing, owning and/or operating, and

marketing EVSE." Electrify America holds that utility support for make-ready infrastructure can encourage additional private sector investment in EV charging infrastructure in New Jersey, while allowing the competitive market to focus on customer experience and reduce costs. Such a shared responsibility model should minimize ratepayer burden and risk of stranded investments while incentivizing new infrastructure within PSE&G's service area. In addition, Electrify America supports additional financial incentives as proposed by PSE&G to cover a percentage of upfront DC Fast Charger and installation costs to encourage EVSE participation in and development of the market.

Q. IS FLEXIBILITY FOR THE MAKE-READY PROPOSAL IN THE PUBLIC DC FAST CHARGING SUBPROGRAM IMPORTANT?

A. Yes. As EV adoption increases within PSE&G's service area, public DCFC operators should have flexibility to adapt to meet driver needs. Any approved make-ready program for public DCFC should not be overly prescriptive, and should allow EVSE infrastructure companies to make appropriate investment decisions based on customer feedback. For example, there should not be requirements to have chargers that are capable of charging more than one vehicle at a time (this is not common for higher power DCFC) or that the infrastructure must be capable of power sharing or participating in demand response events (this may compromise the customer charging experience if adopted and ultimately thwart the State's public policy goals). Electrify America emphasizes that providing the fastest charging speeds on-demand to customers who need them is critical to optimize the user's experience, making DC fast charging unsuitable for load management solutions that throttle customer charging power. In 2017, the Rocky Mountain Institute found that DC fast charging "users expect to be able to obtain a maximum-speed charge from them

in the shortest possible time, so it's generally not practical to turn DCFC on and off (or ramp their power output) in response to changing grid conditions."

Electrify America opposes the competitive solicitation approach for these incentive programs proposed by PSE&G witness Karen Reif at page 21 of her testimony. Such solicitations are a departure from established incentive programs in other service areas which are available publicly on a first-come, first-served basis. With respect to PSE&G's justification for such an approach to avoid duplicative geographic coverage and prioritize high traffic corridors, Electrify America posits that siting decisions are best left to the competitive market, and that such a solicitation approach may introduce administrative burdens that are impractical for nationwide EV infrastructure developers and operators such as Electrify America. For example, Electrify America cannot establish a relationship with a site host, then apply for the make-ready incentive program, and then discover that PSE&G does not deem the site worthy of its subjective criteria. Such conditions would be a disincentive to investment. In particular, Karen Reif's testimony states that qualification criteria must "include an appropriate location within the site to deploy charging stations in a cost effective manner, as determined by PSE&G in its sole discretion, but subject to the participant's agreement." This raises potential concerns that PSE&G may require chargers to be located, for example, near existing transformers that may be at an undesirable location (e.g. behind a grocery store or near a shopping center loading dock), or otherwise deny eligibility. Decisions such as this should not be left exclusively to a utility company in a circumstance where the quality of the customer experience is an obligation of the charging company, not the utility.

Electrify America would urge the Board to require the make-ready rebate to be open to all entities on a first-come, first-served basis, and with minimal requirements for approval. It would be appropriate to set crystal-clear quotas on a county-by-county basis if appropriate to ensure geographical diversity.

Q. SHOULD DATA SHARING FOR THE MAKE-READY PROPOSAL IN THE PUBLIC DC FAST CHARGING SUBPROGRAM BE REQUIRED?

A. No. This proposed requirement serves as another barrier to investment in PSE&G's service area. Specifically, the testimony of Karen Reif states that "the participant will be required to allow PSE&G to access data from the charging stations. PSE&G intends to collect data about the number of charging events, times, duration, usage and load profiles." (at page 24).

Electrify America already publishes much of this data in its Annual Report. The proposed requirement adds administrative and potentially technological burdens that may disqualify certain DCFC chargers or EVSE infrastructure companies from participating. In particular, if technology integration is required to meet this requirement, this may introduce cybersecurity, data protection, and integration cost concerns that may make participation in the program cost prohibitive. Alternatively, if a spreadsheet is required to be sent on a regular basis in a specified format, this may introduce administrative burdens which add labor costs and exposes proprietary data to a potential competitor: the utility itself. Electrify America would encourage the Board to reject any requirement around data sharing and encourage maximum flexibility to EVSE infrastructure companies.

Q. DOES ELECTRIFY AMERICA SUPPORT THE FINANCIAL INCENTIVES TO DEFRAY ELECTRICITY COSTS IN THE PUBLIC DC FAST CHARGING SUBPROGRAM?

A. Not entirely. Electrify America agrees with PSE&G's position, as set forth in the testimony of Company witness Karen Reif that "that another barrier to entry in the DC Fast Charging market is the cost of electricity, especially in cases where demand charges apply and station utilization is low. Given the objective of DC Fast Charging stations – to deliver as much charge to drivers as possible in a short time window – they inherently face high levels of maximum demand under the existing PSE&G tariff. When coupled with low utilization overall, this can make the effective cost per kWh very expensive."

Electrify America appreciates PSE&G's initiative to mitigate such risk and reduce economic barriers to further investment in its service area via ongoing off-bill rebates that reduce the effective cost of electricity to a pre-determined subprogram target rate, as detailed by PGE&G witness Karen Reif. (at page 23). However, Electrify America does not agree that the PSE&G time-limited approach is appropriate or sufficient to enable increased investment within PSE&G's service area.

Q. PLEASE COMMENT FURTHER ON ELECTRIFY AMERICA'S CONCERNS WITH THE SUBPROGRAM TARGET RATE APPROACH.

A. PSE&G's response to discovery request S-PSEG-REV-0018 ("Rev. 18") states that "PSE&G's CEF-EVES filing sets forth a "set point" approach that offers a rebate above a set point for the average billed rate ($/kWh). PSE&G filed with a set point of $0.40 per kWh. Each month, via an off-bill calculation, the effective price ($ per kWh) will be calculated for the site host's bill by dividing the total bill ($) by the total energy used (kWh). The difference between this calculated figure and the set point will be refunded to the customer. This approach effectively mitigates the impact of demand charges that would otherwise create a disincentive during the early, low-usage stage of EV ecosystem deployment." (Rev. 18 at p. 23).

Unfortunately, the proposed five year horizon for the set point approach may not allow sufficient 'headroom' for an EVSE infrastructure company such as Electrify America to make future investment 'pencil' within the PSE&G service area. Specifically, the PSE&G response to discovery request Rev. 18 states that "The filing assumes EV owners will pay $0.45 per kWh initially, eventually dropping to $0.30 per kWh." (at page 22). A $0.05 per kWh difference between the subprogram target rate and what drivers are expected to pay for energy delivered to their vehicle nearly guarantees that any public DFCFC infrastructure will have to operate at a loss. In reality, significant energy losses occur from operating the site as well as converting power from AC to DC for each vehicle. Station operators also need the margin to cover the cost to maintain and repair equipment, and to fund customer service such as call center operations. With the program as designed, and given PSE&G's own assumptions, recovery of any capital or non-electricity operating costs would be nearly impossible, and certainly not promote a 'shared responsibility' model to any extent.

Schedule JS-2 demonstrates the impacts of a 1% load factor under the Large Power and Light (LPL) Secondary rate schedule along with the Basic Generation Service – Commercial and Industrial Energy Pricing (BGS-CIEP) supply schedule Electrify America is on for the majority of its infrastructure in PSE&G's service area with demand exceeding 500 kW,[16] with its largest site in the service area interconnected with a potential maximum demand of 1900 kW or 1.9 MW. Assuming, for comparison purposes, a typical electric vehicle gets 3.5 miles/kWh while a typical fossil-fueled vehicle has an efficiency of 24.9 miles/gallon,[17] the effective cost per kWh of demand alone ***well exceeds $33/gallon*** at a low load factor of 1%, and this excludes energy losses at the site as previously detailed. While EV

16 PSE&G Tariff effective June 1, 2020: https://nj.pseg.com/aboutpseg/regulatorypage/-/media/6A04206002AF417EA4857F50778FE6A0.ashx

17 This calculation assumes a typical vehicle realizes 24.9 miles/gallon. *See* https://www.epa.gov/automotive-trends/highlights-automotive-trends-report

adoption is expected to increase in the upcoming years, the power at which vehicles are capable of recharging are also slated to increase, especially for medium duty and heavy duty electric vehicles. As a result, very low load factors on the order of 1% may well persist beyond the 5-year horizon of PSE&G's subprogram target rate proposal, especially in disadvantaged communities. The specter of such effective costs per kWh and per gallon of demand charges even five years out may be enough to detract from increased investment in PSEG's service area compared to other opportunities where long-term investment pencils sustainably.

Q. DO PSE&G'S SECONDARY RATE SCHEDULES REFLECT THE UNIQUE NATURE OF LOW-LOAD FACTOR DCFC?

A. No. Typical commercial rate schedules, including those that have been Board-approved within PSE&G's service area, are designed for load factors on the order of 50%. Electrify America's higher power DCFC may incur load factors on the order of 1% for the foreseeable future in PSE&G's service area. While PSE&G's subprogram target rate proposal provides cost certainty in initial years for very low load factor charging infrastructure, PSE&G's proposal fails to establish a long-term rate that recognizes the unique cost to serve such infrastructure.

Rev. 18 states that "the same mechanism will serve to maintain the appropriate rate for cost causation in the long term because demand charges, once utilization increases, send the correct cost signals to align peak demands with cost causation for distribution system delivery, transmission, and generation capacity costs of DCFC stations." (at page 23).

Electrify America posits that these 'correct cost signals' may not hold true given that the current secondary rate schedules in place today are not reflective of low-load factor infrastructure. As an example, if two 350 kW fast-chargers were located adjacent to each other and operated by two separately metered charging networks, each would be

billed a demand charge at 350 kW even if charging sessions never occurred at the same time with the full demand charge. If instead the two chargers were operated by the same charging network under one meter, the total billed demand charge across the two chargers would be cut in half. While exact recovery of costs imposed by each commercial customer is unlikely to be practically feasible, it is also unlikely to hold true that the full demand charge is a 'good measure' of the costs imposed on the utility system in this case or similar situations as higher power, relatively low load-factor, customer-friendly fast-charging stations become increasingly common.

Q. IS THERE AN ALTERNATIVE TO DEMAND CHARGES THAT CAN PROVIDE LONG TERM COST CERTAINTY TO FACILITATE EV INFRASTRURE INVESMENT WITHIN PSE&G'S SERVICE AREA?

A. Yes. Demand charges, as detailed previously in my testimony and acknowledged by PSE&G in their filing, present an economic barrier to DCFC infrastructure investment, and send an economic signal to compromise DCFC power at the expense of customer experience and ultimately EV adoption.

Many jurisdictions have approved rates that reduce or eliminate demand charges altogether for low-load factor commercial customers, and even more so for EV charging infrastructure specifically due to state policy goals.[18] We would suggest that the same can be accomplished by PSE&G multiple ways, including for example by providing an incentive to EVSE companies in the form of a demand charge credit equal to the full demand charge. It is not necessarily the case that a demand charge is appropriate.

18 El Paso Electric: Schedule EVC – Electric Vehicle Charging Rate: https://www.epelectric.com/files/html/Rates_and_Regulatory/Docket_46831_Stamped_Tariffs/36_-_Rate_EVC_Electric_Vehicle_Charging_Rate.pdf; Connecticut Light & Power EV Rate Rider: https://www.eversource.com/content/docs/default-source/rates-tariffs/ct-electric/ev-rate-rider.pdf?sfvrsn=e44ca62_0; Gulf Power GS TOU: https://www.gulfpower.com/gulfcommon/pdfs/rates/business/gstou.pdf; Tampa Electric: $0 Demand on Optional GSD: https://www.tampaelectric.com/files/tariff/tariffsection6.pdf#Page=10; DTE Electric, Schedule D1.9 – Experimental Electric Vehicle: https://www.michigan.gov/documents/mpsc/dtee1cur_579203_7.pdf#Page=130

As another example, and while not directly comparable to the EVSE situation, PSE&G's rate schedule for General Lighting and Power Service (GLP) contains an alternative to billing for demand. While this provision may not have been put into place with the charging company use case in mind, it does provide a potential basis for a demand charge credit/incentive that would benefit the DCFC infrastrucutre. The rate schedule provides that "Where no demand meter is installed, the customer's Monthly Peak Demand shall be determined by estimate by dividing the kilowatt-hours by 100 for the applicable billing period."

Schedule JS-2 expands upon the previous calculations to determine what the impact of applying this 'demand limiter' provision would be if in effect for all EV charging infrastructure. At a 1% load factor, an effective cost of demand charges per kWh of less than $0.29 is calculated using the Basic Generation Service – Residential Small Commercial Pricing (BGS-RSCP) supply schedule that would be applicable due to billed demand being below 500 kW. When added onto other costs and riders within the GLP rate schedule, Electrify America notes that this equates to slightly less than the 40 cents per kWh as proposed in PSE&G's set point or subprogram target rate proposal.

As an alternative to the set-point proposal, Electrify America would request the Board to approve the use of this provision for all charging infrastructure, as a starting point – whether or not a demand meter is placed at the site. This would effectively extend cost certainty beyond a 5-year horizon while following cost-causation principles that the Board has already approved in the rate schedule (i.e. as if a demand meter had not been placed at the site), and mitigate concerns with respect to impact on ratepayers.

Q. HOW DOES ELECTRIFY AMERICA PROPOSE THE BOARD EXPAND UPON THE EXISTING DEMAND CHARGE LIMITER IF EXTENDED TO EV CHARGING INFRASTRUCTURE?

A. As detailed earlier in my testimony, even a set point or demand limiter approach that provides an effective energy cost of around 40 cents per kWh will not be sufficient to provide enough 'headroom' for EVSE infrastructure operators to recover capital and operating costs, especially when energy losses are accounted for. As detailed earlier in my testimony, a significant portion of the population may never have access to home or workplace charging options. In a PSE&G rate proceeding the Board should expand upon the nature of the demand limiter provision already approved within PSE&G's GLP secondary rate schedule, and approve a marginal cost, permanent EV rate that provides effective utility rates for electricity delivered to public charging stations. In this proceeding, this may also be accomplished by providing a rebate that accomplishes the same intent. The approved rate or incentive should result in effective electricity rates for public electric vehicle charging infrastructure that are commensurate with, if not lower than, those for residential charging in order to create equitable incentives for adopting electric transportation amongst those that have access to charging at home and those that do not.

Q. SHOULD THE APPROVED RATE INCENTIVE OR PERMANENT EV RATE BE ONLY LIMITED TO NEW INFRASTRUCTURE THAT PARTICIPATES IN PSE&G'S SOLICITATIONS UNDER THE PUBLIC DC FAST CHARGING SUBPROGRAM?

A. No. As detailed previously in my testimony, demand charges were not designed for the low-load factors experienced by EVSE infrastructure companies. Already, PSE&G's proposal to limit the incentive to new infrastructure encourages EVSE infrastructure companies such as Electrify America to pause investment until the proceeding has

completed, contrary to State goals. Analogously, penalizing recent investment within the Company's service area by denying eligibility for the approved rate or incentive inadvertently puts those who have invested in New Jersey without financial support from New Jersey ratepayers at a substantial competitive disadvantage to those firms that have not yet chosen to invest in New Jersey and will invest with ratepayer support on an ongoing basis, as existing station operating costs will be substantially above those stations which are newly built under the program. The competitive disadvantage would be significant enough that it could force existing providers to reconsider whether to maintain operation of a station that cannot compete, or whether to cease operation and relocate infrastructure.

Furthermore, any approved bill incentive or permanent EV rate should not be limited to infrastructure that participates in PSE&G's make-ready solicitations or require data sharing of any kind. While Electrify America agrees with PSE&G ownership of supporting make-ready infrastructure, no entity should be subject to onerous demand charges that may otherwise make the investment unfeasible. Any approved incentive or permanent EV rate should promote ongoing investment within the region.

Q. DOES ELECTRIFY AMERICA SUPPORT PSE&G'S PROPOSED UTILITY OWNERSHIP OF CHARGING FACILITIES [OTHER THAN MAKE-READY] IN THE PUBLIC DC FAST CHARGING SUBPROGRAM?

A. Any such proposal is premature. Electrify America recommends a close examination of utility ownership and operation of charging infrastructure and whether this will sufficiently meet New Jersey's objectives for charging infrastructure. As detailed in this testimony, EVSE infrastructure companies such as Electrify America face multiple barriers to having an economically viable business model, especially in high demand charge areas with low levels of EV adoption as within PSE&G. Electrify America

reiterates that utility investment in and ownership of hardware on the utility side of the meter is an important element of the shared responsibility approach as detailed earlier, and highlights that this approach allows the leveraging of utility expertise in make-ready infrastructure while allowing the competitive DCFC market to innovate, improve on customer experience, and reduce costs with scale. PSE&G's proposal to own and operate, even as a backstop with assurances of utility pricing being set to market conditions, remains premature, as efforts to address barriers to private sector investment must be addressed first, in order to establish whether such an backstop is necessary. The competitive advantage of utilities owning and operating stations could encourage EVSE infrastructure companies to seek investments in other service areas where charging volume will not be compromised by a competitor with a BPU supported rate of return. Given the significant ratepayer risk that would be incurred by utility ownership, including potentially stranded investments, Electrify America would encourage the Board to maintain the shared responsibility approach to meet its goal of ensuring equitable distribution of EVSE. Simply put, competition should spur best outcomes.

Q. WHAT IF THE MAKE-READY INCENTIVE AND EV RATE OR INCENTIVE ARE NOT SUFFICIENT TO MEET THE STATE'S DCFC INFRASTRUCTURE OBJECTIVES IN THE PSE&G SERVICE AREA?

A. Electrify America posits that the shared responsibility approach of utility investment in make-ready infrastructure and private investment in the DCFC charger and customer experience should be sufficient to meet infrastructure policy goals if coupled with a long-term EV rate or incentive, as detailed previously in my testimony. In the event that such measures are not sufficient, Electrify America holds that additional, targeted incentives to offset further capital and operational costs may be a path forward, especially in disadvantaged communities. Such an approach would continue to promote and develop

private, competitive EVSE infrastructure company investment while reducing costs to ratepayers and risk of stranded assets compared to the rate of return that PSE&G would derive for utility owned and operated DCFC – a rate of return that private infrastructure companies can only dream of given the nascent state of the market. Thus, Electrify America requests the Board to defer further consideration of utility owned and operated DCFC proposed in the public DC fast charging subprogram until more cost effective measures for ratepayers are put in place to spur private DCFC infrastructure investment within PSE&G's service area.

Q. DOES THAT CONCLUDE YOUR TESTIMONY?

A. Yes.

JIGAR J. SHAH

RECENT PROFESSIONAL EXPERIENCE

Electrify America, LLC **Reston, VA**
Manager – Distributed Energy & Grid Services June 2018 – Present

- Manage Electrify America's energy portfolio, including minimizing utility costs via rate structure optimization, leveraging distributed energy resources (DER), analyzing and responding to utility filings where they may substantively impact our business interests, engaging with wholesale energy markets, and addressing vehicle-grid integration matters

West Monroe Partners **New York, NY**
Principal – Smart Grid • Energy & Utilities May 2017 – June 2018

- Evaluated distributed energy resource (DER) proposals with energy storage, solar photovoltaic, and demand response components to defer utility transmission and distribution (T&D) investments, including benefit-cost and policy analysis
- Architected utility grid modernization plan and regulatory filing with customer benefits from reliability / efficiency, and utility revenue / operational benefits, including advanced metering infrastructure (AMI), variable rate structures, distribution automation, energy storage, renewables, microgrids, and electric vehicle charging infrastructure

Envision Energy **Houston, TX**
Senior Researcher • Global Digital Energy Center January 2015 – April 2017

- Managed over $5 million in international wind energy R&D projects to lower energy costs via analytics and computational fluid-dynamics (CFD) based control algorithms, collaborating with the National Renewable Energy Laboratory (NREL)
- Transitioned research to commercialization via new technology introduction (NTI) initiatives with strategic customers
- Developed wind farm control technology and fleet optimization analytics using MATLAB and python data-driven models
- Served on American Wind Energy Association (AWEA) Wind Power Plant Performance Measurement Subcommittee

General Electric (GE) Global Research **Niskayuna, NY**
Edison Engineer • Controls, Electronics, & Signal Processing (CESP) August 2011 – January 2015

Commercial Electric Vehicle (EV) Fleet Smart Grid Integration / Energy Storage

- Designed and implemented Supervisory Control and Data Acquisition System (SCADA) leveraging machine leaning enhanced controls algorithms to avoid grid infrastructure upgrades and save over $10,000 in monthly demand charges from concentrated electric vehicle charging per location, including reliability analysis via Six Sigma methodologies (FMEA)

Thermal Storage / Water Heater Smart Grid Integration

- Envisioned and led project revolutionizing electrical residential water heating to incorporate time-of-use pricing, with over $6B in potential bill savings to consumers, increased performance, and smart grid benefits to avoid infrastructure upgrades

Wind Turbine Controls & Optimization

- Developed model-based control algorithms to reduce trips, fatigue, and forces on GE's wind turbines under turbulent conditions and increase annual energy production (AEP), leveraging modeling tools such as MATLAB, Simulink, & FAST

SELECTED PUBLICATIONS / PATENT APPLICATIONS

Method and System for Mitigating Transmission Congestion via Distributed Computing and Blockchain Technology
US Patent and Trademark Office (USPTO) US20170285720 October 2017

Field Test of Wake Steering at an Offshore Wind Farm
Wind Energy Science, Volume 2, Issue 1 May 2017

Cost-Optimal Consumption-Aware Electric Water Heating Via Thermal Storage Under Time-of-Use Pricing
IEEE Transactions on Smart Grid, Volume 7, Issue 2 March 2016

Cloud-based model predictive building thermostatic controls of commercial buildings: Algorithm & implementation
2015 IEEE American Control Conference (ACC) July 2015

Cost-Optimal, Robust Charging of Electrically-Fueled Commercial Vehicle Fleets via Machine Learning
2014 8th Annual IEEE International Systems Conference April 2014

EDUCATION

Princeton University • School of Engineering and Applied Science **Princeton, NJ**
Master of Engineering in Electrical Engineering May 2011

Cornell University • College of Engineering **Ithaca, NY**
Bachelor of Science in Electrical and Computer Engineering, Minor in Business May 2010

		LPL Summer Demand + BGS-CIEP Supply Cost Impact at 1% Load Factor			GLP Demand Limiter + BGS-RSCP Supply Cost Impact at 1% Load Factor			
Demand kW	kWh at 1% Load Factor	Summer Demand Cost	Summer Demand Cost per kWh	Effective Price per Gallon for Demand Only	Billed Demand kW-Limiter	Summer Demand Cost - Limiter	Summer Demand Cost per kWh - Limiter	Effective Price per Gallon for Demand Only - Limiter
500	3600	$16,783.60	$4.66	$33.17	36	$1,024.45	$0.2846	$2.02
750	5400	$25,175.40	$4.66	$33.17	54	$1,536.67	$0.2846	$2.02
1000	7200	$33,567.20	$4.66	$33.17	72	$2,048.90	$0.2846	$2.02
1250	9000	$41,959.00	$4.66	$33.17	90	$2,561.12	$0.2846	$2.02
1500	10800	$50,350.80	$4.66	$33.17	108	$3,073.35	$0.2846	$2.02
1750	12600	$58,742.60	$4.66	$33.17	126	$3,585.57	$0.2846	$2.02
2000	14400	$67,134.40	$4.66	$33.17	144	$4,097.79	$0.2846	$2.02

IN THE MATTER OF THE PETITION OF PUBLIC SERVICE ELECTRIC AND GAS COMPANY FOR APPROVAL OF ITS CLEANENERGY FUTURE – ELECTRIC VEHICLE AND ENERGY STORAGE ("CEF-EVES") PROGRAM ON A REGUALTED BASIS
BPU DOCKET NO. EO18101111

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