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September 18, 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 Atlantic City Electric Company for Approval of a Voluntary Program for Plug-In Vehicle Charging
BPU Docket No. EO18020190

Dear Secretary Camacho-Welch:

This firm represents Electrify America, LLC ("Electrify America"). On September 9, 2020 Commissioner Chivukula granted Electrify America's Motion for Leave to Intervene in the referenced matter. Electrify America is therefore an intervenor in this matter.

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

By: William Lesser

WL: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 ATLANTIC CITY ELECTRIC COMPANY FOR APPROVAL OF A VOLUNTARY PROGRAM FOR PLUG-IN VEHICLE CHARGING	: : : : :	BPU DOCKET NO.: EO18020190

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

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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 the Amended Petition filed by Atlantic City Electric Company ("ACE" or the "Company") in this docket, insofar as it seeks approval of its Voluntary Program for Plug-In Vehicle ("PIV") Charging (the "PIV Program") and its 13 Program Offerings. I respond to the Company's testimony submitted by Kevin M. McGowan, Jennifer M. Grisham, Michael Normand, and Mark Warner. 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 PIV Program and relevant offerings of ACE's proposal will affect the market for fast charging EV installations in New Jersey. I explain how utility ratepayer subsidization of utility-owned DCFC in that market may be detrimental to the public policy of this State. That 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 THEY RELATE 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

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

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 chargers on the electric distribution system. The Master Plan suggests piloting and implementing a modified rate design to manage electric vehicle charging and support demand response programs. Further, the Master Plan encourages incentives for electric vehicle infrastructure and electric vehicle usage in low-income communities to address environmental justice concerns.

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 Clean Energy 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 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

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

annual demand impose an extraordinary financial burden on public DCFC 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 DCFC stations are comparable in cost to the costs paid by consumers charging at home.

In urban areas, including areas within ACE's service territory, 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 effective 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?

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 ACE's service area for a 1% load factor. I additionally have attached a discovery response by ACE. Schedule JS-3 is the ACE Response to Discovery Request CP-ACE-0022.

Q. WHAT ARE YOUR RECOMMENDATIONS?

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

- 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 this objective can be accomplished in an ACE base rate case, the adverse effects of ACE's rate structure on the EV market can be ameliorated in this proceeding through properly designed incentives.
- Implement sufficient incentives now that address undue barriers to the private sector in 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 ACE's service area and throughout New Jersey, applicable to current and future charging investments.
- Take other steps to equitably grow the EV market in New Jersey; and which will allow the charging industry to provide DC fast 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 is investing $2 billion over ten years on 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 energized 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. Additionally, Electrify America designated the Garden State Parkway from Atlantic City northwards as a priority corridor for investment in the Cycle 2 National ZEV Investment Plan.[3]

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

[3] *See* Cycle 2 Plan at 47-48.

addition, and to date, Electrify America has commissioned six charging stations located in metro areas, which offer a mix of 50 kW, 150 kW, and Level 2 charging.

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

[4] *See* https://www.electrifyamerica.com/our-plan.
[5] *See* Cycle 2 Plan at 41.

Electrify America opened its first New Jersey ultra-fast charging station in Bridgewater in May 2019. Electrify America continues to grow and now has nine charging locations energized in New Jersey to date, including in Somerdale, Cherry Hill, East Brunswick, Bridgewater, Fairfield, Kearny, Pompton Plains, Elizabeth, and Clifton. Electrify America has concrete plans to expand and open a charging location energized within the ACE service territory in the foreseeable future. Electrify America's plans recognize the value of operating in New Jersey, including the proximity to major metropolitan areas and existing highway infrastructure. Electrify America anticipates that it will continue to grow within ACE's service territory. However, Electrify America plans to invest in New Jersey in part on the expectation that the utility rates will be structured to support investment, consistent with State Policy.[6]

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 PERSPECTIVE ON BARRIERS TO TRANSPORTATION ELECTRIFICATION IN THE STATE OF NEW JERSEY.

A. As outlined in Electrify America's Cycle 2 Plan, access to affordable, fast, and ubiquitous public charging is a critical component to expanding EV usage in the State of New Jersey. Currently, the operational risks imposed on electric vehicle supply equipment ("EVSE") companies, makes New Jersey uneconomical for EVSE infrastructure companies providing fast chargers. Specifically, Electrify America notes that a single 15-minute coincident charging event from multiple vehicles can result in excessive demand

[6] *Id*. at 43.

charges regardless of the level of customer activity or the volume of electricity delivered throughout a given billing cycle. This operational risk 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 without riders or other non-bypassable surcharges associated with historical infrastructure costs and unrelated programs. Specifically, the effective $/kW-hour 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 in 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.

Q. HOW WOULD ACE 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,[7] 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

[7] *See* https://www.energy.gov/eere/electricvehicles/vehicle-charging.

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, while nearly 80 percent of households earning more than $50,000 own."[8] Builders in New Jersey have also been adding multi-unit-dwellings — apartments, condos, townhouses — at a faster pace for several years.[9] 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. 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 DC fast 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

[8] https://www.citylab.com/life/2018/08/who-rents-their-home-heres-what-the-data-says/566933/.
[9] *Real Estate Market Update* reports that 60% of all new housing starts in 2020 in NJ were in the rental sector.

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.[10] Placing DCFCs in sections of metro areas with high MUD density is a solution to addressing the need of future EV drivers that live in MUDs.[11]

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.[12] These metrics, which we rely on in part in making investment decisions, strongly suggest that the installation of DC fast 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.[13]

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

[10] *See* Cycle 2 Plan at 37.
[11] Cycle 2 Plan at 37.
[12] Cycle 2 Plan at 40.
[13] Cycle 2 Plan at 37.

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. 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 utilization rates of 10 charges per day, due primarily to demand charges.[14] 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.[15] 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.

[14] *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.
[15] 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.

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.

III. COMMENTS ON ACE'S PIV PROGRAM PROPOSAL

Q. DOES ELECTRIFY AMERICA SUPPORT THE MAKE-READY PROPOSAL IN PROGAM OFFERING 9?

A. Yes. Electrify America broadly supports the framework of "shared responsibility," under which utilities such as ACE 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 ACE's service area.

Q. IS FLEXIBILITY FOR THE MAKE-READY PROPOSAL IN PROGAM OFFERING 9 IMPORTANT?

A. Yes. As EV adoption increases within ACE'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 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 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."[16]

Q. DOES ELECTRIFY AMERICA SUPPORT THE RATE INCENTIVE PROPOSEED IN PROGRAM OFFERING 9?

A. Not entirely. Electrify America agrees with ACE's position, as set forth in the testimony of Company witness Mr. Grisham that "a single usage on a DCFC can cause a significantly high demand charge for the commercial owner, dis-incentivizing them to install a DCFC in locations that might not be heavily utilized initially." Electrify America appreciates ACE's initiative to mitigate such risk and reduce economic barriers to further investment in its service area via a monthly rebate that reduces the effective cost of electricity to a pre-determined set point, as detailed by ACE witness Grisham. (Grisham Testimony at 19-22).

However, Electrify America does not agree with the assertion that a time-limited set point approach is appropriate or sufficient to enable increased investment within ACE's service area.

[16] See Rocky Mountain Institute, 2017. "From Gas to Grid: Building Charging Infrastructure to Power Electric Vehicle Demand." Available at: https://rmi.org/wp-content/uploads/2017/10/RMI-From-Gas-To-Grid.pdf.

Q. PLEASE COMMENT FURTHER ON ELECTRIFY AMERICA'S CONCERNS WITH THE SET POINT APPROACH.

A. As detailed in ACE's response to discovery request CP-ACE-0022, attached as Schedule JS-3, ACE "recognizes that profitable DCFC operation requires capital recovery, coverage of other operating costs (besides electricity), and profit, and that sufficient 'headroom' above basic electricity costs is required." ACE details in its discovery response that "the set-point of 20 cents/kwhr – which represents the average cost of electricity (net of the incentive) for DCFC owner/operators – was proposed in relation to anticipated pricing of charging services to EV drivers" and that "35 cents/kwhr is assumed as the target pricing to EV drivers." However, that seems to imply that nearly all of the kWh billed is delivered to electric vehicles. In reality, significant energy losses occur from operating the site as well as converting power from AC to DC for each vehicle. 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 ACE service area.

Specifically, Schedule JS-2 demonstrates the impacts of a 1% load factor under the MGS Secondary Rate Schedule Electrify America would be under for its planned infrastructure in ACE's service area consisting of two 150 kW and two 350 kW chargers, for a total interconnected load of 1000 kW or 1 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 $6/gallon at a low load factor of 1%, and this excludes energy losses

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

at the site as previously detailed. While EV adoption is expected to increase in the upcoming years, the power at which vehicles are capable of recharging is 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 ACE's set-point proposal, especially in disadvantaged communities. The specter of such effective costs per kWh of demand charges and per gallon equivalent even five years out may be enough to detract from increased investment in ACE's service area compared to other opportunities where long-term investment pencils sustainably.

Q. DO ACE'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 ACE'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 ACE's service area. While ACE's set-point proposal provides cost certainty in initial years for very low load factor charging infrastructure, ACE's proposal fails to establish a long-term rate that recognizes the unique cost to serve such infrastructure.

Indeed, in response to discovery request CP-ACE-0022, attached as Schedule JS-3, ACE states: "The set-point represents a trade-off: the lower the set-point, the greater the economic incentive for the DCFC owner/operator, and the greater the potential impact on ratepayers."

Electrify America posits that this "potential impact on ratepayers" may not ring 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 ACE'S SERVICE AREA?

A. Yes. Demand charges, as detailed previously in my testimony and acknowledged by ACE 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 ACE multiple ways, including for example by providing an incentive

[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.

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.

Upon analysis of the MGS SECONDARY rate schedule, Electrify America notes that an alternative to billing for demand incurred at commercial locations is already Board approved within ACE's service area. Specifically, under "DEMAND DETERMINATION FOR BILLING," there is a provision that states "Where no demand meters are installed, a customer's demand will be calculated for the period June 1st thru September 30th, inclusive. This demand will be estimated by dividing the kWh use by 150."[19]

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 $0.045 is calculated. When added onto other costs and riders within the MGS Secondary schedule, Electrify America notes that this equates to around the 20 cents per kWh as proposed in ACE's set point 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 (i.e. as if a demand meter had not been placed at the site), and mitigate concerns with respect to impact on ratepayers.

[19]https://www.atlanticcityelectric.com/SiteCollectionDocuments/NJ%20Tariff%20Section%20IV%20Effective%2012-01-2015.pdf

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 20 cents per kWh may not be sufficient to provide enough "headroom" for EVSE infrastructure operators to recovery 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. The Board should expand upon the demand limiter provision already approved within ACE's MGS 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?

A. **A.** No. As detailed previously in my testimony, demand charges were not designed for the low-load factors experienced by EVSE infrastructure companies. Already, ACE'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. Any approved incentive or permanent EV rate should promote ongoing investment within the region.

Q. DOES ELECTRIFY AMERICA SUPPORT ACE'S PROPOSAL TO OWN AND OPERATE DCFC INFRASTUCTURE IN PIV OFFERING 7?

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 charges areas with low levels of EV adoption as within ACE. 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. ACE's proposal to own and operate remains premature, as efforts to address barriers to private sector investment must be addressed first, in order to establish whether such ownership and operation 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 ACE SERVICE AREA?

A. Electrify America posits that the shared responsibility approach of utility investment in make-ready infrastructure and private investment in the DC fast 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 ACE 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 PIV Offering 7 until more cost effective measures for ratepayers are put in place to spur private DCFC infrastructure investment within ACE's service area.

Q. DOES THIS CONCLUDE YOUR ANSWERING TESTIMONY AT THIS TIME?

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

		MGS Summer Demand Cost Impact at 1% Load Factor			MGS Summer Demand Cost Impacts with Limiter at 1% Load Factor			
Demand kW	kWh at 1% Load Factor	MGS Summer Demand Cost	MGS Summer Demand Cost per kWh	Effective Price per Gallon for Demand Only	Billed Demand kW- Limiter	MGS Summer Demand Cost - Limiter	MGS Summer Demand Cost per kWh - Limiter	Effective Price per Gallon for Demand Only - Limiter
100	720	$662.00	$0.92	$6.54	4.8	$31.78	$0.0441	$0.31
200	1440	$1,324.00	$0.92	$6.54	9.6	$63.55	$0.0441	$0.31
300	2160	$1,986.00	$0.92	$6.54	14.4	$95.33	$0.0441	$0.31
400	2880	$2,648.00	$0.92	$6.54	19.2	$127.10	$0.0441	$0.31
500	3600	$3,310.00	$0.92	$6.54	24	$158.88	$0.0441	$0.31
600	4320	$3,972.00	$0.92	$6.54	28.8	$190.66	$0.0441	$0.31
700	5040	$4,634.00	$0.92	$6.54	33.6	$222.43	$0.0441	$0.31
800	5760	$5,296.00	$0.92	$6.54	38.4	$254.21	$0.0441	$0.31
900	6480	$5,958.00	$0.92	$6.54	43.2	$285.98	$0.0441	$0.31
1000	7200	$6,620.00	$0.92	$6.54	48	$317.76	$0.0441	$0.31

In the Matter of the Petition of Atlantic City Electric Company for Approval of a Voluntary Program for Plug-In Vehicle Charging

BPU Docket No. EO18020190

Response to ChargePoint Data Requests – CP-ACE Set 1
07/09/2020

Question No.: CP-ACE-0022
The Company proposes to provide, "a rate incentive to offset the customer's demand charges for a limited period of time. This incentive provides the customer with a monthly rebate to reduce the effective cost of electricity to a known set point, with a true-up based on a monthly off-bill incentive."

a. What other demand charge relief did the Company consider for non-utility owned DCFC installations?
b. Please explain how the Company determined 20 cents as the appropriate rate incentive to offset a customer's demand charges.
c. Does the Company plan to extend the proposed demand charge offset to existing non-utility owned DCFC charging stations? If not, please explain why the Company believes it is appropriate to provide demand charge relief to only a subset of DCFC stations.

RESPONSE:

The set-point represents a trade-off: the lower the set-point, the greater the economic incentive for the DCFC owner/operator, and the greater the potential impact on ratepayers. Conversely, the higher the set-point, the lower the economic incentive for the DCFC owner/operator, and the lower the potential impact on ratepayers. The proposed set-point of 20 cents/kwhr is intended to represent a fair balance between providing enough incentive to recipients without excessive impact on ratepayers.

a. The Company considered a variety of other approaches to offsetting the impact of demand charges during early market conditions when utilization is relatively low. Other options including a temporary "demand charge holiday," a specialized tariff for public DCFC that does not include demand charges, or a fixed-rate rebate offered for a fixed period of time. The first two options were considered less preferable to the set-point program, since they ignore the cost-causation principle fundamental to rate design and do not provide an effective transition to a standard tariff structure as utilization naturally increases. The fixed-rate rebate (similar to what is being offered in New York) does not scale with the actual need of a given location and can result in recipients getting either more or less incentive than is actually required. The set-point approach also offers an advantage that is highly valued by the industry, which is that the cost of electricity (net of the incentive) is predictable and constant over the incentive period, thereby increasing operating cost certainty for DCFC owner/operators.
b. The set-point of 20 cents/kwhr – which represents the average cost of electricity (net of the incentive) for DCFC owner/operators – was proposed in relation to anticipated pricing of charging services to EV drivers. Two market analogs were considered: a) equivalent cost with gasoline, and b) current DCFC pricing benchmarks in New Jersey.

Based on current vehicle averages, DCFC services would need to be priced around 35 - 40 cents/kwhr to be equivalent with gasoline*. Based on a survey of recent public DCFC pricing in New Jersey, average pricing statewide was approximately 34.5 cents/kwhr (exclusive of free chargers, as of November 1, 2019). Given these two benchmarks, 35 cents/kwhr is assumed as the target pricing to EV drivers. The Company recognizes that profitable DCFC operation requires capital recovery, coverage of other operating costs (besides electricity), and profit, and that sufficient "headroom" above basic electricity costs is required.

c. The Company's current proposal is to make Offer 9 available only to new DCFC construction. This approach is appropriate since it aligns with the policy motivation of increasing the number of DCFC locations available in the territory through new construction. The utility is neutral on whether a similar offer should be made available to existing DCFC installations if the Board determines that incentive availability is appropriate for all customers (existing and new facilities). In that case, however, the size of the offer would need to be expanded, and existing customers should only be eligible for the set-point component of the offer (not make-ready).

* As an example, for gasoline at $2.40/gallon with a traditional vehicle that gets 22.2 mpg, costs are 10.81 cents/mile. For an EV that gets 3.5 miles/kwhr, gas-equivalence is attained at 37.84 cents/kwhr.

Witness: Jennifer Grisham/Michael T. Normand

IN THE MATTER OF THE PETITION OF ATLANTIC CITY ELECTRIC COMPANY FOR APPROVAL OF A VOLUNTARY PROGRAM FOR PLUG-IN VEHICLE CHARGING BPU DOCKET NO. EO18020190

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