STATE OF NEW JERSEY
BOARD OF PUBLIC UTILITIES

IN THE MATTER OF THE PETITION OF PUBLIC SERVICE ELECTRIC AND GAS COMPANY FOR APPROVAL OF ITS CLEAN ENERGY FUTURE – ELECTRIC VEHICLE AND ELECTRIC STORAGE PROGRAM ON A REGULATED BASIS

BPU Docket No. EO18101111

PUBLIC SERVICE ELECTRIC AND GAS COMPANY REBUTTAL TESTIMONY

OF
TODD HRANICKA
DIRECTOR - SOLAR ENERGY
AND
RAYMOND C. ALVAREZ
SENIOR DIRECTOR - ASSET MANAGEMENT, TECHNOLOGY AND SYSTEMS

October 16, 2020

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Q. Please state your names, affiliations and business addresses.

A. My name is Todd W. Hranicka, and I am Director, Solar Energy, for Public Service Electric and Gas Company ("PSE&G" or "Company"). My principal place of business is 80 Park Plaza, Newark, New Jersey 07102.

My name is Raymond C. Alvarez, Senior Director, Asset Management, Technology and Systems for PSE&G. My principal place of business is also 80 Park Plaza, Newark, New Jersey 07102.

Q. Have you testified previously in this proceeding?

A. Neither of us has testified before in this proceeding. We are jointly adopting the Direct Testimony of Jorge L. Cardenas, who filed testimony in this proceeding on October 11, 2018, and who retired from PSE&G in 2019. We are also adopting all discovery responses submitted in this proceeding concerning energy storage issues.

Q. How is the responsibility for Mr. Cardenas' testimony divided between the two panel members?

A. Mr. Hranicka is adopting Mr. Cardenas' testimony and discovery responses regarding the Clean Energy Future – Energy Storage ("CEF-ES") program elements and the program's overall benefits, and the current state of the energy storage market. Mr. Hranicka is also responsible for this rebuttal testimony with respect to those issues. Mr. Hranicka's credentials and experience are fully set forth in Schedule TH-CEF-ES-1 of this rebuttal testimony.

Mr. Alvarez is adopting Mr. Cardenas' testimony and discovery responses, and is responsible for this rebuttal testimony, to the extent those materials reference or require a knowledge of and experience regarding how PSE&G's electric distribution system operates and is managed. Particularly relevant to this energy storage proceeding, this includes things like mitigation of voltage fluctuations and excursions driven by the output of solar arrays; PSE&G's use of standard electric distribution planning processes to estimate load growth on the distribution grid, and the strategies to accommodate this load growth as well as to achieve peak reduction through the use of an energy storage system ("ESS"); and the use of an ESS as an alternative to using extra transformers during substation upgrades to meet applicable planning criteria for reliability and redundancy. Mr. Alvarez's credentials and experience are fully set forth in Schedule RA-CEF-ES-1 of this rebuttal testimony.

Q. What is the purpose of your rebuttal testimony in this proceeding?

A. In our rebuttal testimony, we respond to certain assertions in the direct testimonies of witnesses on behalf of other parties concerning the Company's CEF-ES proposal. Specifically, we respond to the testimony of:

(i) Ezra D. Hausman on behalf of the New Jersey Division of Rate Counsel ("Rate Counsel");

(ii) Peter Cavan on behalf of the Market Paticipants;[1] and

(iii) Justin R. Barnes on behalf of Sunrun Inc.

[1] The "Market Participants" referred to in this rebuttal testimony are Direct Energy Business, LLC, Direct 4 Energy Business Marketing, LLC, Direct Energy Services, LLC, and Gateway Energy 5 Services Corporation (collectively, "Direct Energy"), NRG Energy, Inc. ("NRG"), Just 6 Energy Group Inc. ("Just Energy") and Centrica Business Solutions.

In summary, our conclusions and recommendations are that: (1) the time is right for consideration and resolution of PSE&G's CEF-ES proposal, as part of the New Jersey Board of Public Utilities' ("BPU" or the "Board") on-going implementation of the requirements of the Clean Energy Act ("CEA") and achievement of the CEA goals of 600MW of energy storage by 2021, and 2,000MW by 2030;[2] (2) like the solar energy initiatives pursued since 2008 by PSE&G with the Board's approval, CEF-ES is a beneficial program that will complement, not compete with, other activity in the developing energy storage market; and (3) PSE&G's proposed Distribution Deferral and other CEF-ES subprograms are superior at this time for the deployment of energy storage systems ("ESSs") on the electric distribution system, as compared to the alternative solutions proposed by the Market Participants and Sunrun. Finally, we respond to an issue raised regarding the need for a cost benefit analysis in this case.

I. The Time Is Right For Consideration And Resolution Of CEF-ES, Which Is Consistent With The Terms Of The Clean Energy Act And With New Jersey Policy To Significantly Increase And Broaden The Application Of Energy Storage Systems

Q. Rate Counsel witness Hausman testifies repeatedly that the Board "has not established standards or policies for utility investment in energy storage technology that would justify or support" the various elements of CEF-ES.[3] Similarly, Market Participant witness Cavan suggests that the filing is premature. Do you agree with this conclusion?

A. I do not. As Dr. Hausman discusses, the CEA "mandated that the Board initiate an analysis of the need for, benefits of, and costs of energy storage in New Jersey, and submit a report to the Governor." The study was to "recommend ways to increase opportunities for energy storage and distributed energy resources in the State, including any recommendations for financial incentives to aid in the development and implementation of these technologies by public and private entities

[2] N.J.S.A. 48:3-87.8.

[3] Hausman, at 37-38 (regarding the Solar Smoothing subprogram of CEF-ES); 38 (regarding Distribution Deferral); 40 (regarding Outage Management); and 42 (regarding Peak Reduction for Public Facilities).

in the State."[4] As Dr. Hausman also acknowledges, that report was completed by a group from Rutgers University, and the report was timely adopted by the Board. The report's conclusions, which were quoted by Dr. Hausman as well as by Mr. Cavan, bear repeating:

> This technical analysis of ES shows that it can play an important role in New Jersey's sustainable energy transition. New opportunities are arising to apply mature technologies and gain experience with emerging technologies in the service of a cleaner, more resilient, and more cost-effective electric power system. **These opportunities await at the bulk power level, distribution system level, and behind-the-meter at customers' sites**...Electrochemical battery technologies are beginning to find cost-effective applications, with Li-ion the current leader. Batteries cost-effectively provide ancillary services to the bulk power system. **They hold near-term promise, as costs come down, to help increase hosting capacity for decentralized solar PV on certain distribution systems**; and increase resilience in combination with solar PV on the customer side of the meter for high resilience users such as hospitals, hotels, and supermarkets. With further cost reductions, ES can help with grid stabilization for [offshore wind] projects and EV charging stations. ES can enable several of the key transformations needed to support New Jersey's energy economy, and policymakers have the necessary tools to encourage wider deployments. Fair and efficient policymaking will encourage adoption of ES technologies in applications where they are cost-effective and well suited, while incentivizing emerging, game-changing applications that may soon become feasible. **As with any policy that has transformative aspirations, a key aim should be learning from experience, and adapting both means and ends as evidence accumulates**. This report provides a starting point in that continuing process.[5]

The point is that there are numerous areas of inquiry to pursue if the State is to meet the ambitious storage goals of the CEA and the State's Energy Master Plan, and CEF-ES is an appropriate step in the right direction. As described further in section II of this rebuttal testimony, the subprograms of CEF-ES will allow PSE&G and the State to "learn from experience" how to best incorporate storage into the electric utility distribution system and importantly, will not interfere with other storage initiatives that the Board and the private market can simultaneously pursue.

[4] Hausman, at 32 (quoting N.J.S.A. 48:3-87.8(1)(c).

[5] Hausman, at 32-33 (quoting Rutgers University, New Jersey Energy Storage Analysis (ESA) Final Report, May 23, 2019, available at: https://www.bpu.state.nj.us/bpu/pdf/commercial/New%20Jersey%20ESA%20Final%20Report%2005-23-2019.pdf, at 177 (emphasis added).

Q. What is Dr. Hausman's and Mr. Cavan's view regarding this timing issue?

A. Dr. Hausman suggests that notwithstanding the clear direction of the Rutgers study, consideration of PSE&G's modest proposal must await further lengthy proceedings.[6] Similarly, while acknowledging in detail the CEA requirements to conduct the initial storage study and the efforts undertaken by the Board, through Rutgers, to satisfy those requirements, Mr. Cavan chooses to focus on activities that the Board has not undertaken to date, as a reason to delay action on the potential identified by the Rutgers study.[7]

Q. Are these legitimate bases to delay action on CEF-ES?

A. Absolutely not. First, as noted above, the knowledge gained from implementing the utility-scale ESS projects proposed under CEF-ES will allow precisely the type of "learning from experience" regarding storage opportunities available at the distribution system level that is endorsed under the Rutgers study. Moreover, there is nothing to prevent the Board and all stakeholders from pursuing additional initiatives and conducting stakeholder proceedings in parallel with the commencement of CEF-ES, making use of the experience that PSE&G gains under this relatively modest program.

Q. Dr. Hausman and Mr. Cavan also testify that CEF-ES is somehow impermissible or inappropriate on legal and policy grounds. Can you comment?

A. Yes I can. Dr. Housman claims that the program is "not supported" by the utility's "statutory obligation to provide safe, adequate, and proper service at just and reasonable rates," and that there is no "statutory mandate" for the program.[8] In a similar vein Mr. Cavan, while noting that "PSE&G's objectives are laudable," expresses concern that "development and

[6] Hausman, at 32-33 (noting that despite the completed Rutgers study, the Board "has not yet initiated the [follow-up] proceeding mandated under N.J.S.A. 48:3-87.8(1) (d)" to achieve the CEA storage goals).
[7] Cavan, at 8-9 (noting that the Board has not yet hosted a stakeholder process in consultation with PJM, and has not initiated the stakeholder proceeding intended to follow-up the Rutgers study).
[8] Hausman, at 5.

ownership of ES solutions is not a natural extension of the traditional role of utilities", and that the CEF-ES subprograms would "distract PSE&G from its core functions as a regulated utility."[9]

Q. How do you respond to these concerns?

A. First, I note that Dr.Hausman's concern about "statutory obligations" and "statutory mandates" seems inconsistent with his simultaneous position that PSE&G is free to implement energy storage solutions "under its current regulatory authorization"."[10] I also note that over the past 18 years, while PSE&G has consistently provided reliable, award-winning electric service, it has also innovated and implemented non-traditional clean energy programs that have supported public policies, and has invigorated the clean energy economy for all stakeholders in New Jersey.[11] These programs have included Solar 4 All® (S4A), Solar Loan, and a suite of Energy Efficiency programs. These initiatives have not distracted PSE&G from its core mission of providing reliable, safe, and affordable energy to its customers.

Finally, I note that Dr. Hausman's extensive opinions about the impact of the utility's "statutory obligations" and "statutory mandates" on this proceeding are legal conclusions that neither Dr. Hausman nor I am qualified to reach. In this regard, like PSE&G rebuttal witness Karen Reif, I note that Rate Counsel's legal arguments will continue to be addressed in this matter by PSE&G's counsel. Further, I note that while Rate Counsel formally moved to strike the electric vehicle portion of CEF-EVES on legal grounds that were not accepted by the Presiding Commissioner, no similar motion was made to strike the energy storage portion of the program; the very first time Rate Counsel has raised these concerns is in Dr. Hausman's testimony, nearly

[9] Cavan, at 4, 6.
[10] Hausman, at 44.
[11] By way of example, PSE&G has been recognized by PA Consulting as the recipient of the ReliabilityOne™ Award for Outstanding Reliability Performance in the Mid-Atlantic Region for 18 consecutive years. ReliabilityOne™ Awards are given annually to the utilities that have achieved outstanding reliability performance and have excelled in delivering the most reliable electric service to their customers.

two years after CEF-ES was filed, and more than a year after the Board adopted the Rutgers study identifying, for example, "opportunities at the distribution system level" that can "help increase hosting capacity for decentralized solar PV on certain distribution systems," and recommending that capitalizing on these opportunities should be pursued, at least in part, through experiential learning. While PSE&G's attorneys will respond to Rate Counsel's and others' legal concerns, I am not aware of any actual basis to broadly preclude public utilities from the storage activity proposed in this filing, and as discussed further below, simply "keeping utilities out the market" on competitive grounds is unnecessary and would be inconsistent with clearly expressed state policy.

II. The Storage Portion of The CEF-EVES Program Is Reasonable And Necessary, And Should Be Approved In Its Entirety

Q. Please summarize the thinking behind PSE&G's energy storage proposal.

A. To meet the requirements set forth in the CEA, an energy storage program as filed under CEF-ES is reasonable and necessary as PSE&G seeks to move beyond traditional means and methods of managing the distribution system. The collection of subprograms proposed in this filing will help ensure that when energy storage applications become more widely adopted and cost competitive, PSE&G and a vibrant New Jersey energy storage industry will be well-positioned to effectively deploy ESSs in the appropriate applications, and allow unrestricted system access for renewables, as stated in New Jersey's Energy Master Plan. For example, by implementing the CEF-ES programs, PSE&G will gain a greater understanding of how and where to prudently deploy storage so that PSE&G will be prepared to integrate storage on its system when it is cost-effective with traditional technologies. This will help New Jersey become a center for energy storage jobs, and the network and economic development associated with this effort will yield benefits to the State that last far longer than the term of the CEF-ES Program.

Q. Please summarize the state of the energy storage industry as it relates to the CEF-ES filing.

A. The energy storage industry has experienced regulatory and market uncertainty throughout its growth around the world. In many electricity markets, ESSs are not yet permitted to provide many of the services they are technically capable of, limiting potential revenue streams and overall project economics. While there are efforts to reform these regulations at both the state, federal and RTO levels in the United States, there continues to be uncertainty and barriers to the market's growth. Performance of the ESSs in the CEF-ES Program will help to inform future state, federal and RTO policy with respect to the type of distribution system-level efforts proposed in this filing. In this way, the program can contribute to the establishment of industry standards around energy storage.

Q. Certain parties have expressed concern that approval of CEF-ES will harm competition and stifle innovation with respect to energy storage; is that correct?

A. Not at all; in fact, I believe the opposite is true. I will discuss some of the specific "competitive" issues raised later in this section. At the outset, however, it is important to recognize that today, the energy storage industry is reminiscent of the solar industry when PSE&G's Solar 4 All® (S4A) and Solar Loan programs were approved in 2008-2009. At that time, there were similar uncertainty and cost concerns regarding the viability of solar in New Jersey. Through federal and State policies, and PSE&G's active participation, New Jersey was rewarded with jobs, significant solar generation and reduction of greenhouse gases, and became a national leader in the solar industry.

PSE&G views its participation in energy storage as similar to its participation in the solar market. Under the S4A programs, the Company develops, competitively bids, owns, and operates solar facilities. PSE&G's S4A programs have not provided the utility an unfair advantage or

stunted the development of a solar industry in New Jersey. In fact, it has been quite the opposite. Since approval of the original S4A program in 2009, New Jersey's installed solar capacity has grown over 5,500%, making New Jersey a center for solar jobs and creating an ecosystem that has allowed a national solar market to grow.[12] As a small but active participant in the solar industry -- holding slightly less than 5% of the installed solar capacity in New Jersey -- PSE&G gained first-hand knowledge of the complexities of developing, installing, interconnecting, and operating a solar facility, enabling the utility to better serve the solar industry that has seen significant growth and innovation over the past decade.

Q. Coming back to the competitive issues mentioned by Mr. Cavan on behalf of the Market Participants, he testifies that PSE&G'S energy storage program will "stunt the competitive market" and give PSE&G "an unfair advantage over competitors.[13] Is that a legitimate concern?

A. No it is not. As filed, the 35 MW program constitutes approximately 6% and 2% of New Jersey's 2021 and 2030 energy storage goals of 600 MW and 2,000 MW respectively. PSE&G's filed capacity is small in comparison to the stated energy storage goals of New Jersey, and would not stunt growth or create an unfair advantage in a competitive energy storage market. In fact, just the opposite will occur. This Program will help make New Jersey a center for energy storage jobs, and the network and economic development associated with this effort will yield benefits to the state that last for longer than the term of the CEF-ES Program. Furthermore, the modest scale of this program will not create dependencies towards utility ownership, and there is no evidence that supports this concern.[14]

[12] NJ-OCE Solar Development Data. Per the New Jersey Office of Clean Energy's Solar Activity Reports web page and the "Installation Report", at the end of 2009, 56,490 kW of solar was installed in New Jersey, and as of August 31, 2020, 3,352,013 kW of solar was installed. Installed solar capacity in New Jersey has grown over 5,500% over the past 10 years.

[13] Cavan, at 6-7.

[14] See Schedule THRA-CEF-ES-1, e.g., Sunrun response to PS-SR-5.

Q. Will PSE&G's energy storage filing stifle innovative approaches in deploying the technology in New Jersey?

A. No. As stated above, PSE&G's proposed energy storage programs constitutes a small portion of the State's energy storage goals and are limited to solutions applied at the PSE&G distribution system level, where PSE&G has over a century of expertise in system needs and requirements, and an obvious interest in ensuring that storage is developed and implemented in a manner that protects and enhances the performance of the system. Furthermore, PSE&G will competitively bid to third party suppliers to provide energy storage solutions to meet the requirements of the program as filed. It is unrealistic to believe that these efforts will limit innovations in the energy storage market.

Q. Is there evidence in this case that PSE&G's storage program will spur the competitive market?

A. Yes there is. Mr. Barnes was clear on behalf of Sunrun that his "Bring Your Own Device" program, discussed further in section III below, is not being proposed "to the exclusion of any of the Company's specific proposed investments, but as a necessary component of any energy storage program that the BPU approves." Simply stated, there is more than enough room in the State's legally-mandated 2,000 MW storage market to absorb the 35 MW of ESS proposed under CEF-ES for the period 2021-2027, for the specific distribution system purposes described in the filing. PSE&G's participation in the energy storage market at the level proposed under CEF-ES, similar to what has happened in the solar industry over the past decade, will only stimulate the market, and enable the utility to better serve the energy storage industry.

Q. Is there any reason to believe that having PSE&G serve as the gatekeeper to interconnecting energy storage systems to the grid places third party participants at a disadvantage?[15]

A. No. PSE&G will continue to operate an open system accessible to any third party developer via established interconnection processes. Indeed, PSE&G has been involved in the solar market in New Jersey for some time, and there has never been any evidence of PSE&G restricting third parties from developing solar in NJ, or limiting the growth of the industry.[16]

III. The Alternative Storage Solutions Proposed By The Market Participants And Sunrun Do Not Negatively Impact The Case For CEF-ES

Q. Did intervenors in this case propose alternative solutions for the deployment of energy storage system?

A. Yes, intervenors Market Participants (MPs) and Sunrun both proposed alternative solutions for the deployment of energy storage systems.

The MPs, through their witness Peter Cavan, recommend that PSE&G establish a "Non-Wire Solution" ("NWS") alternative for the Distribution Deferral subprogram.[17] In a NWS process, according the MPs, PSE&G would take competitive bids from third parties for distribution deferral projects; competitors in the market would be free to propose solutions. As I understand the model, a winning bidder would be awarded a contract to construct, own, and operate energy storage systems to defer distribution system upgrades.

Sunrun, through its witness Justin R. Barnes, suggests that PSE&G incorporate in this program "a segment to utilize residential behind-the-meter ("BTM") solar-paired energy storage systems to provide grid services," which includes a straw program design based on programs deployed by other utilities. These programs are referred to as Bring-Your-Own-Device ("BYOD")

[15] Cavan, at 13
[16] See Schedule THRA-CEF-ES-1, PS-MP-PC-6.
[17] Cavan, at 11-12.

programs because they allow non-utility storage owners to participate under standard program terms with any qualifying storage device that can meet program requirements. Participating storage resources are compensated based on the performance of the enrolled devices in supplying the grid service they are signed up to perform. As noted above, Sunrun does not propose a BYOD program to the exclusion of any of the Company's subprograms as filed, but as an addition to the program that the Board should approve.[18]

Q. How do these alternative energy storage solutions compare with PSE&G's CEF-ES program?

A. The recommended programs are different, and do not address all the use cases and needs identified by PSE&G's subprograms.

MPs' NWS to address the Distribution Deferral use case in PSE&G's filing has been deployed by other utilities. However, these programs are new, and while PSE&G does not oppose this approach in principle, the results are anecdotal at this time, and this NWS proposal is not an adequate substitute for PSE&G's Distribution Deferral proposal. The fact is that we are very early in the development of larger scale storage that has measurable impacts on EDC distribution systems. Implementing ESSs for distribution deferral through the utility itself, under a program that is subject to Board oversight and annual Staff and Rate Counsel review, will ensure that these projects are executed in a prudent manner.

Q. How does Sunrun's proposal compare with the CEF-ES program?

A. Sunrun's program is entirely different than PSE&G's subprograms and does not address the specific needs identified in the CEF-ES filing. Sunrun's proposed program targets system-wide peak capacity reduction and generation capacity costs within a given service territory, and

[18] Barnes, at 3-4

will require multiple BTM solar-paired energy storage systems on a single circuit. Under the CEF-ES Distribution Deferral subprogram as filed, by way of contrast, PSE&G plans to install a single, relatively large (e.g., 1 MW / 4 MWh) ESS along multiple circuits that are most likely to see planning capacity violations during summer peak loads. Achieving comparable information and experience under Sunrun's proposal would require "250 to 500 individual residential" BTM solar-paired storage systems.[19]

Q. Mr. Barnes claims that his proposal is "a far more cautious approach to supporting energy storage deployment than what PSEG has proposed from the standpoint of ratepayer costs and risks because it is designed to enable non-ratepayer investment and limit ratepayer costs to the value of the services that are actually delivered." Is Mr. Barnes' proposal actually better for customers?

A. As compared with the CEF-ES solutions, it is inconceivable that the type of BTM program proposed by Sunrun could address the needs, or provide the type of distribution system information and experience, that will be provided by the Distribution Deferral subprogram, or any of the subprograms identified in the CEF-ES filing. In light of the degree of development of ESS technology, the utility's experience operating that technology, and the complexities that would be associated with implementing the type of "distributed storage" system that Sunrun has proposed, PSE&G believes that the CEF-ES solutions are simply more appropriate to meet current system needs, as well as to satisfy State policy supporting cost effective implementation of energy storage.

Q. What is PSE&G's ultimate position regarding these alternative solutions?

A. PSE&G does not oppose these alternative solutions in concept. However, for the purpose of incorporating storage into its distribution system, PSE&G believes the CEF-ES solutions should be prioritized, and development and deployment of the alternative solutions proposed by the

[19] See Schedule THRA-CEF-ES-1, Sunrun response to PS-SR-7.

Market Participants and Sunrun should be addressed at a later time, independent, and separate from this proceeding.

PSE&G believes an all hands on deck approach should be utilized to achieve New Jersey's energy storage goals. By approving PSE&G's energy storage program as filed will enable the utility to better integrate this versatile resource into the distribution planning process, and to subsequently incorporate alternative methods as suggested by Market Participants and Sunrun.

IV. Although A Cost-Benefit Analysis ("CBA") Is Not Required, PSE&G Submitted A CBA In Discovery Demonstrating That The CEF-ES Program Is Cost-Beneficial

Q. Did PSE&G calculate revenue offsets generated by the proposed energy storage systems?

A. Yes. The filing included estimated revenue offset for frequency regulation, energy output, and SRECs. Revenues generated by the proposed units for those items will offset the program costs to the benefit of customers. Revenue streams for frequency regulation, energy, and SRECs are shown in the filing in Schedule SS-CEF-ES-1 of Mr. Swetz's direct testimony, at page 2 of 2. Those revenue streams are also shown in PSE&G's response to RCR-POL-0013, and the supporting calculations and assumptions were included in the confidential workpaper attached to that discovery response.[20]

Q. Did PSE&G also develop a cost benefit analysis ("CBA") for the Energy Storage program consistent with the filing?

A. Yes. It is my understanding that a CBA is not required to be conducted for a pilot program like CEF-ES. Nevertheless, following the filing, PSE&G prepared a CBA using refreshed market data, and incorporating benefit streams in addition to the frequency regulation, energy, and SREC

[20] See Schedule THRA-CEF-ES-1, RCR-POL-0013.

revenues referenced above. That CBA, which was provided in response to request RCR-POL-014, demonstrated that the CEF-ES is cost effective.[21] Thus, Dr. Hausman's claim that the "benefits enumerated in the CBA are inconsistent with those provided in other discovery responses"[22] is inaccurate and misleading, ignoring both the positive CBA results provided in discovery and ignoring PSE&G's explanation of the distinction between the revenue offsets provided with the filing and the benefit streams included in the CBA.[23]

Q. Does this conclude your testimony at this time?

A. Yes it does.

[21] See Schedule THRA-CEF-ES-1, RCR-POL-0014. The confidential workpaper WP-CEF-ES-CBA.xlsx attached to that response, at the "CBA Results" tab, rows 105 to 113, columns E to G shows CBA results for the various CEF-ES subprograms ranging from 1.5 to 2.5 under the Societal Cost Test, and from 0.8 to 1.3 under the Total Resource Cost Test.

[22] Hausman, at 36.

[23] See Schedule THRA-CEF-ES-1, RCR-POL-INF-008 (explaining that the responses to RCR-POL-13 (revenue offsets provided with the filing) and RCR-POL-14 (CBA provided in discovery) were developed by two different consultants at different points in time, and that the CBA was prepared at a later date with refreshed market data, and included additional benefit streams).

QUALIFICATIONS
OF
TODD W. HRANICKA
DIRECTOR – SOLAR ENERGY

My name is Todd W. Hranicka and I am employed by Public Service Electric and Gas Company ("PSE&G" or "Company"). My title is Director - Solar Energy PSE&G. I have been employed by PSE&G since September 2012. Prior to my employment with PSE&G, I was Vice President at Vanguard Energy Partners, LLC, one of the east coast's largest solar construction firms. I have management and oversight responsibility for all aspects of the design and implementation of PSE&G's Solar Loan and Solar 4 All® Programs, including 3 MW-dc of solar plus battery storage projects. Currently, I am also leading Energy Storage and Electric Vehicle Implementation Planning for PSE&G.

EDUCATIONAL BACKGROUND

I have a Bachelor of Arts degree in History from the University of Delaware.

WORK EXPERIENCE

I have been employed by PSE&G for approximately eight years. Prior to joining PSE&G, I worked for Vanguard Energy Partners. As such, I have a broad background in solar construction, design, management, and operations and maintenance. I manage the PSE&G team that has successfully built 158 MW-dc of solar to date. Currently PSE&G is the utility leader in landfill/brownfield solar with 86MW-dc in-service. I also led the team responsible for developing PSE&G's first ever solar and battery storage project at Hopewell Valley Central High School in Hopewell, New Jersey that went in-service in 2015. The Hopewell system provides backup power for a warming/cooling station, emergency lighting and refrigeration in

the event of an extended outage. Additionally, my team developed four other solar and battery storage projects: one at Cooper Hospital in Camden, New Jersey that provides backup power for refrigeration of vital pediatric medicines; another at the Caldwell Wastewater Treatment facility in West Caldwell, New Jersey that works in conjunction with an existing onsite generator to supplement the backup power to the facility to protect against wastewater flowing into New Jersey's waterways; a solar and battery storage project located at the Pennington Department of Public Works garage in Pennington, NJ that will keep the facility operating during an extended outage; and lastly, the Highland Park solar and storage facility located on a municipal landfill and connected to a 4kV circuit in Highland Park, NJ that went in-service December, 2019. The batteries at the Highland Park facility will be used to reduce voltage fluctuations inherent to grid-connected solar systems due primarily to cloud cover and weather variability. The information gathered from the Highland Park system will enable PSE&G to better integrate renewable energy onto the electric grid in the future, allowing for more solar energy projects in New Jersey. For the past ten years, I typically attend Energy Storage International, Solar Power International, Smart Electric Power Alliance (SEPA) and PV America Conferences to take part in educational sessions, investigate new technologies, view demonstrations and generally increase my expertise in the field. I am an active member of SEPA and am a frequent speaker at industry events.

QUALIFICATIONS
OF
RAYMOND C. ALVAREZ
SR. DIRECTOR OF ASSET STRATEGY, TECHNOLOGY AND SYSTEMS

My name is Raymond C. Alvarez and I am employed by Public Service Electric and Gas Company ("PSE&G" or "Company"). My title is Sr. Director of Asset Strategy, Technology and Systems. I have extensive experience in operations engineering, construction and project management, and have been responsible for Electric Asset Strategy in NJ and associated capital investments since 2017.

EDUCATIONAL BACKGROUND

I graduated from Rutgers University in 1984 with a Bachelors in Electrical Engineering. In 1992 I received a Master's Degree in Electrical Engineering with a focus on Electric Power. I also participated in the Con Edison Account Executive Program and the PSEG Leadership Program to continue to enhance my career development. I am a licensed Professional Engineer in NY and NJ, a Certified Project Management Professional and have published multiple papers on Critical Infrastructure Management and Intelligent Substations.

WORK EXPERIENCE

From 1984 to 1998 I worked at Con Edison where I spent three years on two Engineering Development Rotation Programs where I spent time in Nuclear, Fossil, Electric Planning, Electric and Fossil Operations and Construction. At the completion of the rotation program I became a Watch Supervisor at Con Edison's East River Generating Station where I was responsible for the electric generation and steam send out for two fossil power plants. This included the management of bargaining unit personnel working 24x7 shifts. I then became a District Operator at Con Ed where I was responsible for the safe and reliable operation of the Distribution System in New York

City. This included running contingency analysis, being the tagging authority and work order operating authority. I moved into Project Engineering at Con Ed where I developed project scopes, designs, schedules and budgets for multiple transmission projects throughout the City of NY, and then into the Customer Service Group where I became the corporate liaison to clients at the executive level for the Investment Banking Sector, including executive client relationships, reliability analysis, deregulation support and emergency and technical response for the electric, gas and steam we supplied our customers.

In 1998 I left Con Edison and went to work for Cushman and Wakefield as the Manager of Critical Systems for the Lehman Brothers Account responsible for the development and management of the operation, operating budgets and infrastructure capital plans associated with all critical environments including datacenters, critical power and heating, ventilation and air-conditioning and fire protection systems at the World Financial Center Headquarters. In 1999 I was hired by Lehman Brothers and moved over to the owner side where I became the VP and Global Head of Critical Systems. In 2002 I left Lehman Brothers and moved to Jones Lang LaSalle a global real estate company where I was a Vice President responsible for the Critical Systems Practice for multiple clients including Bank of America and Deutsche Bank and eventually became the Americas Lead coordinating all Critical Systems Operations for the Company for the Americas. In 2007 I moved over to Skyscraper, a Facilities and Operating Engineering Company, where I worked as the Chief Operating Officer of the company responsible for multi-state operations of operations engineering, construction and project management.

I joined PSE&G in 2009 and started in Project Management, running transmission and distribution projects in the Bergen County area. Eventually I redesigned the project development and origination process to drive efficiencies in the scope, schedule and budget development. In

2012 I moved over to Project Engineering and was eventually promoted to a Senior Director where I was responsible for the cradle to grave project engineering of all transmission and distribution work. Since 2017 I have been the Senior Director of Asset Strategy, Technology and Systems where I am responsible for Electric Asset Strategy in New Jersey and for PSEG-LI, capital investments, Utility of the Future, Engineering and the Utility Energy Management System, which is used to monitor and operate the Bulk Power System.

PS-SR-5: Mr. Barnes' testimony at page 13, lines 15-19 states, "PSE&G's approach threatens to create a high degree of path dependency towards utility-owned, centralized NWA solutions and stymie the ability of competitive market (*i.e.*, non- utility) energy storage providers to deliver cost-effective solutions to meet the same grid needs." Has Mr. Barnes performed any studies or analysis, or is Barnes aware of any studies or analysis, demonstrating that a utility's ownership of Energy Storage Systems as proposed by PSE&G prevents or depresses third party energy storage providers' ability to participate in these markets, and that utility ownership has created a dependency towards utility-ownership for these services? If yes, please provide the studies, analysis, or reports and all workpapers or underlying documentation.

Response: Path dependency is created when an initial failure to consider all potential options for meeting a given need produces an outcome that constrains future consideration of alternatives. For instance, pursuing only utility-owned and operated storage without consideration of alternatives means that PSEG is not developing the expertise, capabilities, systems and program platforms to procure the same services from third-party providers. This means that opportunities for third party energy storage providers' ability to participate in these markets is depressed for the reasons described in Mr. Barnes' testimony states on page 13 lines 1-6 "PSEG's Distribution Deferral and Public Sector Peak Reduction subprograms effectively hardwire the "solution" as utility-owned energy storage of a certain size and placement without considering other combinations of resources, ownership arrangements, and other factors. In other words, these subprogram proposals lack the holistic, solutions-oriented focus central to the NWA framework."

See also the response to PS-SR-9 and Mr. Barnes' testimony in Section IIB starting at p. 16 for a discussion of why residential customers lack a mechanism for extracting grid service value from customer-sited storage.

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
Docket No. EO18101111

PSE&G DISCOVERY REQUESTS TO MARKET PARTICIPANTS

Date of Response: October 2, 2020

Witness: Cavan, Peter

PS-MP-PC-6

Peter Cavan's testimony at page 13, line 20-23 states, "If a utility is competing with third party entities, as well as serving as the gatekeeper to interconnection, it would have an incentive to favor its own projects and make it more difficult for its competitors to proceed with their projects." Has Mr. Cavan performed any studies or analysis, or is Mr. Cavan aware of any studies or analysis, regulatory investigations or regulatory agency orders demonstrating or finding that PSE&G or any other utility has limited access to third party developers seeking to connect Energy Storage Systems to the utility's electric distribution system? If yes, please provide the studies, analysis, reports, or orders and all workpapers or underlying documentation.

Response: No. PSE&G's proposed programs have not yet been approved so studies, analysis, investigations or orders on how PSE&G limited access to third party developers seeking to connect Energy Storage Systems to its system are not yet available. Due to restrictions on access to customer data, data that would demonstrate PSE&G favors its own projects would likely not be available to the Market Participants. Please see responses to PS-MP-PC-4 and PS-MP-PC-5.

PS-SR-7: Please reference Mr. Barnes' testimony at page 25, lines 3 to 11 regarding "enhanced resource diversity." Has Mr. Barnes performed any studies or analysis, or is Mr. Barnes aware of any studies or analysis, demonstrating that a collection of small individual separate resources operating in coordination can address a distribution circuit overloaded condition to defer investment? How many BTM residential systems would it take to achieve a 1 MW / 4 MWH energy storage system for a circuit? How would all these energy storage systems operate in unison and who would control them? What is Mr. Barnes' recommendation for how to ensure system reliability such that all the BTM residential systems could be installed in a manner that meets requirements of a distribution circuit?

Response: A study is not necessary to demonstrate that a collection of individual storage systems is more resilient against potential outages than a single centralized system. Assuming a standard unavailability rate based on the technology, the probability of multiple systems being unavailable at the same time will always be less than the probability that a single system would be unavailable because the probability of independent events is the product of the probability of each independent event.

The utilization of small individual resources to address distribution capacity needs is the basic foundation of the non-wires alternative (NWA) framework. California's Distribution Investment Deferral Framework (DIDF) is based on locational DER value demonstration projects conducted by each of the three major IOUs in the state as part of a broader distribution planning proceeding. California Public Utilities Commission D.18-02-004 adopting the DIDF can be accessed at the link below.

https://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M209/K858/209858586. PDF

The number of individual BTM systems that would be required to reach the equivalent of a 1 MW/4 MWh centralized system would depend on the system installed. A typical residential storage system is likely to fall within the range of 2-4 kW based on a 4-hour energy requirement, which would translate to 250 – 500 individual residential systems. However, individual systems need not be entirely residential. For instance, larger commercial scale systems could also be procured for the same purpose. Furthermore, the amount of storage required should depend on the actual system need, not an arbitrary predetermined amount of centralized capacity.

As discussed at length in Mr. Barnes' testimony, system owners or an aggregator would operate the storage systems based on dispatch instructions from the utility, under operational parameters determined consistent with the system need. These operational parameters would be defined in the contract for services based on the identified grid need or needs.

Public Service Electric and Gas Company
Case Name: CEF-EVES
Docket No(s): EO18101111

Response to Discovery Request: RCR-POL-0013
Date of Response: 7/21/2020
Witness: Schmid, Michael
Program offsetting revenues

Question:
Please provide the Company's projections for the annual revenues from each of the "value stacking" revenue streams for each of its proposed energy storage ("ES") programs. Please provide all supporting documents, analyses, and workpapers in their native electronic format with formulas intact.

Attachments Provided Herewith: 1
RCR-POL_0013_WP-JLC-CEF-ES-1 - CONFIDENTIAL.xlsx

Response:
The table provides a summary of annual revenues developed for PSE&G by Navigant. The supporting calculations and assumptions are included in the attached confidential workpaper WP-JLC-EF-ES-1.xlsx is attached in its native electronic format with formulas intact.

Sub-Program	Frequency Regulation	Energy	SREC
Solar Smoothing	$11,860,216		
Distribution Deferral	$20,304,685		
Outage Management	$9,304,199		
Micro-grid	$3,221,032	$4,176,403	$5,114,017
Public Facility Peak Reduction	$4,977,701		

Public Service Electric and Gas Company
Case Name: CEF-EVES
Docket No(s): EO18101111

Response to Discovery Request: RCR-POL-0014
Date of Response: 7/21/2020
Witness: Schmid, Michael
Distribution Deferral: cost benefit analysis

Question:
Please provide any cost-benefit analysis performed by or on behalf of the Company for its proposed Distribution Deferral subprogram. Please provide all supporting workpapers in their native electronic format with formulas intact.

Attachments Provided Herewith: 1
RCR-POL_0014_WP-CEF-ES-CBA - CONFIDENTIAL.xlsx

Response:
The cost benefit analysis is provided in the attached confidential workpaper WP-CEF-ES-CBA.xlsx. The attached is in its native electronic format with formulas intact, and is unprintable in this format.

PSE&G is also pursuing this program in support of the State's goal of making New Jersey a national leader in the deployment of a clean energy economy. The State's goals were codified in the Clean Energy Law enacted on May 23, 2018 ("Clean Energy Law"). The Clean Energy Law set the State's energy storage goals at 600 MW of energy storage by 2021 and 2,000 MW by 2030. Zero carbon and low carbon generation resources are vital to maintaining a clean energy future, and energy storage will be an important resource New Jersey can use to accommodate low carbon, intermittent generation like offshore wind, solar, and distributed generation.

Public Service Electric and Gas Company
Case Name: CEF-EVES
Docket No(s): EO18101111

Response to Discovery Request: RCR-POL-INF-0008
Date of Response: 8/24/2020
Witness: Schmid, Michael
Financial Model Cost Clarification

Question:
Regarding the Company's response to RCR-POL-0013 and RCR-POL-0014:
a. Please tie or reconcile the figures found in the summary of annual revenues table provided in the written response to RCR-POL-0013 with the data provided in the workpapers. Please also reference exactly where the figures found in the summary of annual revenues table appear in the workpapers provided in response to RCR-POL-13.
b. Please identify where and explain how each of the data sources referenced in part (a) are incorporated in the CBA results found in the workpapers provided in response to RCR-POL-14
c. Please explain the basis for the any unidentified constants embedded in cell formulas found in the confidential workpapers provided in response to RCR-POL-13.

Attachments Provided Herewith: 0

Response:

a. Revenues for the subprograms can be found in the workpapers as follows:
Frequency Regulation (FR): the "Benefits by Month" tab, Column "F", rows 10 thru 41, provide the estimated FR revenues per subprogram. Naming conventions in the workpaper are slightly different than in the table in the response and filing. Please use the table below for the naming convention reconciliation.

Table Naming Convention	Workpaper Naming Convention
Solar Smoothing	Solar Enablement
Distribution Deferral	Distribution Deferral
Outage Management	Mobile Batteries for Contingency
Micro-grid	Community Microgrid
Public Facility Peak Reduction	BTM Customer Peak Management

Energy: the "Benefits by Month" tab, rows 162 thru 193, provide the estimated solar facility Energy revenues for the Microgrid subprogram. Total Energy revenue is provided in row 197.

SREC: in the "SREC Calcs" tab, the sum of row 258 provides the estimated solar facility SREC revenues for the Microgrid subprogram.

b. The revenue streams provided for part (a) were not incorporated into the CBA workpapers provided in response to RCR-POL-14. The workpapers provided for

responses to RCR-POL-13 and RCR-POL-14 were developed by two different consultants at different times. The CBA was prepared at a later date with refreshed market data, as well as an inclusion of greater quantities of benefits streams.

c. The confidential workpapers provided are the work product of a consultant that supported PSE&G with the Energy Storage filing. Pricing information was based on their research of the Energy Storage and solar markets, ranging from equipment suppliers and engineering firms. If there are specific constants where further clarity is needed, PSE&G can research those constants and provide additional clarity.