BEFORE THE 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 ENERGY STORAGE ("CEF-EVES") PROGRAM ON A REGULATED BASIS	**)** **)** **)** **)** **)**	**BPU DOCKET NO. EO18101111**

DIRECT TESTIMONY OF EZRA D. HAUSMAN, PH.D.
ON BEHALF OF THE
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I. Professional Qualifications and Purpose of Testimony

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

A. My name is Ezra D. Hausman, Ph.D. I am an independent consultant doing business as Ezra Hausman Consulting, operating from offices at 77 Kaposia Street, Auburndale, Massachusetts 02466.

Q. What is your educational and professional background?

A. I hold a BA in Psychology from Wesleyan University, an MS in Environmental Engineering from Tufts University, an SM in Applied Physics from Harvard University, and a PhD in Atmospheric Chemistry from Harvard University. I have been involved in analysis of both regulated and restructured electricity markets for over 20 years. I have provided a detailed resume as Attachment EDH-1.

I have worked as an independent consultant and expert based on my expertise and experience in energy economics and environmental science since 2014. From 2005 until early 2014, I was employed at Synapse Energy Economics, Inc., a research and consulting Company located in Cambridge, Massachusetts, where I served most recently as Vice President and Chief Operating Officer. At Synapse, and continuing as an independent consultant, I served as an analyst and expert in several areas related to my expertise and experience in energy economics. Specific areas include:

- State and regional energy, capacity, and transmission planning, including both utility resource planning and long-term (multi-decadal) climate-constrained resource planning
- Electricity, generating capacity, and demand-side resource market design and analysis

- Review and analysis of utility energy efficiency ("EE") program filings
- Electric system dispatch modeling
- Economic analysis of environmental and other regulations, including greenhouse gas regulation, in electricity markets
- Economic analysis, price forecasting, and asset valuation in electricity markets
- Quantification of the economic and environmental benefits of displaced emissions and market price impacts associated with energy efficiency and renewable energy
- Regulation and mitigation of greenhouse gas emissions from the supply and demand sides of the U.S. electricity sector

I have provided testimony or appeared before public utility commissions and/or legislative committees in Arizona, Florida, Illinois, Idaho, Iowa, Kansas, Louisiana, Maryland, Massachusetts, Minnesota, Mississippi, Missouri, North Carolina, New Hampshire, New Jersey, Nevada, Oregon, Pennsylvania, South Carolina, South Dakota, Utah, Vermont, Virginia, Washington, DC and Washington State, as well as at the federal level. I have provided expert representation for stakeholders at the PJM RTO, at the Midcontinent Independent System Operator, Inc. ("MISO"), and at the Federal Energy Regulatory Commission ("FERC").

Prior to joining Synapse, I was employed from 1998 through 2004 as a Senior Associate at Tabors Caramanis and Associates (TCA) of Cambridge, Massachusetts. In 2004, TCA was acquired by Charles River Associates (CRA), where I remained until I joined Synapse in 2005. At TCA/CRA, I performed a wide range of electricity market and economic analyses and price forecast modeling studies. These included asset valuation studies, market transition cost/benefit studies, market power analyses, and

litigation support. I have extensive experience with market simulation, production cost modeling, and resource planning methodologies and software.

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

A. Yes. I submitted prefiled written testimony on behalf of Rate Counsel in the recent energy efficiency program ("EE 2017") filing by Public Service Electric & Gas Company ("PSE&G") (BPU Docket No. EO17030196); in PSE&G's 2018 CEF-EE filing (BPU Docket No. GO18101112 & EO18101113); and in Rockland Electric's low income/energy efficiency filing (BPU Docket No. ER17080869). I have also participated in numerous Board-sponsored stakeholder processes on behalf of Rate Counsel, including the ongoing BPU Electric Vehicle Infrastructure Stakeholder Work Group, and I have supported Rate Counsel's review of several utility filings that were resolved through settlement prior to submittal of intervener testimony.

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

A. The purpose of my testimony is to address the proposal by Public Service Electric and Gas Company ("PSE&G" or "Company") to implement four programs to support Electric Vehicle ("EV") ownership and charging infrastructure in its service territory, along with five energy storage ("ES") subprograms, on a rate-regulated basis. In my testimony I review the Company's proposal in the context of recent clean energy legislation in New

Jersey,[1] relevant Board orders,[2] the 2019 Energy Master Plan ("EMP"), the EV straw proposal ("Straw Proposal") prepared by Board Staff,[3] and the Energy Storage study prepared by Rutgers University[4] pursuant to the Clean Energy Act ("CEA").[5] I also review whether PSE&G's programs can reasonably be deemed energy efficiency programs suitable for ratepayer funding under New Jersey law. I also address issues concerning equitable access and impact raised by the Company's proposal.

Q. What information have you reviewed in preparation of this testimony?

A. I have reviewed the Company's Petition, supporting testimony, workpapers, and discovery responses provided pursuant to questions propounded by Rate Counsel and other parties, as well as the direct testimony of Rate Counsel witnesses David E. Peterson and Dante Mugrace. I have also reviewed numerous publicly available industry reports, including reports provided with or referenced in the Company's petition and its discovery responses.

[1] "Clean Energy Act," P.L. 2018, c. 17, and the "Plug-In Electric Vehicles Act ("PIV Act")," P.L. 2019, c. 362, codified at N.J.S.A. 48:25-1 et seq.
[2] Among others, I/M/O Implementation of P.L. 2018, c. 17 Regarding the Establishment of Energy Efficiency and Peak Demand Reduction Programs, BPU Docket Nos. QO19010040, QO19060748 & QO17091044, Order Directing the Utilities to Establish EE and Peak Demand Reduction Programs, June 10, 2020 ("CEA Order").
[3] I/M/O Straw Proposal on Electric Vehicle Infrastructure Build Out, BPU Docket No. QO20050357, Straw Proposal, May 18, 2020 ("EV Straw Proposal"). Rate Counsel submitted comments on the Straw Proposal on June 17, 2020.
[4] Rutgers University, New Jersey Energy Storage Analysis ("ESA"), Final Report, May 23, 2019.
[5] P.L. 2018, c. 17; N.J.S.A. 48:3-87.

II. Summary of Conclusions and Recommendations

Q. What are your conclusions and recommendations to the Board regarding the Company's EV proposals?

A. While I am not an attorney, I do not believe that the proposals offered by PSE&G are supported by its statutory obligation to provide safe, adequate, and proper service[6] at just and reasonable rates,[7] and that there is no mandate or authority to implement the Company's EV proposals on a rate regulated basis. I find the proposals to be premature, as the Board has yet to issue a ruling on Staff's EV Straw Proposal or to establish guidelines for utility involvement in the Electric Vehicle ecosystem. I further find that the Company's proposals raise significant equity and free-ridership issues that have not been addressed by the Company. While there are elements of the Company's EV proposals that may be beneficial for New Jersey, I recommend that the Board not approve these offerings at this time.

Q. What are your conclusions and recommendations to the Board regarding the Company's ES proposals?

A. While I am not an attorney, I believe that the proposals offered by PSE&G are not supported by its statutory obligation to provide safe, adequate, and proper service at just and reasonable rates, and that there is no mandate or authority to implement the Company's ES proposals on a rate regulated basis. I further find that the Company's

[6] N.J.S.A. 48:2-23 and N.J.A.C. 14:3-3.1.
[7] N.J.S.A. 48:2-21.

proposals are speculative in nature, and not designed to resolve any actual reliability needs identified by the Company. Finally, I note that if there are actual reliability requirements for which energy storage represents the least-cost solution, the Company can implement that solution under its current regulatory authorization.

I find that the Company's Cost-Benefit analysis, provided in response to a data request, is not supported by testimony and is predicated on a speculative assessment of benefits that is inconsistent with other materials provided by the Company.

While there are elements of the Company's proposals that may be beneficial for New Jersey, I recommend that the Board not approve these offerings at this time.

III. Regulatory Framework for Electric Vehicles

Q. Please briefly describe the current regulatory framework for electric vehicles in New Jersey.

A. The regulatory framework for EVs has evolved rapidly in the last two years. The centerpiece is New Jersey's PIV Act, enacted in January 2020, which sets forth the State's goal of 300,000 light duty EVs registered in the state by the end of 2025, as well as a goal of 2 million registered light duty EVs by 2035, and that 85% of all light duty vehicles sold or leased in the state be EVs by the end of 2040.[8] The PIV Act further set numerical and locational standards for installation of public chargers in the state by 2025 and 2030, including goals for location and quantity of DC Fast Chargers ("DCFC") and

[8] N.J.S.A. 48:25-3(a)(1) through –(a)(3).

public Level 2 chargers,[9] and sets increasing goals over time for the percentage of multi-unit dwellings and overnight lodging facilities to host EV chargers.[10]

Of relevance here, the PIV Act sets forth a mechanism for EV purchase rebates and rebates for the installation of EV charging equipment. Specifically, Section 4 establishes an "EV Incentive Rebate Program" which "shall take the form of a one-time payment to the purchaser or lessee of an eligible vehicle."[11] Section 6 states that "[t]he Board of Public Utilities may establish and implement a program to provide incentives for the purchase and installation of in-home electric vehicle service equipment"[12] which "shall not exceed $500 per person."[13] Section 7 establishes a Plug-in Electric Vehicle Incentive Fund, to be administered by the Board and funded from the Societal Benefits Charge ("SBC") at a level of $30 million per anum.[14] Finally, the Board is given authority to develop additional incentives for EVSE, "in consultation with the department."[15]

Finally, the PIV Act gives the Board flexibility to "adopt policies and programs to accomplish the goals established pursuant to this section," subject to the PIV Act and

[9] N.J.S.A. 48:25-3(a)(4) through –(a)(5).
[10] N.J.S.A. 48:25-3(a)(6) through –(a)(7).
[11] N.J.S.A. 48:25-4.
[12] N.J.S.A. 48:25-6(a).
[13] N.J.S.A. 48:25-6(c)(2).
[14] N.J.S.A. 48:25-7.
[15] N.J.S.A. 48:25-6(d)(2).

"any other existing statutory authority."[16] As noted below, the Board is in the process of establishing its policies pursuant to this law.

Other New Jersey initiatives addressed EV policy and objectives as well, but do not set forth mechanism to promote EV ownership that have the force of law. In June 2019, Governor Murphy established the New Jersey "Partnership to Plug In" and established a goal of having no fewer than 300,000 registered Zero-Emissions Vehicles in the State by 2025. This partnership was memorialized in a Memorandum of Understanding among the New Jersey Department of Environmental Protection ("DEP"), the New Jersey Board of Public Utilities ("Board") and the New Jersey Economic Development Authority ("EDA").[17] In January 2020, the State released its updated Energy Master Plan ("EMP")[18] a policy document which includes a "strategy" to "Reduce Energy Consumption and Emissions from the Transportation Sector." This strategy included a number of sub-strategies to support the expansion of EV ownership, charging infrastructure, and clean transportation options, including to low-income communities, vehicle fleets, NJ TRANSIT, and medium- and heavy-duty vehicles.

The primary policy initiative identified in the EMP to encourage purchase of light-duty vehicles is cash rebates, consistent with the approach established in the PIV Act. The EMP also noted the need "to create a comprehensive 'EV Ecosystem' that

[16] N.J.S.A. 48:25-3(b).
[17] http://liberty.state.nj.us/governor/news/news/562019/approved/20190603b.shtml.
[18] State of New Jersey, "2019 New Jersey Energy Master Plan, Pathway to 2050," available at https://www.nj.gov/emp/docs/ (viewed 8/31/20).

provides consumers with easy access to charging infrastructure for EVs."[19] Among the policy directions identified in the EMP to promote increased charging infrastructure was a " 'shared responsibility' model for EV infrastructure that promotes appropriate roles for both the utility and for private investors."[20] The EMP also identified rate reform as an important part of the State's strategy, to address the risk that demand charges would make charging at low-utilization locations prohibitively expensive, "particularly in multi-family dwellings or at small-to-medium size commercial businesses."[21]

The PIV Act was enacted in January 2020, shortly after the final EMP was released. On May 18, 2020, Board Staff distributed a "Straw Proposal" for review and comment proposing how the Board would implement the PIV Act.[22] In this proposal, Staff elaborated on its interpretation of the concept of a " 'Shared Responsibility' business model for Ownership, Maintenance and Advertising of EV Infrastructure."[23] Staff's view of this model was that "EDCs invest in (and earn on) the wiring and backbone infrastructure necessary to enable a robust EV Ecosystem and the private sector owns, operates and advertises the EVSE." Staff recommended that EDC ownership of charging infrastructure be limited to a role as "party of last resort", investing in EVSE only where necessary when the private sector has failed to do so. The Straw Proposal

[19] EMP, page 64-65.
[20] EMP, page 66.
[21] *Id.*
[22] I/M/O Straw Proposal on Electric Vehicle Infrastructure Build Out, BPU Docket No. QO20050357, Straw Proposal, May 18, 2020 ("EV Straw Proposal"). Rate Counsel submitted comments on the Straw Proposal on June 17, 2020.
[23] Straw Proposal, page 7.

does not specify how such situations are to be identified, but it is clear that the private sector is to be given the first opportunity to meet public charging needs before a utility would step in.[24] The Straw Proposal specifically limited the role of utilities in owning or investing in EVSE beyond "charger-ready" infrastructure due, in part, to the risk of charging technology becoming obsolete:

> *…the portions of the EV Ecosystem that are likely to become obsolete the fastest are the EVSE. Staff expects that as technology changes and various standards come and fade away, there is significant risk associated with this rapid pace of technological change, particularly with respect to networking hardware and payment systems, and the software tied to this equipment. Further, EDCs have no particular expertise in siting, maintaining, marketing or operating EVSE, whereas EVSE Infrastructure Companies specialize in providing these services.*[25]

Q. Has Staff's Straw Proposal been accepted as policy guidance by the Board as of this writing?

A. No. The Board has not yet issued a ruling on the Straw Proposal, nor has it established specific rules or roles for utilities and other entities in building out the EV ecosystem in New Jersey. This process is ongoing.

[24] Straw Proposal V(A): "Staff proposes that charging station infrastructure, or EVSE, costs will be generally borne by private investors, with no recourse to ratepayer funds, except where the EDC acts as the party of last resort, where investment in EVSE is not occurring, or is not occurring in specific geographic areas."
[25] Straw Proposal, page 8.

Q. When did PSE&G file its EV program, relative to the events described above?

A. PSE&G filed its program in October 2018, predating all of the developments described above.

Q. Has PSE&G amended its petition in response to these developments since its initial filing?

A. No.

Q. What authority did PSE&G cite in its filing for utilities to offer electric vehicle and energy storage programs such as those the company has proposed on a rate regulated basis?

A. None. The Company's filing states only that "Recent legislative and executive action in New Jersey has demonstrated a general State policy in support of electric vehicles and energy storage projects."[26] The Company goes on to discuss the goals set forth in the CEA, the Governor's Executive Order 28 calling for a revised EMP, and the fact that New Jersey is "a partner" in the California zero emission vehicle program.[27]

[26] Petition, ¶ 6.
[27] Petition, ¶s 6-7.

Q. Is this unusual?

A. Yes. In general New Jersey utilities cite specific regulatory authority supporting the relief they request. For example, in the Company's recent CEF-EE filing,[28] the Company states:

> "Pursuant to Section 13 of P.L. 2007, c. 340…codified in part as N.J.S.A. 48:3-98.1(a)(1), an electric or gas public utility may, among other things, provide and invest in energy efficiency and conservation programs in its service territory on a regulated basis. An electric or gas public utility's investment in energy efficiency and conservation programs is eligible for rate treatment approved by the Board, including a return on equity, or other incentives or rate mechanisms. N.J.S.A. 48:3-98.1(b).[29]

Q. In your opinion, are PSE&G's proposed EV program offerings necessary and well-designed to meet the goals set forth above?

A. Only partly. PSE&G has proposed solutions to encourage off-peak charging, to address the demand charge obstacle identified in the EMP, and to make EVSE ownership and home-charging possible for residents of multi-unit buildings. Whether these mechanisms would be effective or not is an open question, as will be discussed below. There are other elements of PSE&G's EV proposals, also discussed below, that seem only tangentially related to the State's goals and that I do not believe would be effective in promoting

[28] In the Matter of the Petition of Public Service Electric and Gas Company for Approval of its Clean Energy Future-Energy Efficiency ("CEF-EE") Program on a Regulated Basis, BPU Docket Nos. GO18101112 and EO18101113 (hereinafter "CEF-EE Filing").
[29] CEF-EE Filing, ¶ 5.

additional EV ownership. In general, it does not appear that the Company's proposals are aligned with the State's goals, but certain of its proposed offerings contain reasonable steps that could help alleviate obstacles, and might provide valuable information that will support future program design.

Finally, I will say again that the State goals articulated above are just goals, and no specific role or guidelines for utilities to invest in EV infrastructure has been issued by the Board.

Q. If you believe that there are elements of PSE&G's offerings that could be beneficial to overcoming obstacles to EV development and provide valuable information, why are you recommending that the Board deny the Company's petition at this time?

A. A finding that an initiative could have public benefits, or that it is aligned with State policy in a general sense, does not mean that it is suitable for ratepayer funding through utility bills. Regulated electric utilities in New Jersey have a specific mandate to provide reliable electric service at reasonable cost in their monopoly service territories, and are granted the opportunity to earn a return on prudently-incurred costs of capital investment to do so. On rare occasions, the Legislature has determined that certain additional functions qualify for rate-regulated investments by New Jersey utilities, most notably by specifically authorizing energy efficiency investments on a rate-regulated basis.[30] In that case, the Board set forth specific regulations and Minimum Filing Requirements

[30] N.J.S.A. 48:3-98.1(a)(1).

("MFR"),[31] and has periodically reviewed utility petitions for program design and cost recovery accordingly. The Legislature set forth additional energy efficiency program requirements and cost recovery principles for utilities under the CEA, and the Board issued its implementation rules and MFRs for that law in the CEA Order.

No such special ratepayer-funded utility function has been carved out for the support of private EV ownership. While the Legislature set forth a goal of expanded EV infrastructure and ownership in New Jersey, and it authorized the Board to "adopt policies and programs to accomplish the goals established pursuant to this section,"[32] there is no specific provision authorizing ratepayer funded utility investments in this area. The Board is currently in the process of defining a role for utilities in supporting EV infrastructure in its consideration of Staff's EV Straw Proposal under Docket No. QO20050357. It would be premature for the Board to take the extraordinary step of granting ratepayer funding for the Company's proposals through this petition, not only in the absence of specific legislative authority, but before it even completes its own consideration of an appropriate role for utilities in this area.

Finally, it should be noted that utility ratepayers are already funding a large number of New Jersey's environmental priorities, including energy efficiency programs,

[31] Appendix A to the May 8, 2008 Board Order in I/M/O Electric Public Utilities and Gas Public Utilities Offering Energy Efficiency and Conservation Programs, Investing in Class I Renewable Energy Resources, and Offering Class I Renewable Energy Programs in their Respective Service Territories on a Regulated Basis Pursuant to N.J.S.A. 48:3-98.13, BPU Docket No. EO08030164.
[32] N.J.S.A. 48:25-3(b).

the Renewable Portfolio Standard ("RPS"),[33] the carbon emissions costs incorporated in the cost of electric energy under the Regional Greenhouse Gas Initiative ("RGGI"), the Zero Emissions Credits ("ZECs") supporting nuclear generation plants in New Jersey, the costs to support offshore-wind, and the various clean energy programs administered by the State. While many of these may be appropriately embedded in electric utility rates, it is a simple fact that it is a regressive way to fund state policy priorities, and these costs are particularly burdensome to lower-income ratepayers for whom utility bills are already a significant portion of their income. Electric utilities certainly have a role to play in ensuring reliable electric service is available to support the EV ecosystem. This does not mean it is appropriate for them to invest in EV charging equipment in homes and businesses at ratepayer expense.

IV. Proposed EV subprogram offerings

Q. What are the specific Electric Vehicle offerings proposed by PSE&G in its Petition in this matter?

A. Table 1 lists each of the proposed EV offerings, deployment goals, and budgets as reported on page 4 of the direct testimony of PSE&G witness, Karen Reif.

[33] The RPS requirement has been periodically increased. The current RPS is mandated by the New Jersey Clean Energy Act, N.J.S.A. 48:3-87(d), and its implementing Board Order, BPU Docket Nos. ER18040356 and EO18111250, Decision and Order (revised Dec. 28, 2018).

TABLE 1. PSE&G PROPOSED EV OFFERINGS, DEPLOYMENT LEVEL, AND BUDGET

Subprogram	Description	Target Number of Charging Stations	Investment Costs ($ million)
Residential Smart Charging	Incentives towards Level 2 networked EV Chargers at residences	37,000	$93
Level 2 Mixed-Use Charging	Deployment of electrical infrastructure and incentives for Level 2 chargers	2,200	$39
Public DC Fast Charging	Deployment of electrical infrastructure and incentives towards or ownership of DC Fast Chargers	450	$62
Vehicle Innovation	- Incentives for electric school buses and charging equipment; - Open solicitation for customized electrification projects	60	$45
Cross-Subprogram Investment	Investment that is common to all subprograms and includes investment in IT and education and outreach.		$22
	Total Investment ($ million)		***$261***

Q. Did PSE&G provide a cost-benefit analysis in support of its proposed EV subprograms?

A. No.

Q. Has PSE&G quantified the impact of its proposed EV subprograms on EV adoption rates in its service territory?

A. No. In Discovery Request RCR-POL-0001(a), Rate Counsel requested "all analyses prepared by or for the Company of the expected impact of each of PSE&G's Residential Smart Charging Subprograms on… Number of electric vehicles ("EVs") purchased and EV miles driven by PSE&G customers." The Company did not provide or identify any such analysis.

Q. Does the Company cite any environmental benefits to its residential charging program, other than to incentivize the purchase of home EV chargers?

A. Yes. The Company cites the environmental benefits associated with its program. Although the Company has provided no analysis to support its assertions, Ms. Reif claims that "[t]he increased EV adoption resulting from PSE&G's four EV subprograms would remove approximately 16 million net tons of CO_2 emissions through the period 2035."[34] However, as neither Ms. Reif nor any other witness quantifies how PSE&G's subprograms will contribute to increased adoption of EVs, these claims of environmental benefits cannot be verified.

Q. Should the Board accept this assertion?

A. I believe it is generally true that driving EVs in New Jersey produces less CO_2 than driving conventional automobiles, and if the State meets its ambitious EV goals, there would be a significant reduction in CO_2 emissions from the transportation sector. However, what has not been established or even projected is the benefit of PSE&G's specific proposals toward achieving those goals. As I discuss herein, I believe there would be a high level of free ridership associated with the Company's offerings, which means that much of the environmental benefit could not be attributed to the programs themselves. Further, as noted above, the Company's claim of environmental benefits was provided with no supporting analysis, so I would recommend that the Board assign it no weight.

[34] Reif Direct, page 5 at 2-4.

Q. Do you have any other general concerns about the Company's proposed EV charging subprograms?

A. Yes. In general, I am concerned about a "reverse Robin Hood" effect wherein all of PSE&G's ratepayers, other than Universal Service Fund participants, would be required to subsidize a small subset of higher-income customers who can afford a luxury EV.

Q. Does the Company acknowledge that its EV programs will mostly serve high-income customers?

A. Not really, The Company claims that:

> [t]he EV subprograms will support the widespread adoption of EVs in all sectors of the economy, including multi-family and low-income customers, as well as customers residing in communities most impacted by air pollutants and GHGs. The subprograms will utilize multiple approaches to engage customers and encourage customer participation. These approaches include collaboration with advocacy and community groups, online advertising, e-mail marketing, and direct mailings, amongst other methods.[35]

[35] Petition, ¶ 12.

Q. Does this address your concern regarding whether the Company's proposed Residential Smart Charging subprogram will primarily benefit higher-income customers?

A. No. In my opinion, the inability of low- and moderate-income customers to afford a new, luxury vehicle is not a function of inadequate marketing communications – it is a matter of ability to pay.

V. Comments on specific proposed EV subprograms

Q. Please briefly describe the Company's proposed Residential Smart Charging subprogram.

A. According to Ms. Reif, the proposed Residential Smart Charging subprogram is intended to "promote installation of Level 2 networked EV Chargers at residences in the PSE&G territory, and provide customer incentives to encourage charging during off-peak periods,"[36] specifically for "residential customers in the PSE&G territory that live in single-family residences or multi-unit dwellings of four units or less."[37] PSE&G proposes to pay for both a charger and installation thereof, with a cap of $2000 per installation. In addition, PSE&G would upgrade utility service to the home, if necessary, to support the additional load. Although paid for by ratepayers, the EV-driving customer would own, operate, and maintain the EV charger.[38] In addition, the Company proposes to offer an

[36] Reif Direct, page 12 at 8-10.
[37] Reif Direct, page 12 at 14-16.
[38] Reif Direct, page 13 at 3-14. The Company reserves the right "to adjust the cap in response to market trends on notice to Board Staff and Division of Rate Counsel."

off-bill "rebate in the amount of two cents per kWh for each kWh of EV charging that occurs during off-peak periods."[39] Finally, the Company proposes to initiate a voluntary, vehicle-based data collection program, with unspecified financial rewards for participation to "provide PSE&G with valuable vehicle data that is not available from home charging stations, such as miles traveled and frequency, duration and location of charging sessions that take place outside of the home vehicle location."[40]

Q. In your view, is this proposed subprogram well-suited to address the barriers to EV adoption in New Jersey?

A. No. For example, I do not believe that the cost of a home charger, generally between $400 and $1000,[41] is a primary barrier for most New Jerseyans who can otherwise afford electric vehicles – nor has the Company provided any evidence that it is.[42] I believe that the number one obstacle for most consumers today is the cost of the electric vehicle itself, which ranges from $37,000 to over $100,000, and is substantially higher when compared to the cost of a comparable car with an internal combustion engine. Consistent with the

[39] Reif Direct, page 13 at 15-16. The Company also reserves the right "to adjust these rebates in response to customer behavior, on notice to Board Staff and Division of Rate Counsel."
[40] Reif Direct, page 13 at 20 to page 14 at 7.
[41] For example, the ChargePoint Home Flex Level 2 charger retails for $699. https://www.chargepoint.com/drivers/home/chargepoint-home-flex/.
[42] In Discovery Request RCR-POL-0001(a), Rate Counsel requested "all analyses prepared by or for the Company of the expected impact of each of PSE&G's Residential Smart Charging Subprograms on… Number of electric vehicles ("EVs") purchased and EV miles driven by PSE&G customers." The Company did not provide or identify any such analysis.

PIV Act, the BPU has attempted to address this issue by offering vehicle rebates of up to $5000 per vehicle (scaled based on miles of range on a single charge.)[43]

Q. What are the implications of this observation?

A. There is a significant and growing market for EVs in New Jersey today, with or without utility incentives to support installation of home chargers.[44] This market is largely higher-income consumers who can afford to be early adopters of this technology, and who can afford to purchase or lease new luxury vehicles.[45] This demand exists even given limitations to the current charging ecosystem. If these owners and potential owners were to participate in the Company's residential rebate programs, they would be classic "free riders" – that is, they would get the benefit of ratepayer-subsidized incentives for behavior that they would have done anyway, yielding no net societal benefit.

Q. In your opinion, is providing customers with free at-home EV chargers, plus free installation (subject to a cap) and free utility service upgrades consistent with the EV ecosystem role set forth for a New Jersey utility such as PSE&G in the PIV Act and/or the EV Straw Proposal?

A. No. I do not believe the PIV Act or Board Staff's Straw Proposal supports this role for utilities under the "shared responsibility" model. This is not consistent with the "wiring

[43] The budget for EV rebates was reduced in the third revised budget for Fiscal Year 2020 (extended to September 30, 2020) from $30,000,000 to $14,000,000 to support extensions of other NJCEP programs.
[44] "Projections of Electric Vehicle Adoption in New Jersey", prepared for ChargEVC by Gabel Associates, Inc. Available at http://www.chargevc.org/wp-content/uploads/2019/09/ChargEVC-Updated-PEV-Projection-Sept-18-2019.pdf, pages 11-12.
[45] *Ibid.*, pages 13-14.

and backbone infrastructure" role set out by Staff. Further, I believe this would be subject to a high level of free ridership, as customers who would have purchased EVs in any case would now get utility service upgrades, chargers, and installations with the cost socialized to all ratepayers – including the many ratepayers who cannot possibly afford a new luxury vehicle.

Q. Regarding the off-peak rebate element of the proposed Residential Smart Charging subprogram, is providing customers with an off-bill rebate of two cents per kWh for off-peak charging an appropriate role for a New Jersey utility such as PSE&G?

A. Innovative rate design that encourages off-peak charging is a reasonable role for New Jersey utilities, and "rate reform" is identified in the EMP as an important strategy for expanding EV ownership and promoting the affordability of charging. If this aspect of the EV Straw Proposal is authorized by the Board under Docket No. QO20050357, this kind of rate incentive may be an appropriate utility role.

However, I do not think the Company's proposal is well-conceived or likely to be effective. The very largest EV batteries available today have an energy capacity of under 90 kWh, and a typical charge is much smaller than that because the battery will very rarely be fully discharged. At the same time, many EV drivers often charge at no marginal cost to themselves at their workplace or through a charging network program. It seems unlikely that a rebate of a few dollars a month, at most, will weigh strongly against convenience to customers who are able to purchase luxury vehicles. Thus, the effectiveness of this rebate toward getting customers to charge off-peak is questionable.

Q. Has PSE&G explained why it believes two cents per kWh is an appropriate rebate amount to encourage off-peak charging?

A. In response to discovery, the Company identified this amount as "based on the difference between PSE&G's standard residential service distribution rate and off-peak distribution time-of-use rate."[46] In other words, the rebate level is based on the Company's existing rate structure, and is not derived from any research or data on effective incentives for off-peak EV charging; nor is the rebate based on any analysis of the cost of providing electric service for EV charging.

Q. Please briefly describe the Company's proposed Level 2 Mixed-Use Charging subprogram.

A. Under this proposed subprogram, PSE&G would "deploy the Make-Ready Infrastructure and will also provide rebates, tiered by customer type, towards the upfront cost of the Level 2 charging equipment and installation."[47] This proposed subprogram is targeted at a variety of customers that would not be eligible for the residential charging program, such as larger multi-family buildings, workplaces, fleet operators, municipalities, and overnight lodgings.[48] The specific rebate level would be tiered based on the type of entity to receive the rebate with the highest level (initially 80%) available for multi-family buildings and the lowest level (initially 20%) available for private entities. Finally, PSE&G proposes to give participants the option of paying back their share of the costs of

[46] PSE&G response to Staff Discovery Request S-PSEG-REV-0011.
[47] Reif Direct, page 15 at 8-10.
[48] Reif Direct, page 16 at 20 to page 17 at 2.

the Level 2 charging equipment and installation through two-year, interest-free loans with on-bill repayment.[49]

Q. Would chargers installed under this subprogram be available for use by the public?

A. My understanding is that the program is generally geared toward private entities that desire Level 2 charging for their own employees, patrons, or other purposes. However, it is possible that the customer would be an Electric Vehicle Service Provider ("EVSP") or an establishment such as an inn that provides charging as a service to its customers.

Q. In your view, is this proposed subprogram well-suited to address the barriers to EV adoption in New Jersey, and consistent with the EV regulatory environment in the State?

A. Some elements of this subprogram are geared toward making ownership of EV charging equipment more accessible and affordable to low- and moderate-income families, who are more likely to reside in multi-family units, for example by reducing the up-front costs through rebates and zero-interest loans for the customers' share of the cost. I believe these elements are consistent with the goal in the EMP to increase clean transportation options for low- and moderate-income residents, and with the goal established in the PIV Act for an increasing share of multi-unit dwellings to host EV chargers.[50] However, while it may be an appropriate utility role to provide "make-ready" infrastructure for private entities for their own use or commercial purposes, I do not believe that providing rebates

[49] Reif Direct, page 18 at 5-15.
[50] N.J.S.A. 48:25-3.

for charger and installation costs to these customers is consistent with a utility's function or with any mandate under the PIV Act.

Q. Please briefly describe the Company's proposed Public DC Fast Charging subprogram.

A. As described by Ms. Reif, PSE&G proposes to offer a DC Fast Charging ("DCFC") subprogram under which the Company will "deploy Make-Ready electrical infrastructure and either own or provide financial incentives towards the upfront cost of DC Fast Charging equipment. PSE&G will also provide financial incentives to defray electricity costs."[51] Specifically, PSE&G proposes to provide rebates for 80% of the charger and installation cost for "public entities", and 40% for "non-public entities."[52] PSE&G proposes to give participants the option of paying back their share of the costs through two-year, interest-free loans with on-bill repayment.[53] PSE&G would implement the utility ownership model "if the competitive market is unable to support the DC Fast Charging station development using the Third-Party Ownership Model."[54]

Q. Would all chargers deployed under this subprogram be available to the public?

A. Yes.

[51] Reif Direct, page 19 at 3-5.
[52] Reif Direct, page 21 at 9-13. In response to discovery request EVgo-PSEG-0001, the Company defines "public entities" as local government units, and "non-public entities" as "commercial entities that will provide unrestricted public access to the charging stations, such as retail stores and malls with large parking lots."
[53] Reif Direct, page 21 at 14-15.
[54] Reif Direct, page 19 at 11-12.

Q. In your view, is this proposal consistent with Staff's proposal for a "shared responsibility model" for EV infrastructure development in the State?

A. No. Under the "shared responsibility model" put forward by Staff in the Straw Proposal, EDCs would "invest in, and earn on, the wiring and backbone infrastructure necessary to make locations Charger Ready as well as on any Board-approved EVSE owned by the EDCs."[55] There is no support in the Straw Proposal, or in any New Jersey law or rule that I am aware of, for utility rebates to defray the upfront costs of commercial DCFC equipment. To the contrary, Staff proposed "that charging station infrastructure, or EVSE, costs will be generally borne by private investors, with no recourse to ratepayer funds, except where the EDC acts as the party of last resort, where investment in EVSE is not occurring, or is not occurring in specific geographic areas."[56] Under the Straw Proposal, this last case may support PSE&G's "utility ownership" model in certain very limited cases, but only *after* the market fails to produce a competitive supplier in a location identified as important for establishing adequate geographical coverage.

Q. Please briefly describe the Company's proposed Vehicle Innovation subprogram.

A. Under this subprogram, PSE&G proposes to spend $33 Million for "grants to public school districts to cover the cost of purchasing electric school buses, as well as deployment of the Make-Ready infrastructure and financial incentives towards charging

[55] EV Straw Proposal, page 2.
[56] EV Straw Proposal, page 7.

equipment."[57] This offering would support 102 grants of $300,000 per bus. For efficiency of resources, PSE&G would "encourage participation from school districts with needs for more than one bus."[58] Further, the Company proposes to "target school districts across the socioeconomic spectrum, including urban districts, to ensure the benefits of the program extend to low-income school children."[59]

The Company also proposes to spend $2 million per year to support "innovative, customized projects that will be gathered from respondents during an open solicitation process.[60]

Q. With regard to the school bus subprogram, is PSE&G proposing to cover the full cost of electric school buses and charging infrastructure?

A. Essentially, yes. Citing an Electric School Bus Report prepared by consultant VEIC for PSE&G, Ms. Reif states that "…[c]urrently, electric school buses are estimated to cost between $300,000 and $325,000, making them two to three times more expensive than conventional diesel buses."[61]

Q. Is funding electric school buses an appropriate use of ratepayer funds in New Jersey?

A. No. As Rate Counsel noted in its comments on the Straw Proposal:

[57] Reif Direct, page 27 at 12-14.
[58] *Id.* at 16-18.
[59] *Id.* at 18-20.
[60] *Id.*, page 27 at 21 to page 28 at 1.
[61] *Id.*, page 32 at 14-15.

> New Jersey public utility law has developed safeguards for the respective property rights and obligations of ratepayers and public utility companies. An EDC may recover only the fair value of prudent investments in utility property that is used and useful in providing public utility service. Public utility service must be safe, adequate and proper. Utility rates must be "just and reasonable." A related principle is that costs should be allocated to the party who causes the utility to incur them, i.e., the "cost causation" principle. In other words, a party that wants and will benefit from a public utility investment or service should pay for it… The provision of electric transportation equipment is not a public utility function… An EDC certainly may not use ratepayer funds to purchase an electric school bus and donate it to a school district or their transportation contractor, nor donate to the school or contractor the incremental cost of an electric school bus. Such equipment would not be used and useful in providing public utility service. The same principles prohibit using ratepayer funds to purchase electrically powered motor vehicles or other equipment to be owned and used by a port authority, transportation agency or other entity.[62]

I do not question the significant health benefits of reducing particulate pollution that harms low-income children in New Jersey. However, the question before the Board is whether this is an appropriate use of ratepayer funds, consistent with the standards of public utility ratemaking. I reassert that it is not.

[62] Rate Counsel Comments on EV Straw Proposal, June 17, 2020, pages 7-8.

VI. Cost Recovery and Rate Design

Q. How does PSE&G propose to recover the costs of its proposed EV subprograms?

A. PSE&G's proposal for cost recovery is discussed in detail in the testimony of Rate Counsel witness, Dante Mugrace. The rate design proposals and implications of the Company's EV subprograms are discussed in detail by Rate Counsel witness, David E. Peterson. Briefly, PSE&G proposes to create an EV component of a new Technology Innovation Charge ("TIC") to the Company's tariff, to be called the Clean Energy Future-Electric Vehicle Component ("CEF-EVC") that is "proposed to be applicable to all electric rate schedules on an equal cents per kilowatt-hour basis in the same manner as currently utilized for all electric components" of the Company's Green Program Recovery Charge, or "GPRC".[63]

Q. Does this raise concerns for you?

A. Yes. I raised earlier my general concern that funding EV infrastructure, beyond that required for the provision of reliable electric service, is beyond the scope of an electric utility's franchise in New Jersey. Even if the costs of EV infrastructure were to be incurred by a utility and recovered in rates, these costs should be borne by EV drivers, and not socialized to other ratepayers who do not own, and cannot afford, these premium products. As Rate Counsel noted in its comments on the Straw Proposal, "Requiring ratepayers as a whole, many of whom may never be able to afford these luxury vehicles,

[63] Direct testimony of Stephen Swetz, page 11 at 17 to page 12 at 5.

to subsidize those who can afford them, is wholly inequitable, and is not made up for by the fact that there may be system benefits several decades from now."[64]

The greatest benefit from EV ownership and operation accrues to the EV owner through reduced fuel cost and operating expense. Because today's EVs (and those for the foreseeable future) are luxury vehicles, these benefits are likely to be overwhelmingly captured by the higher-income customers who can afford such cars. It is hard to fathom why the costs of the utility's offerings should be socialized to *all* customers in a class, including low- and moderate-income customers whose disposable income level prohibits early-adoption of such vehicles, when the benefits will overwhelmingly accrue to higher-income customers.

Q. Are the Company's proposed EV subprogram offerings "energy efficiency" programs, in the sense envisioned in the New Jersey Law?

A. I am not an attorney, but a plain reading of the N.J.S.A. 48:3-98.1(d) suggests that they are not. The definition of "Energy efficiency and conservation program" is given therein as:

> …any regulated program, including customer and community education and outreach, approved by the board pursuant to this section for the purpose of conserving energy or making the use of electricity or natural gas more efficient by New Jersey consumers, whether residential, commercial, industrial, or governmental agencies.

[64] Rate Counsel Comments on Straw Proposal, June 17, 2020, page 3.

The Company's proposals certainly do not make the use of electricity or natural gas more efficient by New Jersey consumers; in fact, if anything they would lead to the purchase and consumption of *more* electricity by the Company's customers.[65] In this sense, the proposed programs may be viewed more as a market development initiative for PSE&G, clearly an inappropriate use of ratepayer funds, than as an energy efficiency program.

In addition, in contrast to all Board-approved energy efficiency programs that I am aware of, there is no requirement that the customer selects a more efficient device (in this case an energy-efficient EV or EV charger) from among those on the market to qualify for an incentive – merely that it be capable of charging an electric car.

Q. What are the implications of the anticipated increase in kWh sales attributable to the EV programs?

A. All else being equal, the increased adoption of EVs will lead to increases in kWh sales which will undoubtedly lead to greater utility revenues and, in turn, greater profits for utility shareholders. In that sense. PSE&G's proposed EV programs may be viewed as market development activities. In a competitive market, the cost of market development activities is typically absorbed by shareholders in anticipation of future profits. In contrast, PSE&G seeks to recover the cost of this program from its customers.

[65] The EMP estimates that fully electrifying the transportation and building industries in New Jersey will increase the use of electricity by as much as 2.3 times by 2050. EMP, p.176.

VII. Regulatory Framework for Electric Storage

Q. Turning now to the energy storage subprograms proposed by PSE&G in this matter, please briefly describe the current regulatory framework for electric storage investments in New Jersey.

A. The Clean Energy Act 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 in the State."[66]

The CEA further mandated that "No later than six months after completion of the report, the Board shall initiate a proceeding to establish a process and mechanism for achieving the goal of 600 megawatts of energy storage by 2021 and 2,000 megawatts of energy storage by 2030."[67]

The energy storage analysis ("ESA") was completed by Rutgers University in May 2019[68] and concluded as follows:

> This technical analysis of ES shows that it can play an important role in New Jersey's sustainable energy transition. New opportunities are arising

[66] N.J.S.A. 48:3-87.8(1)(c).
[67] N.J.S.A. 48:3-87.8(1)(d).
[68] 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.

> 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.[69]

To my understanding, the Board has not yet initiated the proceeding mandated under N.J.S.A. 48:3-87.8(1) (d).

The 2019 Energy Master Plan reiterated the quantitative goals from the CEA with a particular emphasis on the need for storage for renewable energy integration

[69] ESA, page 177.

applications.[70] The EMP further noted that "Energy storage can provide numerous services to New Jersey's energy system, such as load balancing, frequency regulation, and resiliency services. In particular, storage is one of the few resources that can provide diurnal balancing as the state increases the amount of renewable energy on the grid."[71] With respect to battery storage in particular (the focus of PSE&G's ES offerings in this matter) the EMP states, "wholesale market revenues alone are insufficient to make battery storage a reality, and New Jersey does not currently have a means of pricing the benefits that batteries can provide at the distribution level. New Jersey is committed to adopting changes in regulatory policy that recognize the full wholesale and distribution value of batteries."[72]

Thus New Jersey policymakers have expressed a goal for rapid deployment of additional energy storage, but do not yet have a clear policy or mechanisms in place for incentivizing and compensating such investments.

Q. Has the Board adopted changes in regulatory policy as envisaged in the Clean Energy Act and the EMP to "recognize the full wholesale and distribution value of batteries?"

A. Not as of this writing.

[70] EMP, page 127, Goal 2.3.6.
[71] *Id.*
[72] *Ibid.*, page 128.

Q. Does PSE&G need Board approval in this docket to implement cost-effective distribution system solutions using battery storage?

A. In my view, it does not. PSE&G has an obligation to provide low-cost, reliable service to its customers using whatever technology it deems most appropriate, subject to prudency review in a rate case by the Board. For example, if distribution system expansion can be avoided at a cost savings using energy storage for a few peak hours, the Company has an obligation to do so – it does not need special pre-approval from the Board in a generic energy storage docket. What the Company does not have authority to do is to engage in *non*-cost-effective pilot programs for research and development purposes at ratepayer expense.

VIII. Proposed ES Program Offerings

Q. What are the specific Energy Storage offerings proposed by PSE&G in its petition in this matter?

A. Table 2 lists each of the proposed ES offerings, deployment goals, and budgets as reported on page 5 of the direct testimony of PSE&G witness Jorge L. Cardenas.

TABLE 2. PSE&G PROPOSED ES OFFERINGS, DEPLOYMENT LEVEL, AND BUDGET

Subprogram	Description	Installations	Storage MW	Program Cost ($ million)
Solar Smoothing	ESS used to smooth short-term changes in voltage due to intermittent generation	5	10	$ 13.1
Distribution Deferral	ESSs that resolve forecasted overloads on the system	7	13	$ 38.6
Outage Management	Deploy fleet of mobile ESSs for contingency resources during substation construction	6	6	$ 20.0
Microgrids for Critical Facilities	Provide capital to support the development of microgrids	1 to 4	2	$ 25.7
Peak Reduction for Public Sector Facilities	ESSs sited at public sector facilities and deployed to reduce peak demand	4	4	$ 11.9
	Total	***23-26***	***35***	***$ 109.4***

Q. Did PSE&G provide a cost-benefit analysis in support of its proposed ES programs?

A. The Company did not provide a cost-benefit analysis ("CBA") with its filing; it did provide a CBA workbook in response to discovery.[73] However, this analysis and its underlying assumptions were not supported by testimony. In addition, the benefits enumerated in the CBA are inconsistent with those provided in other discovery responses.[74]

[73] Provided in response to Rate Counsel Data Request RCR-POL-0014.
[74] Specifically, responses to Rate Counsel Discovery Request RCR-POL-13 and RCR-POL-19. In response to Discovery Request RCR-POL-INF-0008(b), the Company explained that "[t]he 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."

Q. Please briefly describe the Company's proposed "Solar Smoothing" subprogram.

A. Under this proposed subprogram, battery storage technology would be installed along circuits impacted by a large amount of solar photovoltaic generation to help mitigate power quality issues such as voltage fluctuations associated with variable solar energy output.[75] The Company claims that these systems would also "allow PSE&G to gain further knowledge of the operation and integration of the combination of renewables and storage, and provide infrastructure that enables growth in renewable energy development."[76] Finally, Mr. Cardenas states that "[t]he ESSs may also participate in the PJM frequency regulation markets or offer their energy into the wholesale energy markets when favorable to help offset the overall cost of the program."[77] PSE&G proposes to implement five such projects over the 5-year program period, with a total storage capacity of 10 MW and a total budget of $13.1 million.

Q. What is your recommendation to the Board regarding this proposed subprogram?

A. I recommend that the Board reject this proposed subprogram. The Company has not identified a specific need for this subprogram for purposes of providing reliable electricity service at a reasonable cost, beyond a general indication that such technology may be needed at some point in the future for power quality reasons. The Board has no basis to judge whether this approach is a prudent, least-cost use of ratepayer funds in furtherance of the utility's franchise responsibility. Further, the Board has not established

[75] Cardenas Direct, page 6 at 8-12.
[76] *Id.*, page 6 at 20-22.
[77] *Id.*, page 6 at 22 to page 7 at 2.

standards or policies for utility investment in energy storage technology that would justify or support a speculative application such as this.

Q. Please briefly describe the Company's proposed Distribution Deferral subprogram.

A. Under this proposed subprogram, PSE&G proposes to use battery storage as a "non-wires solution" to defer more costly solutions to potential overload situations on its 13 kV and 4 kV distribution systems. The Company states that these solutions "help supplement the operating capacity of the substation transformer (which typically acts as the limiting factor on the system), thereby ensuring that demand can be met during peak periods during the deferral period."[78] The Company projects installation of a total of 13 MW of storage in 1 MW to 3 MW increments over five years, with a total cost of $38.6 million.[79]

Q. What is your recommendation to the Board regarding this proposed subprogram?

A. I recommend that the Board reject this proposed subprogram. The Company has not identified a specific need for this subprogram for purposes of providing reliable electricity service at a reasonable cost, beyond a general indication that such technology may be useful in the future to defer distribution enhancements. The Board has no way to judge whether this approach is a prudent, least-cost use of ratepayer funds in furtherance of the utility's franchise responsibility. Further, the Board has not established standards or policies for utility investment in energy storage technology that would justify or support such a speculative application.

[78] *Id.*, page 11 at 1-9.
[79] *Id.*, page 12 at 11 to page 13 at 8.

Q. Please briefly describe the Company's proposed Outage Management subprogram.

A. Under this proposed subprogram, the Company would acquire and deploy a total of six mobile battery storage systems to reduce the number of mobile transformers and/or temporary substations necessary to maintain reliability during planned and unplanned outages of its existing substations.[80] Mr. Cardenas states that "the ESSs may also be mobilized to address outage management conditions ranging from emergency response, to equipment failure, to temporary load relief" and that, when not being used for their primary purpose, "[t]he ESSs also have the capability to participate in the PJM frequency regulation market or offer their capacity into the energy markets."[81]

Mr. Cardenas acknowledges that the savings associated with this primary outage management function for the proposed storage systems would be slight;[82] however, according to Mr. Cardenas, "[t]he core benefit to utilizing storage, however, would be an ability to use the mobile ESSs for many of the other purposes described in this filing when not needed for those contingency situations."[83] PSE&G proposes to acquire six mobile energy storage systems under this subprogram over the five-year program period, each with a storage capacity of 4 MW and a power output of 1 MW, at a total cost of $20 million.[84]

[80] *Id.*, page 13 at 9 to page 17 at 11.
[81] *Id.*, page 14 at 19 to page 15 at 1.
[82] *Id.*, page 16 at 9-11.
[83] *Id.*, page 16 at 11-13.
[84] *Id.*, page 17 at 1-11.

Q. What is your recommendation to the Board regarding this proposed subprogram?

A. I recommend that the Board reject this proposed subprogram. The Company has not identified a specific need for this subprogram for purposes of providing reliable electricity service at a reasonable cost, beyond a general indication that such technology may be a useful approach to reducing the need for mobile transformers and temporary substations for future outage management purposes, nor has it even suggested that it is a lower-cost approach for its primary purpose. The Board has no way to judge whether this approach is a prudent, least-cost use of ratepayer funds in furtherance of the utility's franchise responsibility. Further, the Board has not established standards or policies for utility investment in energy storage technology that would justify or support such a speculative application.

Q. Please briefly describe the Company's proposed Microgrids for Critical Facilities subprogram.

A. Under this proposed subprogram, the Company "intends to develop, install, and operate microgrids with energy storage that can enable critical facilities within a community to maintain a reliable supply of electricity during an unplanned outage."[85] Mr. Cardenas states that microgrids, which he claims "may be a part of the next-generation energy grid,"[86] "supply critical facilities with on-site or networked generation resources, are a means for communities to provide electricity for essential services and shelter during an

[85] *Id.*, page 17 at 13-15.
[86] *Id.*, page 18 at 7.

extended outage or emergency."[87] Although the Company has not yet identified the project configuration it would implement, it based its projection on investment in four microgrid projects, each with a 4 MWh battery system (0.5 MW output capacity) paired with a 1 MW solar array, for a total cost of $25.7 million.[88] The solar generation was included because, according to Mr. Cardenas, "it was anticipated that many municipalities would prefer their microgrid be partially supplied from a renewable resource."[89]

Q. What is your recommendation to the Board regarding this proposed subprogram?

A. I recommend that the Board reject this proposed subprogram. This application represents additional investment at certain customers' facilities to obtain extremely high levels of power quality that are not available to all ratepayers, and thus should not be funded by all ratepayers. While this may be an appropriate use of energy storage to enhance reliability at critical facilities, these services can be provided by the marketplace and are not an appropriate role for a New Jersey utility.

Q. Please briefly describe the Company's proposed Peak Reduction for Public Sector Facilities subprogram.

A. Under this proposed subprogram, "PSE&G proposes to locate ESSs at public sector facilities to both help provide energy cost management services for the customer, and to

[87] *Id.* at 3-5.
[88] *Id.*, page 18 at 10-21.
[89] *Id.*, page 18 at 19-20.

potentially defer traditional distribution upgrades."[90] According to Mr. Cardenas, this would bring "one of the fastest growing segments of the storage market" to public sector facilities; it would also benefit the utility and its ratepayers by reducing peak load, potentially facilitating distribution deferral in locations where there are no available sites for utility-owned storage.[91] PSE&G proposes to implement four such systems over the five-year program period, each with a storage capacity of 4 MW and a power output of 1 MW, at a total cost of $11.9 million.[92]

Q. What is your recommendation to the Board regarding this proposed subprogram?

A. I recommend that the Board reject this proposed subprogram. As Mr. Cardenas acknowledges, this is a growing, cost effective use of storage that is actively being served by the private market.[93] Further, the Company has not identified a specific need for this subprogram for purposes of providing reliable electricity service at a reasonable cost, beyond the general idea that reducing peak loads at public sector facilities could, hypothetically, provide distribution deferral benefits to the utility and its ratepayers. The Board has no way to judge whether this approach is a prudent, least-cost use of ratepayer funds in furtherance of the utility's franchise responsibility. Further, the Board has not established standards or policies for utility investment in storage technology that would justify or support such a speculative application.

[90] *Id.*, page 19 at 8-10.
[91] *Id.*, page 19 at 7 to page 20 at 21.
[92] *Id.*, page 21 at 1-12.
[93] *Id.*, page 19 at 13-14.

Q. Do you have any final comments on the Company's proposed ES programs?

A. Yes. I want to be clear that I believe energy storage may well be an invaluable part of a clean energy future, and the applications the Company has identified may well provide benefits to New Jersey. However, as noted above with respect to the Company's EV proposals, a finding that an initiative could have public benefits, or that it is aligned with State policy in a general sense, does not mean that it is suitable for ratepayer funding through utility bills. Regulated electric utilities in New Jersey have a specific mandate to provide reliable electric service at reasonable cost in their monopoly service territories, and are granted an opportunity to earn a return on prudently-incurred costs of capital investment to do so. Unless the Legislature has determined that certain additional functions qualify for rate-regulated investments by New Jersey utilities, as in the case of certain Board-approved energy efficiency investments, it is not appropriate or reasonable for the utility to go beyond its statutory obligation on a rate regulated basis as the Company has proposed.

Unless tied to a specific reliability need, there is no legislative or regulatory provision for a utility to invest in energy storage technology that "may" solve certain operational or reliability purposes in the future. If the investment is tied to a specific need, there is no requirement for special regulatory authorization such as the Company is seeking in this matter. If an investment is prudent and in the service of providing reliable, least-cost service, the utility can and should make that investment in the normal course of its operations.

IX. Recommendations

Q. What are your recommendations for the Board regarding PSE&G's proposed EV subprogram offerings?

A. I believe that the proposals offered by PSE&G are not consistent with its obligation to provide reliable electric service at the lowest reasonable cost, and that there is no provision in the PIV Act or any Board Order that supports the Company's EV proposals. I find the EV proposals to be premature as the Board has yet to issue a ruling on Staff's Straw Proposal or to establish guidelines for utility involvement in the Electric Vehicle ecosystem. I further find that the Company's proposals raise significant equity and free-ridership issues that have not been addressed by the Company. While there are elements of the Company's proposals that may be beneficial for New Jersey, I recommend that the Board not approve these offerings at this time.

Q. What are your recommendations for the Board regarding PSE&G's proposed ES subprogram offerings?

A. I believe that the ES proposals offered by PSE&G are not supported by its statutory obligation to provide reliable electric service at the lowest reasonable cost, and that there is no mandate or authority for the Company's proposals. I further find that the Company's ES proposals are speculative in nature, and not designed to resolve any actual reliability needs identified by the Company. Finally, I find that if there are actual reliability requirements for which energy storage represents the least-cost solution, the Company can implement that solution under its current regulatory authorization.

While there are elements of the Company's ES proposals that may be beneficial for New Jersey, I recommend that the Board not approve these offerings at this time as premature.

Q. Does this conclude your testimony?

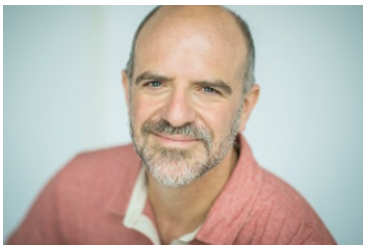
A. Yes, it does at this time. Rate Counsel reserves its right to present supplemental testimony based on any updated and/or new information.

Attached Exhibit

Exhibit EDH-1 Resume of Ezra D. Hausman, Ph.D.

Ezra D. Hausman, Ph.D.

Curriculum Vitae



I am an independent consultant in energy and environmental economics.

I have worked for over two decades as an energy market expert with a focus on market design and market restructuring, planning and ratemaking, energy efficiency programs, environmental regulation, and pricing of energy, capacity, transmission, losses and other electricity-related services. I have performed market analysis, provided expert testimony, led workshops and working groups, and provided other support in both regulated and restructured electricity markets for clients including federal and state agencies, offices of consumer advocate, legislative bodies, cities and towns, non-governmental organizations, foundations, industry associations, and resource developers.

I hold a Ph.D. in atmospheric science from Harvard University, an S.M. in applied physics from Harvard University, an M.S. in water resource engineering from Tufts University, and a B.A. in psychology from Wesleyan University.

PROFESSIONAL EXPERIENCE

Ezra Hausman Consulting, Newton, MA. President, March 2014 – Present.
I provide research, analysis, expert testimony, and policy support services in regulatory, litigation, and stakeholder processes covering a wide range of electric sector and electriciuty market issues. The focus of my consulting work includes:

- Ratemaking and regulatory proceedings
- Wholesale market design and analysis for electricity, generating capacity, and related services
- Demand-side management/energy efficiency program design and cost/benefit analysis
- Utility role in developing electric vehicles infrastructure
- Interaction of air quality and environmental regulations with electricity markets
- Analysis and implementation of greenhouse gas rules
- Clean Air Act enforcement support
- Long-term electric power system planning
- Consumer and environmental protection
- Market power and market concentration analysis in electricity markets.

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Synapse Energy Economics Inc., Cambridge, MA.
Chief Operating Officer, March 2011 – February 2014;
Vice President, July 2009 – February 2014;
Senior Associate, 2005-2009.

- Conducted research, wrote reports, and presented expert testimony pertaining to consumer, environmental, and public policy implications of electricity industry regulation. Provided expert support and representation in planning, greenhouse gas mitigation, and other stakeholder processes.
- As Vice President and Chief Operating Officer, I was also responsible for day-to-day operations of the company, quality assurance, client service, and professional development of staff.

Charles River Associates (CRA), Cambridge, MA. Senior Associate, 2004-2005
CRA acquired Tabors Caramanis & Associates in October 2004.

Tabors Caramanis & Associates, Cambridge, MA. Senior Associate, 1998-2004
As a member of the modeling group, developed and maintained dispatch modeling capability in support of electricity market consulting practice.

Performed modeling and analysis of electricity and natural gas markets, generation and transmission systems.

Global Risk Prediction Network, Inc., Greenland, NH. Vice President, 1997-1998
Developed private sector applications of climate forecast science in partnership with researchers at Columbia University.

Hub Data, Inc., Cambridge, MA. Financial Software Consultant, 1986-1987, 1993-1997
Responsible for design, implementation and support of analytic and communications modules for bond portfolio management software.

Abt Associates, Inc., Cambridge, MA. Environmental Policy Analyst, 1990-1991
Quantitative risk analysis to support federal environmental policy-making.

Massachusetts Water Resources Authority, Charlestown, MA. Analyst, 1988-1990
Applied and evaluated demand forecasting techniques for the Eastern Massachusetts service area; assessed yield/reliability relationship for the eastern Massachusetts water supply system.

Somerville High School, Somerville, MA. Math Teacher, 1986-1987
Courses included trigonometry, computer programming, and basic math.

EDUCATION

Ph.D., Earth and Planetary Sciences. Harvard University, Cambridge, MA, 1997

S.M., Applied Physics. Harvard University, Cambridge, MA, 1993

M.S., Civil Engineering. Tufts University, Medford, MA, 1990

B.A., Wesleyan University, Psychology. Middletown, CT, 1985

FELLOWSHIPS, AWARDS AND AFFILIATIONS

UCAR Visiting Scientist Postdoctoral Fellowship, 1997

Postdoctoral Research Fellowship, Harvard University, 1997

Certificate of Distinction in Teaching, Harvard University, 1997

Graduate Research Fellowship, Harvard University, 1991-1997

Invited Participant, UCAR Global Change Institute, 1993

House Tutor, Leverett House, Harvard University, 1991-1993

Graduate Research Fellowship, Massachusetts Water Resources Authority, 1989-1990

Teaching Fellowships:

Harvard University: *Principles of Measurement and Modeling in Atmospheric Chemistry; Hydrology; Introduction to Environmental Science and Public Policy; The Atmosphere*.

Wesleyan University: *Introduction to Computer Programming; Psychological Statistics; Playwriting and Production.*

Community Service

Vice President of Finance, Congregation Dorshei Tzedek, 2018 - Ongoing
Academic Mentor and Athletic Coach, SquashBusters Boston, 2014 - Ongoing
Judge, Cleantech Open innovation competitions, 2015-2016
President, Burr Elementary School Parent Teacher Organization, 2005-2007

EXPERT TESTIMONY AND SERVICES

Before the Public Utility Commission of Oregon (Case No. UE 374) – 2020-Ongoing
Expert witness on behalf of the Sierra Club in Pacific Power General Rate Case.

Before the Pennsylvania Public Utility Commission (Docket No. R-2020-3017206) – 2020-ongoing
Expert witness on behalf of the Clean Energy Council regarding Philadelphia Gas Works' general rate increase request.

Before the Public Service Commission of the District of Columbia (Formal Case No. 1154) – 2020
Expert witness on behalf of the Sierra Club regarding Washington Gas Light's PROJECT*pipes* II filing.

Before the New Jersey Board of Public Utilities (Docket No. EO18020190) – 2018-ongoing
Expert witness on behalf of the New Jersey Division of rate Counsel regarding the Atlantic City Electric's proposed Voluntary Program for Plug-In Vehicle Charging.

Before the New Jersey Board of Public Utilities (Docket. Nos. ER18070688 and GR18070689) – 2019
Expert witness on behalf of the New Jersey Division of rate Counsel regarding the Public Service Electric & Gas' 2018 PSE&G Green Programs Cost Recovery Filing. Settled prior to filing of intervener testimony.

Before the New Jersey Board of Public Utilities (Docket No. G018030350) – 2018
Expert witness on behalf of the New Jersey Division of rate Counsel regarding the South Jersey Gas' Energy Efficiency Programs IV filing. Settled prior to filing of intervener testimony.

Before the New Jersey Board of Public Utilities (Docket No. GO18030355) – 2018
Expert witness on behalf of the New Jersey Division of rate Counsel regarding the New Jersey Natural Gas Company's SAVEGREEN energy efficiency and renewable energy programs. Case was settled prior to filing of intervener testimony.

Before the New Jersey Board of Public Utilities (Docket No. EO18101111) – 2018-ongoing
Expert witness on behalf of the New Jersey Division of rate Counsel regarding the Public Service Electric & Gas' proposed *Clean Energy Future - Electric Vehicle and Energy Storage* program.

Before the New Jersey Board of Public Utilities (Docket Nos. GO18101112 and EO16101113) – 2018-ongoing
Expert witness on behalf of the New Jersey Division of rate Counsel regarding the Public Service Electric & Gas' proposed *Clean Energy Future - Energy Efficiency* program.

New Jersey Board of Public Utilities – 2020-Ongoing
Expert participation is stakeholder process regarding conversion to high-efficiency street lights on behalf of Rate Counsel.

New Jersey Board of Public Utilities – 2019-Ongoing
Expert participation is stakeholder process regarding transportation electrification policies on behalf of Rate Counsel.

New Jersey Division of Rate Counsel – 2016-Ongoing
General policy and stakeholder participation support on matters related to energy efficiency, renewable energy, and electrification of transportation in New Jersey.

Before the Washington Utilities and Transportation Commission – 2020-Ongoing
Expert witness on behalf of the Sierra Club regarding potential sale of ownership sale in Colstrip generating unit.

Before the Utah Public Service Commission (Docket No. 18-035-36) – 2020
Expert witness on behalf of the Sierra Club in Rocky Mountain Power depreciation case.

PacifiCorp Multi-State Protocols Stakeholder Process – 2019-Ongoing
Participation on behalf of Sierra Club in stakeholder process to establish protocols for allocation of resource costs ad benefits among PacifiCorp states.

Advisory Consulting for Natural Resources Defense Council – 2019-2020
Provide advisory and technical support to analysis team.

Memphis Light, Gas and Water – Power Supply Alternatives Study (2019-Ongoing)
Expert support for Sierra Club participation in Power Supply Advisory Team.

Before the Washington Utilities and Transportation Commission (Dockets UE-190334 and UG-190335) – 2019
Expert witness on behalf of the Sierra Club in Avista Energy rate case.

Before the Public Service Commission of South Carolina (Docket No. 2018-319-E) – 2019
Expert witness on behalf of the Sierra Club in Duke Energy Carolinas rate case.

Before the Public Service Commission of South Carolina (Docket No. 2018-318-E) – 2019
Expert witness on behalf of the Sierra Club in Duke Energy Progress rate case.

Before the Virginia State Corporation Commission (Case No. PUR-2018-00065) – 2018
Expert witness on behalf of the Sierra Club in Dominion Power IRP proceeding.

Before the Missouri Public Service Commission (Case No. EO-2018-0038) – 2018
Expert services in support of Sierra Club's participation in integrated resource planning process.

Before the Florida Public Service Commission (Docket No. 20170225-EI) – 2017-2018
Expert witness on behalf of the Sierra Club in FPL Determination of Need proceeding.

Before the North Carolina Utilities Commission (Docket No. E-7, SUB 1146) – 2017-2018
Expert witness on behalf of the Sierra Club in Duke Energy Carolinas rate case.

Before the New Jersey Board of Public Utilities (Docket No. ER17080869) – 2017
Expert witness on behalf of the New Jersey Division of rate Counsel regarding Public Service Electric and Gas Company's proposed Energy Efficiency 2017 Program.

Before the New Jersey Board of Public Utilities (Docket No. EO17030196) – 2017
Expert witness on behalf of the New Jersey Division of rate Counsel regarding Rockland Electric Company's proposed Low Income Audit and Install Energy Efficiency Program.

Before the New Jersey Board of Public Utilities (Docket No. GO15050504) – 2017
Expert witness on behalf of the New Jersey Division of rate Counsel regarding Elizabethtown Gas Company's Petition to Extend the Term of Energy Efficiency Programs. Settled prior to filing of intervener testimony.

Before the North Carolina Utilities Commission (Docket No. E-2, SUB 1142) – 2017
Expert witness on behalf of the Sierra Club in Duke Energy Progress rate case.

Before the Idaho Public Utilities Commission (Case No. AVU-E-17-01) – 2017
Expert witness on behalf of the Sierra Club in Avista Corporation rate case.

Before the Iowa Utilities Board (Docket No. RPU-2017-0002) –- 2017
Expert witness on behalf of the Sierra Club for Interstate Power and Light petition for ratemaking principles for proposed 500 MW wind project.

Before the Washington Utilities and Transportation Commission (Dockets UE-170033 and UG-170034) – 2017
Expert witness on behalf of the Sierra Club in Puget Sound Energy (PSE) rate case.

Clean Power Plan Modeling in PJM and MISO – 2016-2017
Participation on behalf of the Sustainable FERC Project in ISO initiative to model scenarios for state compliance with federal greenhouse gas mitigation rules.

California ISO/PacifiCorp Market Integration – 2015-2017
Technical support to Sierra Club in stakeholder review and participation in all relevant proceedings in California.

Before the New Jersey Board of Public Utilities (Docket No. GO14121412) – 2015
Expert witness on behalf of the New Jersey Division of rate Counsel regarding the New Jersey Natural Gas Company's petition for approval of its Extension of Energy - Efficiency Programs. Case was settled prior to filing of intervener testimony.

Before the New Jersey Board of Public Utilities (Docket No. GR15010090) – 2015
Expert witness on behalf of the New Jersey Division of rate Counsel regarding South Jersey Gas Company's petition for for Approval to Continue its Energy Efficiency Programs and Energy Efficiency Tracker. Case was settled prior to filing of intervener testimony.

United States Department of Justice – US District Court for the Eastern District of Missouri (Civil Action No. 4:11-CV-00077) – 2013-2019
Expert witness on behalf of the United States Department of Justice on successful prosecution of clean air act case.

Before the Missouri Public Service Commission (Case No. EO-2015-0084) – 2014-2015
Expert services in support of Sierra Club's participation in integrated resource planning process.

Before the Missouri Public Service Commission (File No. ER-2014-0258) – 2014-2015
Expert witness on behalf of the Sierra Club in Ameren Missouri rate case.

Before the Arizona Corporation Commission (Docket No. E-01345A-11-0224) – 2014
Expert witness on behalf of the Sierra Club regarding Arizona Public Service petition for rate treatment for acquisition of an additional ownership share of the Four Corners generating units.

Before the Missouri Public Service Comission (Docket No. ET-2014-0085) – 2013
Testimony on behalf of the Missouri Solar Energy Industries Association regarding Union Electric (d/b/a Ameren Missouri) motion to suspend payment of solar rebates.

Before the Missouri Public Service Comission (Docket No. ET-2014-0059 and ET-2014-0071) – 2013
Testimony on behalf of the Missouri Solar Energy Industries Association regarding Kansas City Power and Light Company's motions to suspend payment of solar rebates.

Eastern Interconnect Planning Collaborative (EIPC) – 2012-2013
Expert support on behalf of coalition of NGO stakeholders in transmission and resource planning process, including development and review of modeling assumptions and interim results, and development of comments.

Puget Sound Energy (PSE) – 2012-2013
Expert participant in PSE's 2013 IRP stakeholder process on behalf of the Sierra Club.

Before the Washington Utilities and Transportation Commission (Docket Nos. UE-111048 and UG-111049) – 2011
Testimony on behalf of the Sierra Club regarding the cost of operating the Colstrip power plant and other power procurement issues.

Before the Kansas Corporation Commission (Docket No. 11-KCPE-581-PRE) - 2011
Presented written and live testimony on behalf of the Sierra Club regarding Kansas City Power and Light request for predetermination of ratemaking principles.

Vermont Department of Public Service - 2011
Provided scenario analysis of the costs and benefits of various electric energy resource scenarios in support of the state Comprehensive Energy Plan.

Massachusetts Department of Energy Resources – 2009-2011
Served as expert analyst and modeling coordinator for analysis related to implementation of the Massachusetts Global Warming Solutions Act.

Iowa Office of Consumer Advocate – 2010-2011
Assisted Consumer Advocate in evaluating a proposed power purchase agreement for the output of the Duane Arnold nuclear power station.

Before the Missouri Public Service Commission (Docket No. EW-2010-0187) – 2010
Expert participant on behalf of the Sierra Club in stakeholder process to develop a "demand side investment mechanism" in Missouri.

Before the Louisiana Public Service Commission (Docket No. R-28271 Subdocket B) – 2009-2010
Expert participant on behalf of the Sierra Club in Renewable Portfolio Standard Task Force considering RPS for Louisiana.

Joint Fiscal Committee of the Vermont Legislature – 2008-2010
Serving as lead expert advising the Legislature on economic issues related to the possible recertification of the Vermont Yankee nuclear power plant.

Town of Littleton, NH – 2006-2010
Serving as expert witness on the value of the Moore hydroelectric facility.

Before the Nevada Public Service Commission (Docket No. 08-05014) – August 2008
Presented prefiled and live testimony on behalf of Nevadans for Clean Affordable Reliable Energy regarding the proposed Ely Energy Center and resource planning practices in Nevada.

Before the Mississippi Public Service Commission (Docket No. 2008-AD-158) – July 2008
Presented written and live testimony on behalf of the Sierra Club regarding the resource plans filed by Entergy Mississippi and Mississippi Power Company.

Kansas House of Representatives - Committee on Energy and Utilities – February 2008
Presented testimony on behalf of the Climate and Energy Project of the Land Institute of Kansas on a proposed bill regarding permitting of power plants. Focus was on the risks and costs associated with new coal plants and on their contribute to global climate change.

Before the Vermont Public Service Board (Docket No. 7250) – 2006-2008
Prepared report and testimony in support of the application of Deerfield Wind, LLC. For a Certificate of Public Good for a proposed wind power facility.

Before the Iowa Utilities Board (Docket No. GCU-07-1) – October, 2007 – January 2008
Presented wrtten and live testimony on behalf of the Iowa Office of Consumer Advocate regarding the science of global climate change and the contribution of new coal plants to atmospheric CO_2.

Before the Nevada Public Service Commission (Docket No. 07-06049) – October 2007
Presented prefiled direct testimony on behalf of Nevadans for Clean Affordable Reliable Energy regarding treatment of carbon emissions costs and coal plant capital costs in utility resource planning.

Before the Massachusetts General Court, Joint Committee on Economic Development and Emerging Technologies – July 2007
Presented written and live testimony on climate change science and the potential benefits of a revenue-neutral carbon tax in Massachusetts.

Town of Rockingham, VT – 2006-2007
Served as expert witness on the value of the Bellows Falls hydroelectric facility.

Before the South Dakota Public Utilities Commission (Case No EL05-22) – June 2006
Minnesota Public Utilities Commission (Docket TR-05-1275) – December 2006
Submitted prefiled and live testimony on the contribution of the proposed Big Stone II coal-fired generator to atmospheric CO_2, global climate change and the environment of South Dakota and Minnesota, respectively.

Before the Arkansas Public Service Commission (Docket No. 06-070-U) – October 2006
Submitted prefiled direct testimony on inclusion of new wind and gas-fired generation resources in utility rate base.

Federal Energy Regulatory Commission (Docket Nos. ER055-1410-000 and EL05-148-000) – May-Sept 2006

- Participant in settlement hearings on proposed capacity market structure (the Reliability Pricing Model, or RPM) on behalf of State Consumer Advocates in Pennsylvania, Ohio and the District of Columbia
- Invited participant on technical conference panel on PJM's proposed Variable Resource Requirement (VRR) curve
- Filed Pre- and post-conference comments and affidavits with FERC
- Participated in numerous training and design conferences at PJM on RPM implementation.

Before the Illinois Pollution Control Board (Docket No. R2006-025) – June-Aug 2006
Prefile and live testimony presented on behalf of the Illinois EPA regarding the costs and benefits of proposed mercury emissions rule for Illinois power plants.

Long Island Sound LNG Task Force – January 2006
Presentation of study on the need for and alternatives to the proposed Broadwater LNG storage and regasification facility in Long Island Sound.

Before the Iowa Utilities Board (Docket No. SPU-05-15) – November 2005
Presented written and live testimony on whether Interstate Power and Light's should be permitted to sell the Duane Arnold Energy Center nuclear facility to FPLE Duane Arnold, Inc., a subsidiary of Florida Power and Light.

PUBLICATIONS AND REPORTS

Hausman, E., Review of AltaGas' Climate Business Plan and Renewable Natural Gas Study. Technical report prepared on behalf of the Sierra Club, June 2020.

Hausman, E., The Worst of Both Worlds: Why the Ohio Legislature's OVEC Bailout Bill would Harm Consumers, Impede Competition, Increase Pollution, and Impair the Health and Welfare of Ohioans for Decades. White paper produced on behalf of The Sierra Club, June 2017.

Hausman, E., Risks and Opportunities for PacifiCorp - State Level Findings: Utah, Produced on behalf of the Sierra Club, October 2014.

Hausman, E., Risks and Opportunities for PacifiCorp - State Level Findings: Oregon, Produced on behalf of the Sierra Club, October 2014.

Hausman, E., Risks and Opportunities for PacifiCorp in a Carbon Constrained Economy, Produced on behalf of the Sierra Club, October 2014.

Luckow, P., E. Stanton, B. Biewald, J. Fisher, F. Ackerman, E. Hausman, 2013 Carbon Dioxide Price Forecast, Synapse Energy Economics, November 2013.

Stanton, E., T. Comings, K. Takahashi, P. Knight, T. Vitolo, E. Hausman, Economic Impacts of the NRDC Carbon Standard: Background Report prepared for the Natural Resources Defense Council, Synapse Energy Economics for NRDC, June 2013

Comings T., P. Knight, E. Hausman, Midwest Generation's Illinois Coal Plants: Too Expensive to Compete? (Report Update) Synapse Energy Economics for Sierra Club, April 2013

Stanton E., F. Ackerman, T. Comings, P. Knight, T. Vitolo, E. Hausman, Will LNG Exports Benefit the United States Economy? Synapse Energy Economics for Sierra Club, January 2013

Chang M., D. White, E. Hausman, Risks to Ratepayers: An Examination of the Proposed William States Lee III Nuclear Generation Station, and the Implications of "Early Cost Recovery" Legislation, Synapse Energy Economics for Consumers Against Rate Hikes, December 2012

Wilson R., P. Luckow, B. Biewald, F. Ackerman, and E.D. Hausman, 2012 Carbon Dioxide Price Forecast, Synapse Energy Economics, October 2012.

Fagan B., M. Chang, P. Knight, M. Schultz, T. Comings, E.D. Hausman, and R. Wilson, The Potential Rate Effects of Wind Energy and Transmission in the Midwest ISO Region. Synapse Energy Economics for Energy Future Coalition, May 2012.

Hausman, E.D., T. Comings, "Midwest Generation's Illinois Coal Plants: Too Expensive to Compete? Synapse Energy Economics for Sierra Club, April 2012.

Hausman, E.D., T. Comings, and G. Keith, Maximizing Benefits: Recommendations for Meeting Long-Term Demand for Standard Offer Service in Maryland. Synapse Energy Economics for Sierra Club, January 2012.

Keith G., B. Biewald, E.D. Hausman, K. Takahashi, T. Vitolo, T. Comings, and P. Knight, Toward a Sustainable Future for the U.S. Power Sector: Beyond Business as Usual 2011 Synpase Energy Economics for Civil Society Institute, November 2011.

Chang M., D. White, E.D. Hausman, N. Hughes, and B. Biewald, Big Risks, Better Alternatives: An Examination of Two Nuclear Energy Projects in the U.S. Synpase Energy Economics for Union of Concerned Scientists, October 2011.

Hausman E.D., T. Comings, K. Takahashi, R. Wilson, and W. Steinhurst, Electricity Scenario Analysis for the Vermont Comprehensive Energy Plan 2011. Synapse Energy Economics for Vermont Department of Public Service, September 2011.

Wittenstein M., E.D. Hausman, Incenting the Old, Preventing the New: Flaws in Capacity Market Design, and Recommendations for Improvement. Synapse Energy Economics for American Public Power Association, June 2011.

Johnston L., E.D. Hausman, B. Biewald, R. Wilson, and D. White. 2011 Carbon Dioxide Price Forecast. Synapse Energy Economics White Paper, February 2011.

Hausman E.D., V. Sabodash, N. Hughes, and J. I. Fisher, Economic Impact Analysis of New Mexico's Greenhouse Gas Emissions Rule. Synapse Energy Economics for New Energy Economy, February 2011.

Hausman E.D., J. Fisher, L. Mancinelli, and B. Biewald. Productive and Unproductive Costs of CO2 Cap-and-Trade: Impacts on Electricity Consumers and Producers. Synapse Energy Economics for National Association of Regulatory Utility Commissioners, National Association of State Utility Consumer Advocates, National Rural Electric Cooperative Association, and American Public Power Association, July 2009.

Peterson P., E. Hausman, R. Fagan, and V. Sabodash, Report to the Ohio Office of Consumer Counsel, on the value of continued participation in RTOs. Filed under Ohio PUC Case No. 09-90-EL-COI, May 2009.

Schlissel D., L. Johnston, B. Biewald, D. White, E. Hausman, C. James, and J. Fisher, Synapse 2008 CO2 Price Forecasts. July 2008.

Hausman E.D., J. Fisher and B. Biewald, Analysis of Indirect Emissions Benefits of Wind, Landfill Gas, and Municipal Solid Waste Generation. Synapse Energy Economics Report to the Air Pollution Prevention and Control Division, National Risk Management Research Laboratory, U.S. Environmental Protection Agency, July 2008.

Hausman E.D. and C. James, Cap and Trade CO2 Regulation: Efficient Mitigation or a Give-away? Synapse Enegy Ecomics presentation to the ELCON Spring Workshop, June 2008.

Hausman E.D., R. Hornby and A. Smith, Bilateral Contracting in Deregulated Electricity Markets. Synapse Energy Economics for the American Public Power Association, April 2008.

Hausman E.D., R. Fagan, D. White, K. Takahashi and A. Napoleon, LMP Electricity Markets: Market Operations, Market Power and Value for Consumers. Synapse Energy Economics for the American Public Power Association's Electricity Market Reform Initiative (EMRI) symposium, "Assessing Restructured Electricity Markets" in Washington, DC, February 2007.

Hausman E.D. and K. Takahashi, The Proposed Broadwater LNG Import Terminal Response to Draft Environmental Impact Statement and Update of Synapse Analysis. Synapse Energy Economics for the Connecticut Fund for the Environment and Save The Sound, January 2007.

Hausman E.D., K. Takahashi, D. Schlissel and B. Biewald, The Proposed Broadwater LNG Import Terminal: An Analysis and Assessment of Alternatives. Synapse Energy Economics for the Connecticut Fund for the Environment and Save The Sound, March 2006.

Hausman E.D., P. Peterson, D. White and B. Biewald, RPM 2006: Windfall Profits for Existing Base Load Units in PJM: An Update of Two Case Studies. Synapse Energy Economics for the Pennsylvania Office of Consumer Advocate and the Illinois Citizens Utility Board, February 2006.

Hausman E.D., K. Takahashi, and B. Biewald, The Glebe Mountain Wind Energy Project: Assessment of Project Benefits for Vermont and the New England Region. Synapse Energy Economics for Glebe Mountain Wind Energy, LLC., February 2006.

Hausman E.D., K. Takahashi, and B. Biewald, The Deerfield Wind Project: Assessment of the Need for Power and the Economic and Environmental Attributes of the Project. Synapse Energy Economics for Deerfield Wind, LLC., January 2006.

Hausman E.D., P. Peterson, D. White and B. Biewald, An RPM Case Study: Higher Costs for Consumers, Windfall Profits for Exelon. Synapse Energy Economics for the Illinois Citizens Utility Board, October 2005.

Hausman E.D. and G. Keith, Calculating Displaced Emissions from Energy Efficiency and Renewable Energy Initiatives. Synapse Energy Economics for EPA website 2005

Rudkevich A., E.D. Hausman, R.D. Tabors, J. Bagnal and C Kopel, Loss Hedging Rights: A Final Piece in the LMP Puzzle. Hawaii International Conference on System Sciences, Hawaii, January, 2005 (accepted).

Hausman E.D. and R.D. Tabors, The Role of Demand Underscheduling in the California Energy Crisis. Hawaii International Conference on System Sciences, Hawaii, January 2004.

Hausman E.D. and M.B. McElroy, The reorganization of the global carbon cycle at the last glacial termination. Global Biogeochemical Cycles, 13(2), 371-381, 1999.

Norton F.L., E.D. Hausman and M.B. McElroy, Hydrospheric transports, the oxygen isotope record, and tropical sea surface temperatures during the last glacial maximum. Paleoceanography, 12, 15-22, 1997.

Hausman E.D. and M.B. McElroy, Variations in the oceanic carbon cycle over glacial transitions: a time-dependent box model simulation. Presented at the spring meeting of the American Geophysical Union, San Francisco, 1996.

PRESENTATIONS AND WORKSHOPS

American Public Power Association: Invited expert participant in APPA's roundtable discussion of the current state of the RTO-operated electricity markets. October 2013.

California Long-Term Resource Adequacy Summit (Sponsored by the California ISO and the California Public Utility Commission): Panelist on "Applying Alternative Models to the California Market Construct." February 26, 2013.

ELCON 2011 Fall Workshop: "Do RTOs Need a Capacity Market?" October 2011.

Harvard Electricity Policy Group: Presentation on state action to ensure reliability in the face of capacity market failure. February 2011.

NASUCA 2010 Annual Conference: "Addressing Climate Change while Protecting Consumers." November 2010.

NASUCA Consumer Protection Committee: Briefing on the Synapse report entitled, "Productive and Unproductive Costs of CO_2 Cap-and-Trade." September 2009.

NARUC 2009 Summer Meeting: Invited speaker on topic: "Productive and Unproductive Costs of CO2 Cap-and-Trade." July, 2009.

NASUCA 2008 Mid-Year Meeting**:** Invited speaker on the topic, "Protecting Consumers in a Warming World, Part II: Deregulated Markets." June 2008.

Center for Climate Strategies: Facilitator and expert analyst on state-level policy options for mitigating greenhouse gas emissions. Serve as facilitator/expert for the Electricity Supply (ES) and Residential, Commercial and Industrial (RCI) Policy Working Groups in the states of Colorado and South Carolina. 2007-2008.

NASUCA 2007 Mid-Year Meeting**:** Invited speaker on the topic, "Protecting Consumers in a Warming World" June 2007.

ASHRAE Workshop on estimating greenhouse gas emissions from buildings in the design phase: Participant expert on estimating displaced emissions associated with energy efficiency in building design. Also hired by ASHRAE to document and produce a report on the workshop. April, 2007.

Assessing Restructured Electricity Markets An American Public Power Association Symposium: Invited speaker on the history and effectiveness of Locational Marginal Pricing (LMP) in northeastern United States electricity markets, February, 2007.

ASPO-USA 2006 National Conference: Invited speaker and panelist on the future role of LNG in the U.S. natural gas market, October, 2006.

Market Design Working Group: Participant in FERC-sponsored settlement process for designing capacity market structure for PJM on behalf of coalition of state utility consumer advocates, July-August 2006.

***NASUCA 2006 Mid-Year Meeting*:** Invited speaker on the topic, "How Can Consumer Advocates Deal with Soaring Energy Prices?" June 2006.

Soundwaters Forum, Stamford, CT: Participated in a debate on the need for proposed Broadwater LNG terminal in Long Island Sound, June 2006.

Energy Modeling Forum: Participant in coordinated academic exercise focused on modeling US and world natural gas markets, December 2004.

Massachusetts Institute of Technology (MIT): Guest lecturer in Technology and Policy Program on electricity market structure, the LMP pricing system and risk hedging with FTRs. 2002-2005.

LMP: The Ultimate Hands-On Seminar. Two-day seminar held at various sites to explore concepts of LMP pricing and congestion risk hedging, including lecture and market simulation exercises. Custom seminars held for FERC staff, ERCOT staff, and various industry groups. 2003-2004.

Learning to Live with Locational Marginal Pricing: Fundamentals and Hands-On Simulation. Day-long seminar including on-line mock electricity market and congestion rights auction, December 2002.

LMP in California. Led a series of seminars on the introduction of LMP in the California electricity market, including on-line market simulation exercise. 2002.

Resume updated September 2020