October 12, 2018

Via Electronic Mail

Energy Master Plan Committee
emp.comments@bpu.nj.gov

RE: Energy Master Plan

Dear Energy Master Plan Committee Members:

Environmental Defense Fund ("EDF") commends Governor Murphy and his administration for the thoughtful and thorough approach they have taken to develop the 2019 Energy Master Plan ("EMP"), and thanks the New Jersey Board of Public Utilities ("BPU") for this opportunity to provide responses to questions posed in connection with its development. EDF is a national non-profit membership organization engaged in linking science, economics and law to create innovative, equitable and cost-effective solutions to society's most urgent environmental problems. EDF has more than two million members and activists nationwide and over 80,000 in New Jersey. As an organization, EDF has been active in New Jersey on environmental issues since the 1970's.

We would be remiss if we did not highlight the urgency of this moment at which New Jersey is refreshing its energy policy: the latest Intergovernmental Panel on Climate Change ("IPCC") report, issued within the past week,[1] has sounded the alarm that we all have even less time than previously thought to avert catastrophic effects of climate change. The new report, which was written by hundreds of scientists hailing from 40 different countries and draws on research from thousands of scientific studies, found that we are on pace to hit 1.5 °C global warming potentially as soon as 2030. It is critically important to stay below that threshold, because although even 1.5 °C global warming involves significant risks, staying below that threshold significantly reduces the risks of water scarcity, ill-health, food insecurity, flood and drought, extreme heat, tropical cyclones, biodiversity loss, and sea level rise compared to a 2°C warming scenario.[2]

To stay below the 1.5 degree warming threshold, we must pursue each of the following:

- Decreased energy demand;

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[1] The new report is available at http://www.ipcc.ch/report/sr15/.

[2] *See* Casey Ivanovich and Ilissa Ocko, Six Takeaways from the New Climate Report, http://blogs.edf.org/climate411/2018/10/08/six-takeaways-from-the-new-climate-report/?utm_source=email&utm_campaign=expert_none_upd_clim&utm_medium=email&utm_id=1539010774&utm_content=climateteam (October 8, 2018) for a summary of the scientific takeaways of the new report.

- Lower emissions from energy supply;
- Actively removing carbon dioxide from the atmosphere;
- Fully decarbonizing the electricity sector by mid-century;
- Ensuring renewables are the world's dominant energy source by 2050; and
- Balancing land-use between sustainable agriculture practices, bioenergy production, and carbon storage.

Moreover, the likelihood that we will reach the 1.5 °C warming threshold is highly dependent upon the emission pathways of non-CO_2 climate pollutants, such as methane and black carbon. If the emissions of non-CO_2 pollutants are not curbed, there is a 66% likelihood of surpassing the 1.5 °C threshold, regardless of reductions to carbon dioxide. Reducing methane and black carbon emissions is also crucial for limiting the rate of warming in the near-term. It is clear that we must reduce emissions of these pollutants in addition to CO_2, and several broad mitigation measures in areas such as the energy sector tackle the reduction of both.

Emissions pathways consistent with limiting warming to below or near 1.5 °C require reaching net zero emissions around midcentury, and pursuing carbon dioxide removal mechanisms within this century. While the transitions in energy systems, land, transportation, infrastructure, and industries would be unprecedented in scale, they are not necessarily unprecedented in speed. In this context, New Jersey's refresh of its energy and climate policy comes not a moment too soon. The state's Global Warming Response Act ("GWRA") statewide emissions limit to achieve eighty percent greenhouse gas emissions reductions by 2050 and its commitment to a 100% clean energy future by 2050 is generally consistent with the critical path identified by scientists in the new report – although even faster transformation would be desirable and may ultimately turn out to be needed. We welcome the opportunity to work with the Energy Master Plan Committee and other stakeholders to build a stronger, safer, more resilient future for New Jersey.

In these comments, we provide responses to certain questions where we think we have useful information and/or insight to offer; for ease of reference, we retain the numbering of the questions as originally posed although we are not providing responses to every question.

I. Building a Modern Grid Discussion Points

General

1. What does a modern grid look like in 2030 and 2050? What are the timeframes and pathways to achieve that?

    A modern grid, supported by intelligent system operations and cost-effective system investments, can provide more reliable and resilient electric service to all customers. Utilizing grid assets more efficiently, a modernized grid can create new opportunities for energy efficiency and peak demand reduction while lowering costs for customers. Lastly, the added visibility and control enabled by smart grid solutions further allow utilities to strategically integrate renewable and distributed energy resources ("DERs") and deliver cleaner energy and deliver it more efficiently.

    Against the backdrop of the most recent IPCC report, New Jersey's policies including the GWRA, as well as the rapid technological advances and electrification trends, EDF believes that the need to build a smarter energy infrastructure has never been greater. EDF recommends that the grid be modernized as expeditiously as possible to enable well-targeted grid investments that address the challenges and opportunities associated with these trends in alignment with state policy goals.

Strategic planning, design, and implementation is required to ensure that grid modernization efforts result in net benefits for customers and realize the full potential of a modern grid that is more flexible, clean, efficient, reliable, responsive to diverse customer needs, and protects the environment (see response to #2). To this end, EDF believes that a vision of a desired future electric grid is essential in mapping a strategic and cost-effective transition plan that maximizes public benefits and that will be able to adapt to state-specific market developments (e.g., increases in renewable and DER penetration, changes in technologies and customer preferences). While grid modernization drivers often overlap across the country, the degree to which individual drivers like DER penetration and customer preferences affect individual distribution systems and customer bases invariably vary. Prior to planning and implementing grid modernization pathways and timelines, EDF recommends, a vision of a future grid first be defined. To this end, we encourage regulators, utilities and other key stakeholders to articulate such a vision taking into account the most pressing state-specific energy market pressures and grid needs as well as state energy goals that the modern grid is expected to advance.

Developing a modernized grid is a process that requires much deliberation and collaboration among the stakeholders who will be impacted by the grid changes. We believe that in order to establish a grid modernization timetable, detailed objectives must be developed and advanced through a formal stakeholder process (see response to #2).

2. What is the most critical step to modernize the grid? What barriers exist to prevent state implementation of a modern grid?

As states across the country chart their own path toward grid modernization, one emerging best practice we have observed is the development of a roadmap including guiding principles and priorities through robust stakeholder input. Increasingly we see that utilities, regulators, consumer advocates, and other stakeholders value the importance of a collaborative and integrated process to advance grid modernization in alignment with state-specific priorities such as New Jersey's Energy Master Plan. Regulators can leverage these open processes to develop key questions, objectives, and principles. Building an understanding of these basic tenets among stakeholders at the outset can serve as an overarching framework that informs the evaluation of present challenges, the pace of transformation, and the development of near-and long-term action items. Clarifying these building blocks in the beginning further enables all stakeholders to assess whether grid upgrades are realizing anticipated benefits and furthering policy goals.

EDF released a whitepaper on this topic last year, which offers six key categories which we deem essential guiding posts for any sustainable grid modernization roadmap:[3]

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[3] Environmental Defense Fund, Ronny Sandoval, *A Roadmap for a Clean, Modern Grid – The 6 Areas That Should Guide our Efforts* (December 6, 2017), available at: http://blogs.edf.org/energyexchange/2017/12/06/a-roadmap-for-a-clean-modern-grid-the-6-areas-that-should-guide-our-efforts/?_ga=2.223092575.51712604.1538170347-1332550974.1534854280

1. Sensing and monitoring for enhanced system awareness: Technology has already significantly increased the grid's efficiency, and future advances hold remarkable promise to make it even cleaner, cheaper, and more reliable. Advanced sensors throughout our energy system make outages easier to identify and help utilities respond faster to disasters, from wildfires to hurricanes.
2. Intelligent integration of diverse distributed resources: Residential rooftop solar is booming and large, utility-scale solar projects are increasing, too. How this new, clean, and distributed resource is integrated into the grid will not only determine how efficiently it works, but also how satisfied customers will be with their investments. And solar isn't the only new resource grid operators are managing. Some software solutions, like demand response services, can provide virtual energy by quickly adjusting demand in response to supply.
3. Maximizing the role of renewable energy: Yesterday's grid was dirtier, but it sure was simpler. Technologies like wind, solar and storage (batteries) are becoming more and more affordable, but they need to be managed differently than coal or gas power plants. This will require new infrastructure, policies, and even market structures that value the benefits they bring to the system.
4. Electrification of transportation systems: Transportation is the largest contributor to our carbon budget. The electrification of America's automobile fleet could result in significant carbon reductions *if* the transition is managed correctly. This includes using more renewable energy to charge cars. But it also includes new charging infrastructure and pricing structures for customers that incentivize charging when it is powered by clean resources.
5. Access to actionable energy data: When it comes to the energy revolution, customers need to be included. And in today's digital world that means they need secure and simple access to their energy data and the ability to share it with companies that can help them maximize their energy dollars. Luckily, there are models out there that show how to open access to this critical information while keeping customer privacy protected.
6. Efficient transmission and distribution management: The less energy lost on its way to customers, the less energy has to be generated in the first place. And the more we ask of our grid, the better the transmission and distribution system needs to be. Our energy system is aging, and billions of dollars have already been earmarked for scheduled improvements and maintenance. These efforts should be planned in conjunction with these other critical areas to leverage private and public investments.

A major barrier to modernizing the grid is the current utility business model, which does not incentivize utilities for taking the steps necessary to modernize the grid and, in fact, establishes disincentives for investments in innovative grid modernization. New York has done groundbreaking work to develop a new utility business model better suited for grid modernization in its Reforming Energy Vision ("REV") initiative,[4] which can be a helpful reference point for New Jersey.[5]

3. How does a modern grid address, adapt, or respond to climate change and its impacts on New Jersey?

   Climate change is correlated with more frequent and extreme weather events including, hotter heat waves, higher storm surges and more floods. Strategic grid modernization investments can better position New Jersey to cope with the stresses these increasingly common weather patterns impose on the electric grid. Smart grid solutions for example can enhance the grid's resiliency by expanding visibility and control to system planners and operators across distribution assets. These can not only increase the speed with which outages and other contingencies are identified, but can also increase how quickly these conditions may be isolated and subsequently restored.

   In addition, a modern grid, and the innovative technologies and techniques embedded within it, allows us to utilize our existing energy infrastructure more efficiently, reducing the need for traditional investments that build out delivery infrastructure and fossil-fuel based power generation. Relatedly, emerging technology solutions, facilitate the large-scale deployment for renewable and distributed energy resources by determining the optimal placement on the grid, taking into account weather forecasting and increasingly dynamic electric system conditions to better utilize power from renewables. Leveraging emerging solutions related to modeling and simulation, controls, interoperability, cybersecurity, and reliability, grid modernization can maximize and accelerate the deployment of intermittent renewable generation safely.

   Similarly, a modern grid also supports optimal integration of environmentally beneficial electrification technologies, which are further described in our response to question 6 of this Building A Modern Grid Discussion Points section of this document.

   Finally, grid modernization practices such as demand side programs, storage, and voltage optimization (see more on this below) all have the potential to lessen the generation of greenhouse gas emissions in the power sector thereby mitigating climate change impacts.

4. How does the state plan for fuel diversity and renewable energy within a modern grid?

   As noted in the response to question #3 for this discussion group, a modern grid will allow New Jersey to better integrate large-scale renewables and low-carbon DERs.

5. What integrated distribution planning is needed in a modern grid?

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[4] General information about the REV initiative is available at https://rev.ny.gov/.

[5] EDF staffers who have been engaged in work in connection with the REV initiative have written a white paper describing how reforms of the type undertaken in the REV initiative may be useful to regulators in other states who are seeking to align utility sector regulation with desired environmental outcomes. *See* E. Stein and F. Ucar, Driving Environmental Outcomes Through Utility Reform: Lessons from New York REV (January 2018), available at https://www.edf.org/sites/default/files/documents/driving-environmental-outcomes.pdf.

Following up on our response to #1, EDF believes it will be challenging to envision what kind of future distribution system planning is required, absent a well-defined starting point. EDF recommends that the utilities and stakeholders perform a self-assessment to understand what the present state of the grid is, including grid functionalities and distribution system planning; what and where data gaps are and how much work needs to be done to reach state goals. This is especially important given how disparate different distribution systems can be across service territories. This would help to determine and prioritize the key functionalities and technologies New Jersey's future grid must have; and further facilitate comprehensive and transparent distribution system planning that is more responsive to the challenges posed by DER penetration.

Tying distribution planning reforms back to transparent goals ensures that distribution system upgrades and investments not only support desired objectives, it would further provide an opportunity for stakeholders to assess whether updated distribution system planning practices are in fact having the desired effect.

As a starting point we recommend that utilities with robust stakeholder input:

- create agreement / understanding around modeling assumptions and planning scenarios
- improve standardized and transparent distribution planning and operations
- identify and prioritize near-term and long-term distribution planning reforms based on the policy objectives, self-assessment, as well as on-going market developments

For reference, Ohio's recent efforts on grid modernization should offer instructive example context. The components of integrated distribution planning needed to modernize the grid were explained well in a recent Ohio rate case as follows:

> "Modernizing the electric distribution planning process often involves developing integrated distribution planning processes that will proactively consider DER in planning the distribution system. The integrated distribution planning process is an important roadmap to ensure that utilities factor DER in to their planning, because it impacts load forecasts, operation, and the capability of the distribution system. Effectively considering DER in an integrated distribution plan will allow utilities to more holistically and effectively assess the modern distribution grid, more effectively integrate DER, harness unique DER attributes, and also minimize duplication of services or system overbuild. An integrated distribution planning process also enables utilities to methodically analyze least-cost, best-fit non-wires DER solutions on an apples-to-apples basis with traditional solutions.
>
> "The integrated distribution plan can be broadly broken up into 5 main categories:
>
> "1. System Planning, including developing methodologies to plan for and evaluate non-wires solutions
> "2. System Operation
> "3. Interdependencies and Timing

"4. Stimulating DER
"5. Validation"[6]

6. In what ways can a modern grid meet the Global Warming Response Act 2050 greenhouse gas emissions reduction requirements and the Governor's goal of achieving 100% clean energy by 2050?

See response to #3, above, which describes in general terms how a modern grid can address, adapt, or respond to climate change and its impacts on New Jersey, including how it can help increase the system's ability to rely heavily on intermittent renewable resources. In addition, a modern grid is essential to meeting these goals as cost-effectively as possible by providing a platform for environmentally beneficial electrification, the emerging practice of reducing emissions by converting energy uses traditionally provided for through on-site fossil fuel combustion to electric energy harnessing a generation fleet that is increasingly clean as renewable capacity and generation expand.

Over the course of the past decade, various efforts have been made to envision what actual decarbonization would entail—and they have reached remarkably similar conclusions. The consensus vision is that a clean electric grid is the essential element of decarbonization – and that this grid will become an engine for decarbonizing currently fossil-fuel-dependent sectors through electrification. This strategy is already gaining traction (beyond New Jersey's electrically powered public rail and subway transportation systems) in the transportation sector – although it has a considerable distance to go! – and may also prove vital in stationary applications, including space heating, domestic hot water, and even industrial applications. Decarbonizing the grid and converting major systems in a high proportion of the building stock are both massive undertakings requiring considerable lead time, so they must be undertaken in parallel. Until recently, electric technologies for heating and hot water were typically uncompetitive with on-site combustion either economically or from an emissions standpoint. This has changed in recent years and is expected to continue changing, as continuously improving electric technologies and cleaner electric generation are both improving the environmental performance of technologies such as ground-source heat pumps, air source heat pumps, and heat pump water heaters. Not only do many of these electric technologies have favorable environmental attributes in many operating conditions due to their efficiency – some, such as electric heat pump water heaters, can be "integrated" with the grid to improve the grid's performance, by providing much-needed flexibility. But because of conventional wisdom based on older generations of end-use technologies and a coal-fired electric generation fleet, electrifying these building-level applications has barely begun and faces strong headwinds. New Jersey, with its in-state generation fleet almost coal-free, is well positioned to begin the process of environmentally beneficial electrification.

For electric utilities, environmentally beneficial electrification is an exciting prospect. It gives the electric system a starring role in the clean energy future, creating new opportunities including a new source of load growth. A "modern grid" that is able to rely

[6] Direct Testimony of Mark Higgins, *In the Matter of the Application of Duke Energy Ohio, Inc. for an Increase in Electric Distribution Rates,* Case No. 17-32-EL-AIR (June 27, 2018) at p. 13), available at: http://dis.puc.state.oh.us/TiffToPDf/A1001001A18F27B70708E06358.pdf.

more and more heavily on non-emitting generation is essential to optimizing this strategy. However, environmentally beneficial electrification also presents long-term questions concerning the role and viability of natural gas utilities, which provide a public service that has traditionally been considered both vital and comparatively environmentally friendly. It creates a constellation of urgent questions for regulators who are continuing to approve business plans that involve investment in natural gas infrastructure that is expected to last for many decades but which could – and perhaps must – become stranded assets much sooner.

Perhaps not surprisingly, the Electric Power Research Institute, Inc., an independent non-profit organization focused on the electric industry, has developed significant enthusiasm for the concept – focusing on what it terms "Efficient Electrification," which it defines as "an Integrated Energy Network to help achieve the most efficient use of energy, the cleanest production, delivery and use of that energy, and measureable benefits to consumers, workers, drivers, and others."[7] Equally unsurprisingly, the American Gas Association takes a contrary view, arguing such a strategy would be costly and would not deliver the anticipated emissions reductions.[8]

Based on our own review of the increasingly extensive literature on this topic, we are of the view that, with the right technologies, environmentally beneficial electrification can and must be a key component of any serious clean energy transition strategy. The performance of electric technologies to replace combustion-based technologies is constantly improving and in our view some of the key assumptions that drove the AGA's pessimistic findings are inconsistent with the current state of technology. However, New Jersey policymakers will need to work quickly to familiarize themselves with this opportunity, which is assessed in a growing body of literature, as well as examples emerging in the most forward-thinking jurisdictions,[9] such as the Netherlands (where movement away from some natural gas

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[7] EPRI Journal, *Electrification: The Conversation is Changing* (May 17, 2018), available at: http://eprijournal.com/electrification-the-conversation-is-changing/.

[8] *See* Implications of Policy-Drive Residential Electrification, an American Gas Association Study prepared by ICF (July 2018), *available at* https://www.aga.org/globalassets/research--insights/reports/AGA_Study_On_Residential_Electrification.

[9] Some key resources on this topic that we would recommend include J. Weiss, R. Hledik, M. Hagerty, and W. Gorman, Electrification: Emerging Opportunities for Utility Growth (a Brattle Group Study) (January 2017), available at http://files.brattle.com/files/7376_electrification_whitepaper_final_single_pages.pdf; EPRI, U.S. National Electrification Assessment (April 2018), available at http://ipu.msu.edu/wp-content/uploads/2018/04/EPRI-Electrification-Report-2018.pdf; Implications of Policy-Drive Residential Electrification, an American Gas Association Study prepared by ICF (July 2018), *available at* https://www.aga.org/globalassets/research--insights/reports/AGA_Study_On_Residential_Electrification; Dennis, K., Colburn, K., Lazar, J. (2016). "Environmentally Beneficial Electrification: The Dawn of 'Emissions Efficiency'." The Electricity Journal. Volume 29. July 2016. http://www.sciencedirect.com/science/article/pii/S1040619016301075; S. Billimoria, L. Guccione, M. Henchen, and L. Louis-Prescott, The Economics of Electrifying Buildings (Rocky Mountain Institute) (June 2018), available at https://rmi.org/wp-content/uploads/2018/06/RMI_Economics_of_Electrifying_Buildings_2018.pdf; NREL, Electrifications Future Study: End Use Electric Technology Cost and Performance Projections through 2050 (December 2017), available at https://www.nrel.gov/docs/fy18osti/70485.pdf; Northeast Energy Efficiency Partnerships, cold climate Air Source Heat Pump ("ccASHP") database, available at https://neep.org/initiatives/high-efficiency-products/emerging-technologies/ashp/cold-climate-air-source-

distribution in favor of alternatives has already begun).[10] The 2019 Energy Master Plan must include environmentally beneficial electrification so that current and future decisions by the utilities and other parties concerning the design, planning, implementation, and funding of grid improvements and the future of the natural gas system can be made in a manner consistent with the coming transformation.

State Policy

7. How can state policies support a modern grid to increase resiliency and reliability and fight climate change?

   As noted in response to #2, above, New Jersey will need to re-examine the traditional utility business model to develop the best framework for supporting a modern grid. The changes will relate to such topics including but not limited to: performance-based ratemaking, rate design, microgrids, DER policies and access to customer energy usage data.

   For reference, in response to hurricane Sandy, Consolidated Edison in New York is conducting, with input from EDF and other stakeholders and climate experts, a thorough assessment of its vulnerabilities to climate risks and utility efforts to adapt the grid. The utility's climate change vulnerability study is slated for completion in late 2019 and will encompass key climate and weather factors including an analysis of temperature, sea level rise, storm surge, and extreme weather events.[11]

8. What regulations need to be updated with a modern grid? Should there be performance metrics tied to grid performance?

   See response to #7, above. In addition, EDF strongly recommends that performance metrics related to grid performance be developed. Performance metrics are essential to ensuring a successful grid modernization program. Metrics closely tied to desired policy outcomes and increased system functionality, enable all stakeholders to track the progress of grid upgrades as well as course-correct certain aspects of the design and implementation of grid modernization investments.

   When a utility develops a grid modernization plan, the utility must demonstrate that the benefits exceed the costs. When the deployment plan is approved, the utility receives permission to begin incurring costs and recovering these costs from its customers. The customers may be required to start paying for the grid equipment before the benefits from the grid deployment are fully realized. Having clear, outcome-based performance metrics

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heat-pump; NYSERDA Renewable Heat and Cooling Policy Guide https://www.nyserda.ny.gov/-/media/Files/Publications/PPSER/NYSERDA/RHC-Framework.pdf.

[10] Netherlands Ministry of Economic Affairs, Energy Agenda: Toward a Low Carbon Energy Supply (English version), https://www.government.nl/binaries/government/documents/reports/2017/03/01/energy-agenda-towards-a-low-carbon-energy-supply/Energy+agenda.pdf.

[11] New York Public Utilities Commission, ORDER APPROVING ELECTRIC, GAS AND STEAM RATE PLANS IN ACCORD WITH JOINT PROPOSAL 2/21/2014, available at: http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId={2CE04DF8-F1E2-48EA-84E2-CD42771F30B4}

will protect the utility's customers by holding the utility accountable for delivering all the benefits promised.

Several states including New Jersey have already employed such metrics. Most recently, in New Jersey, the August, 2017 NJ BPU order in the Rockland Electric Company ("RECO") Advanced Metering Infrastructure ("AMI") program required the utility to provide the BPU with a series of AMI metrics providing a good example of performance metrics and a model for future grid modernization filings. Another good example of thoughtful and detailed grid modernization metrics, which EDF helped develop, was filed by Exelon subsidiary Commonwealth Edison ("ComEd")[12] for their Illinois customers in October 2012. Similarly, in Indiana, Duke Energy is required to report on the progress of its smart grid investments through metrics including voltage reductions, energy savings, and greenhouse gas emissions reductions from voltage optimization.[13]

9. Could regulated rate design and tariff structures be developed to implement the development of a modern grid? What are examples of these?

Rate design requires regulators to balance multiple, sometimes conflicting values; the best tariff for one purpose may be unsuitable for a different purpose.[14] We understand this question to be asking how rate designs and tariff structures could encourage utility customers to make efficient consumption and DER decisions that are consistent with the utility constructing a modern grid, and/or deploy and use technology at their own premises in a way that optimizes the use of and/or contributes optimally to the grid.

For example, rates and tariffs could in theory encourage customers to manage their demand; manage their total consumption; avoid using a lot of generation at particular times; make a point of using a lot of generation at particular times (i.e., to preferentially charge batteries and other storage devices at those times); deploy combined PV and storage in a manner that provides maximum system or emissions avoidance benefits even if total energy output is slightly depressed compared to the maximum possible output; etc.

Today, most consumers of electricity, especially residential consumers, pay for electric service based on tariffs that do not reflect the dramatic variation in the cost of the underlying service depending on the time and location of consumption. Specifically, consumers are effectively given no incentive to avoid high levels of consumption at times or locations where electric service is exceptionally costly, nor to increase consumption when it is particularly inexpensive and clean. The absence of adequate price signals means that consumers have no incentive to achieve efficient levels of consumption—and the result is higher prices overall for all consumers. It also drives bad environmental outcomes for

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[12] Commonwealth Edison, Revised Smart Grid Advanced Metering Infrastructure Deployment Plan (October 3, 2012), available at http://blogs.edf.org/energyexchange/files/2014/01/Ohio-AEP-Com-Ed-plan-Ex-15-02.pdf.

[13] Indiana Utility Regulatory Commission, Docket No. 44720, March 7, 2016, available at https://www.in.gov/oucc/files/44720_Sett_Agr.pdf.

[14] The NARUC rate design manual issued in 2016 provides a broad examination of rate design options for the modern grid. NARUC, *Distributed Energy Resources Rate Design and Compensation Manual* (November 2016), available at: https://www.naruc.org/rate-design/.

several reasons. For example, time-variant pricing of electricity can be used to discourage use of the dirtiest generation, which is often from antiquated resources that are expensive to run; to encourage the use of non-emitting generation from intermittent resources when they are available (these typically have almost no variable costs), and deploy and operate those resources in a manner that optimizes the benefits for their owners and for the grid; and to manage consumption holistically so that demand can be balanced with intermittent supply in the most flexible manner possible. Conversely, the absence of time-variant prices makes it difficult to avoid the most polluting resources and integrate maximum amounts of intermittent supply efficiently. Today's flat price signals also fail to reflect the fact that if consumption rises too much in certain locations, major investments in infrastructure will be needed in the future, and the costs of those investments will be borne by future ratepayers. Many of today's ratepayers are also future ratepayers, but without meaningful price signals reflecting both the short and long-run marginal costs of additional stress on particular system elements, price signals fail to encourage them to contain the future costs that they themselves will bear.

A smarter system will be one that makes strides toward rectifying this dysfunction in pricing. As Professors Boyd and Carson have explained, "[g]iven the truly massive task of decarbonizing the power sector over the coming decades, ratemaking could turn out to be a critical tool in facilitating and scaling key innovations necessary for a low-carbon electricity system…."[15] In New York, for example, the REV reforms have included a push for piloting "Smart Home Rates." These rates would be designed specifically to give residential customers who are early adopters of sophisticated technologies an opportunity to use the capabilities of those technologies to manage their electricity consumption in a manner that has favorable outcomes for the system. For example, Con Edison's Smart Home Rate pilot would include demand-based pricing for delivery system costs as well as real-time pricing for supply costs.[16] While Smart Home Rates may be especially complicated and potentially challenging for customers to get used to (especially customers without technologies that help automate responsiveness to demand and time-variant prices), a range of more modest reforms are also being explored in Con Edison's AMI rate pilot and more generically in the Value of DER ("VDER") proceeding, where NY Department of Public Service Staff is working with the utilities and other stakeholders to design next-generation tariffs for DER owners.

Demand-based rates for delivery service have been given considerable attention throughout the REV process in New York – perhaps because they address more directly than other innovative rate designs the problem of peak demand rising too fast compared to ordinary consumption – but their importance for achieving clean energy goals has recently become clearer as environmentally beneficial electrification has become a front-burner issue. In May of this year, EDF teamed up with a diverse coalition consisting of New York's joint utilities, the Institute for Policy Integrity at NYU School of Law, New York Battery & Energy Storage Technology Consortium, and parties with a particular interest in geothermal heating to file comments in the VDER proceeding describing some principles of what is

[15] Boyd, W. and Carlson, A. (2016) "Accidents of Federalism: Ratemaking and Policy Innovation in Public Utility Law." University of California Los Angeles Law Review, 63: 810, 878 (2016).
[16] *See generally* NY PSC Case 14-M-0101, Proceeding on Motion of the Commission in Regard to Reforming the Energy Vision, Consolidated Edison Company of New York, Inc., Orange and Rockland Utilities, Inc., Smart Home Rate REV Demonstration Project Implementation Plan (filed August 27, 2018).

wrong with today's electric pricing and what more efficient tariffs might look like, including the following observation:

> "The current, mainly volumetric, pricing of electricity service treats all kWh the same within a utility's service territory – with only limited variations in supply rates throughout the year. Many costs, however, vary significantly by time and location. In particular, many costs associated with building, maintaining, and operating the electricity grid are incurred based on peak usage – on an individual customer basis, a local system basis, and on a bulk power system basis. This disconnect between rates and costs creates misleading price signals that lead to inefficient customer usage decisions and deployment and use of DER without consideration of its impact on the system. Under this type of pricing, desirable beneficial electrification technologies that significantly increase a customer's kWh consumption, but which may actually reduce that customer's peak usage, or usage at system peak, would increase their delivery service bill even though they could be reducing underlying system costs. Conversely, customers adopting certain technologies that reduce overall kWh usage, but do not alter their peak usage, or usage at system peak, would see lower delivery service bills even though their overall impact on the system remains the same. This leads to an inequitable distribution of costs among utility customers."[17]

In contrast to delivery service, electric supply is, and should be, priced volumetrically, but it should also vary by time and location. Time-variant electric rates are somewhat more well-known and have been piloted in more locations than demand-based rates. Managing system costs through time-variant pricing is a promising way to contain costs to ratepayers in the future, and is also relevant to clean energy outcomes because of the time-variant nature of wholesale market prices of generation and the relationship between those wholesale prices and environmental outcomes. Implementing time-variant volumetric pricing to recover generation costs is not only efficient, as it aligns with cost causation, but also helps discourage consumption during high demand times. We are not yet deeply familiar with wholesale market dynamics experienced by New Jersey consumers, but we are aware that in New York, the highest priced times correlate largely with the times when emissions are highest, because some of the least efficient, most polluting units are only used during those times.[18] In any case, the environmental price signal embedded in the supply charge would be magnified if generation were subject to a price on carbon. The more precise the time-variant signal, the more it can help customers respond in a manner that makes optimal use of intermittent renewable resources.

The costs of electric supply also vary with location, due to transmission constraints and different levels of demand across geography that result in location-dependent prices. However, allowing electricity prices to vary with location can be politically and/or legally

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[17] NY PSC Matter 17-01277, In the Matter of the Value of Distributed Energy Resources Working Group Regarding Rate Design, Coalition for Sustainable Distributed Clean Energy Comments on Rate Design Successor to Net Metering for Mass Market Customers (May 29, 2018), available at http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId={F65D1001-457A-42E5-972F-2C8CE31A7EBC}.

[18] Martin, Nick (2015). "Carbon-Tuning New York's Electricity System: Uncovering New Opportunities for CO2 Emissions Reductions." Pace University School of Law, Pace Energy and Climate Center, November 2015.

challenging. One alternative to this is to provide a price premium to DERs that generate in places that face higher supply costs. Specifically, regulators could target DER owners with a price signal that embeds the locational specificity and environmental value not fully reflected in consumption tariffs. The "value stack" compensation developed in the VDER proceeding uses such specificity to direct PV to the most useful times and locations, and encourage PV owners to enhance its value by pairing it with storage or other technologies that improve the quality of the services it provides to the grid. The value stack specifically compensates eligible resources for values including energy commodity ("LMP," also known as "locational marginal price," an amount based on the wholesale price of energy commodity, at a particular location and time), a capacity value that takes into account intermittency or dispatchability of the resource, distribution system value ("D"), and environmental value ("E"). The environmental compensation, E, would be the greater of the applicable Tier 1 Renewable Energy Credit ("REC") price per kWh or an amount based on the Social Cost of Carbon per kWh (net of the RGGI price, to avoid double payments for the same carbon savings).[19] A future value stack, whether in New York or elsewhere, could potentially include additional environmental values, such as avoided costs relating to pollutants other than carbon dioxide.

Finally, for new rate structures to achieve results at scale, they must become the "new normal" – which is why one of the most exciting aspects of Con Edison's AMI rate pilot is that some pilot participants will be given the new rates as their default pricing (with bill protection). Similarly, California, which has rigorous clean energy goals, is rapidly moving toward default time-of-use pricing. Defaulting customers onto these more advanced rates not only mainstreams new rate structures, but given that only a small percentage of customers ever opt out of tariff structures,[20] it also ensures that a large majority of customers will be subject to these rates.

13. Should residential, commercial, or industrial customers of the energy distribution systems receive a benefit, incentive, or subsidy to fund upgrades to the grid? What types and level of incentive should this include or not? Should this include rate and tariff designs/structures? Should these incentives be limited to low and moderate-income households?

This question seems to overlap substantially with question #9 in these Modernizing the Grid discussion points. For purposes of these comments, we surmise that this is intended to refer to customers installing resources on their own premises that have the *effect* of enhancing/improving the operation of the grid. With that in mind, we refer you to our response to question #9 above – specifically the description of the "value stack" developed in New York's VDER proceeding. Default consumption tariffs that enable customers to reduce their costs by relying heavily on advanced technology – such as the "Smart Home Rates" being developed in New York – could also help provide incentives for customers to install such resources.

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[19] *See* NYPSC Case 15-E-0751, In the Matter of the Value of Distributed Energy Resources; Case 15-E-0082, Proceeding on Motion of the Commission as to the Policies, Requirements and Conditions For Implementing a Community Net Metering Program, Order on Net Energy Metering, Transition, Phase One of Value of DER, and Related Matters (March 9, 2017), at 106, footnote 42.

[20] *See, e.g.,* Todd, A. et.al. (2013). "Smart Grid Investment Grant: consumer behavior study analysis", Lawrence Berkeley National Lab LBNL-6247E; the percentage of individuals opting out of a tariff they have been defaulted onto is relatively low, whereas voluntary opt-in rates tend to have very low adoption.

Technology

16. What technologies and measures can be adopted to make the energy distribution systems more efficient and reduce losses? How do these technologies assist in managing annual and peak load?

EDF notes that Volt/VAR Control, has been an integral component of grid modernization efforts across the country. Integrated Volt/VAR Control ("IVVC"), also known as voltage optimization ("VVO"), involves the management of various electric distribution system assets and advanced control technologies to "right-size" the voltage delivered to end-use electric customers.

Remarking on the importance of VVO as a grid modernization component, the National Association of Regulatory Utility Commissioners stated that "VVO technology serves as a platform for potential future grid modernization initiatives that can deliver operational visibility, efficiency, and control of the electric distribution grid, improving reliability and customer service for a relatively small incremental investment."[21]

VVO can help manage the integration of DERs across the electric grid and also reduce overall voltage levels, while ensuring these voltages remain within acceptable standards for electric distribution. Reductions in distribution system voltage have been demonstrated to result in reductions in energy consumption across the electric circuits on which this practice is applied. For example, in a September 2014 report published by the U.S. Department of Energy ("DOE") on Duke Energy's smart grid investments entitled "Integrated Smart Grid Provides Wide Range of Benefits in Ohio and the Carolinas," the DOE found that Duke Energy consistently achieved 2% voltage reduction on over 200 Ohio distribution circuits where VVO was deployed, reducing system losses and fuel costs for its power generation.

More recent VVO deployments have consistently achieved 4% energy savings by using software to monitor voltage along the entire circuit to the customer's meter. Customers across circuits with active VVO management and lower voltage levels consume less energy without needing to make changes to their individual consumption behavior. Investments in VVO technology and grid modernization can result not only in energy reductions, but also may provide additional visibility and operational flexibility in managing DERs and responding to a variety of dynamic system conditions.

In New Jersey, RECO is planning to roll out VVO as part of their AMI program and anticipates $1.8 million in benefits from a reduction in the amount of power purchased and consumed due to VVO. Also, the Clean Energy Act directs state utilities to study and consider the effectiveness of this technology.

To offer other specific examples of how this grid modernization practice can help optimize the use of grid assets and advance energy goals, here is a snapshot of a few states, which

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[21] National Association of Regulatory Utility Commissioners EL-2/ERE-3. Resolution Supporting the Rapid Deployment of Voltage Optimization Technologies, adopted November 14, 2012, available at http://pubs.naruc.org/pub/53A0D9D5-2354-D714-51C7-09A3F27DACAE.

have committed to a large-scale assessment or deployment of VVO:

- In North Carolina, EDF negotiated a commitment from Duke Energy Carolinas to perform a cost-benefit study for full deployment of voltage optimization. The recently released report shows that it would be cost-effective for the utility to invest $1 billion in voltage optimization over the next 26 years, and that this would produce $2 billion in benefits, including 115,000 tons of CO2 reductions annually.[22]
- In Ohio, EDF has been an active participant in AEP Ohio's gridSMART case, in which American Electric Power (AEP) filed its cost/benefit study for full deployment of VVO in June 2018. AEP customers would realize "$1.52 in VVO benefits for every dollar of VVO related capital and O&M costs incurred over 15 years... In addition, improved energy efficiency associated with VVO is estimated to reduce CO2 emissions by 8,602,913 metric tons ("t") over 15 years."
- As part of the Reforming the Energy Vision initiative in New York, the Public Services Commission required utilities to submit plans for grid modernization including near-term and long-term VVO plans.
- In Illinois, following an agreement reached by EDF and other advocates, the Illinois Commerce Commission approved Ameren's $122 million voltage optimization plan. The plan commits to prioritizing lowering voltage on electric lines in low- and moderate-income communities.

EDF recommends that the 2019 Energy Master Plan include voltage optimization as one component. More specifically, EDF recommends that the utilities, upon completion of the required system studies, report on the current capabilities for voltage optimization across their systems, and outline a pathway to identify the potential for energy savings and carbon reductions that can be achieved with strategic, cost effective additional investments.

17. What is the role of advanced meter infrastructure, IoT, and data analytics in the modern grid? How can technology assist in two-way communication, trouble shooting and overall grid management? What changes in operating protocols and grid designs will be needed to handle the two-way flow of power?

As mentioned above in response to #1 and #2, the degree to which individual drivers like DER penetration and extreme weather events affect individual distribution systems and customer bases vary. This is why it is essential to identify and understand what the most pressing energy related pressures are that New Jersey's electric grid has to address. Careful analysis should precede rushed responses and too narrow technology discussions and inform how, which, and when challenges should be pursued. Some basic questions that can guide such an analysis are:

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[22] 2018 Smart Grid Technology Plans of Duke Energy Carolinas, LLC and Duke Energy Progress, LLC, Docket No. E-100, Sub 157, available at: https://starw1.ncuc.net/NCUC/ViewFile.aspx?Id=637b938c-008b-4b25-bc20-b50d9d9f5034

a. Does our existing grid allow us to achieve our policy objectives?
b. Can additional investments allow us to better achieve these policy objectives?
c. Provided we have a uniform and agreed upon benefit cost assessment framework, can these incremental investments be made in a cost-effective manner?
d. What are the key grid functionalities needed to advance the state's policy goals and which ones contribute to more than one EMP goal objective, *e.g.*, DER integration and customer empowerment?

In order to maximize grid modernization benefits these basic questions need to be thoroughly reviewed before settling on more specific technologies or approaches.

Over the last few years, various states have concluded that AMI is a foundational technology that can enable a range of desired grid functions.[23] As the power system transforms into a dynamic, interconnected network, increased short-term variability and uncertainty of net load[24] will increasingly be the norm requiring granular visibility of distribution systems.[25] At the same time, climate trends reinforce the need for resilience while customers demand more choice in making energy decisions. AMI aligns with all of these emerging issues. As a recent AMI brief by the Northeast Energy Efficiency Partnership put it, "[d]eploying AMI opens the door for the electric grid to step into the twenty-first century."[26]

More specifically, AMI not only allows the utility to provide more reliable service but also improves voltage optimization and gives customers opportunities to save on their energy bills through access to their energy usage data. The following explanation from a recent Ohio rate case provides more detail:

> "The opportunity for consumers to save energy and save money with smart meter data is based on advances in computational capability that did not exist a decade ago. With energy efficiency efforts, one fundamental problem has been the expense of evaluating how much a home or building is wasting energy and identifying appropriate steps needed to reduce that waste. In the industrial and large commercial sectors, the amounts of energy consumed are large enough to justify significant investments in customer-owned submeters on electric circuits and information technology systems to analyze energy use (even though those investments are often unnecessary in theory because the utility's advanced meters collect the same information). However, in the residential sector, loads are much smaller and more diverse, meaning that efficiency solutions that depend on usage data have been severely limited up until recently because of a multi-hundred-dollar cost per

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[23] The North Carolina Clean Energy Technology Center, 50 States of Grid Modernization, available at https://nccleantech.ncsu.edu/the-inaugural-50-states-of-grid-modernization-report-now-available/.
[24] California ISO, What the duck curve tells us about managing the grid, available at https://www.caiso.com/documents/flexibleresourceshelprenewables_fastfacts.pdf.
[25] Martinot, Eric. Grid Integration of Renewable Energy: Flexibility, Innovation, and Experience, pre-publication version, Annual Review of Environment and Resources 2016.
[26] Advanced Metering Infrastructure: Utility Trends and Cost-Benefit Analyses in the NEEP Region, February 2017, http://www.neep.org/sites/default/files/resources/Advanced%20Metering%20Infrastructure%20-%20Utility%20Trends%20and%20Cost-Benefit%20Analyses%20in%20the%20NEEP%20Region.pdf.

home in metering equipment, communications systems and installation is necessary when advanced meter data are not easily accessible.

"A real opportunity in the residential sector is the availability of continuous energy usage information in a secure, standard electronic format made available by AMI. Energy usage patterns vary greatly across households – very few homes are alike. A detailed analysis of each home's use opens the door to tailored and highly effective strategies for managing energy use and helping consumers save money. Research and experience in other states shows that energy conservation solutions that use granular and real-time data generate bill savings more effectively and in many instances can cost ratepayers significantly less than traditional energy efficiency programs."[27]

18. Who should manage and oversee access to advance meter infrastructure data? Who should own the data?

Most importantly the customer should have free, easy, timely, and secure access to his or her energy usage data and be able to share that data seamlessly with a third-party of their own choosing in a standardized format. To this end, the industry standard Green Button Connect My Data ("GBC") should be considered as the primary pathway for offering secure, convenient, and standardized methods to access and share data. GBC was recently adopted by RECO in New Jersey[28] and has been adopted by utilities in California, Colorado, Illinois, Texas, and New York.

More broadly speaking, the Open Data Access Framework ("ODAF"), developed by EDF and the Citizens Utilities Board for use in Illinois provides a good reference point, and sets out the guiding principles for access to customer energy usage data.[29] Addressing issues such as types of data, third party authorization and access, data format, methods of delivery, timeliness, billing quality data, data security, the ODAF offers utilities and regulators the underpinnings for a robust data access policy.

19. What advanced distribution monitoring or distribution monitoring systems should be in place to manage and control the energy distribution systems?

As mentioned in our response to #17, integrated and data-driven discussions are essential to identifying key grid functions needed to advance the state's policy goals. Clarity on these foundational points will not only inform and prioritize which technologies and practices are needed, but it will also enable stakeholders to evaluate whether the respective utility investment projects are in alignment with state priorities and maximizing public benefits.

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[27] Direct Testimony of Michael Murray, *In the Matter of the Application of Duke Energy Ohio, Inc. for an Increase in Electric Distribution Rates,* Case No. 17-32-EL-AIR (June 27, 2018) at pp. 8-9), available at: http://dis.puc.state.oh.us/TiffToPDf/A1001001A18F25B65540J05939.pdf.

[28] New Jersey Board of Public Utilities, *IN THE MATTER OF THE PETITION OF ROCKLAND ELECTRIC COMPANY FOR APPROVAL OF AN ADVANCED METERING PROGRAM; AND FOR OTHER RELIEF,* August 23, 2017, Docket No. ER16060524, available at: https://www.state.nj.us/bpu/pdf/boardorders/2017/20170823/8-23-17-2F.pdf.

[29] EDF and CUB, *Open Data Access Framework,* available at: http://blogs.edf.org/energyexchange/files/2014/08/14- -CUB-EDF-Exhibit-1-1-Open-Data-Access-Framework-FINAL.pdf.

20. What are the current technological advancements for natural gas leak detection and how often should the natural gas distribution system be reviewed for leaks? Should specific methods leak detection and mitigation measures be mandated?

The state's gas distribution utilities should adopt advanced leak detection and quantification technologies as a faster and more effective approach to detecting, quantifying, and prioritizing natural gas leaks for repair and replacement. This newer technology is more sensitive and detects smaller, hard-to-find leaks as well as larger leaks that represent a climate, economic, and safety concern.

In 2015, the BPU approved the PSE&G Gas System Modernization Program (GSMP I). The order provided that the company would use data on leak flow rate (the volume of methane leaking from gas pipes) to help prioritize its local distribution pipe replacement program. As part of a collaborative project[30], PSE&G used EDF's flow rate data to prioritize gas lines for replacement in order to reduce emissions more rapidly. Our analysis from this pilot shows that using leak flow rate for prioritizing pipe replacement allowed PSE&G to achieve an 83% reduction of quantified methane emissions early on by replacing one-third fewer miles of gas lines than that needed to achieve the same level of emission reduction under a business-as-usual scenario.

In May, 2018, the BPU approved PSE&G's GSMP II. The order provided that PSE&G use methane emission flow volume as part of the prioritization process for the replacement of 280 miles of Utilization Pressure Cast Iron mains (out of a total of 875 miles of mains replaced). Additionally, PSE&G will hire a third-party vendor to conduct the survey, a significant advancement from GSMP I when EDF conducted the survey. Upon completion of the survey, PSE&G will consult with EDF to establish a threshold based upon the survey data to determine the pipeline replacement prioritization.

There is now sufficient momentum in the industry to adopt and fully operationalize these technologies. Utilities like CenterPoint Energy and Pacific Gas & Electric Co. have already deployed advanced leak detection technologies across a majority of their service territories. NJ utilities should be required to adopt these technologies.

II. <u>Sustainable and Resilient Infrastructure Discussion Points</u>

General

2. What are pathways forward to ensure New Jersey has secure, modern, and resilient infrastructure by 2030? By 2050?

Conduct an energy system modeling study over the entire NJ economy, which would include not only the power sector but the other energy sectors of the economy, to identify least cost pathways to transition New Jersey from its current energy system to one that is secure,

[30] *See* Collaboration with PSE&G: Data helps prioritize gas line replacement, available at https://www.edf.org/climate/methanemaps/pseg-collaboration.

modern, resilient, and decarbonized consistent with the state's economy-wide climate goals. A recent study for Minnesota provides a good example.[31]

3. What is the role of restructuring and competitive markets on infrastructure and energy needs?

States with restructured electric sectors, where electric distribution companies purchase electric power in competitive markets, get the benefits of competitive pricing for electric commodity. These wholesale markets operate on various timescales, ranging from long-term capacity needs to hourly pricing to real-time frequency regulation. Natural gas wholesale markets provide some similar competitive dynamic; however, they have evolved largely to meet heating needs, which are less time-sensitive, and they do not provide the granular price signals that are vital to proper operation of the electric wholesale markets. As the electric generation fleet has become increasingly dependent on natural gas supply, the divergence of these two sectors and the practices prevalent in them has emerged as a salient issue – one that will grow even more urgent as the electric sector becomes increasingly dependent on a combination of intermittent renewable resources, which require system flexibility to absorb their intermittency, and natural gas-fired generation. Standardizing the pricing of flexible (non-ratable) fuel delivery services in the gas market – and ensuring that prices in the electric markets reflect the real fuel delivery costs to power plants – will foster appropriate competition between the natural gas supply chain and new lower-cost, data-driven flexibility resources like demand response and storage. Updating wholesale energy markets so they value flexibility will alter the risk/reward balance toward entrepreneurial innovation and away from monopolistic pipeline investments.

State Policy

8. What is the role of the following in achieving 2030/2050 goals: decoupling; advanced metering infrastructure (AMI); distributed energy resources (DER); and micro grids? If previously answered in another stakeholder group, please cite which one.

We address the role of decoupling in our response to question 1 in the Reducing Energy Consumption section below. As a general matter, decoupling is necessary but insufficient to reduce utility companies' financial interest in maximizing electricity sales (sometimes called the "throughput incentive"). Together with other similar reforms, addressing the throughput incentive supports achievement of 2050 goals because it helps focus electric utility companies' attention and resources on efficient use of infrastructure they have and developing the infrastructure and business practices that New Jersey will need to meet its clean energy goals.

We address the role of advanced metering infrastructure in our response to question 17 in the Modernizing the Grid Discussion Points section above. In summary, AMI is a common grid modernization investment that offers resiliency benefits and enables energy consumption and demand reductions (through voltage optimization and demand management opportunities it enables, such as through demand-based rates) that make clean energy procurement more achievable and affordable. It also enables price signals that

[31] *See* Minnesota's Smarter Grid: Pathways Toward a Clean, Reliable and Affordable Transportation and Energy System (prepared by Vibrant Clean Energy, LLC, for McKnight Foundation & GridLab) (July 31, 2018), available at https://www.mcknight.org/wp-content/uploads/MNSmarterGrid-VCE-FinalVersion-LR-1.pdf.

allow customers to disfavor the most costly, highly polluting generators and rely much more heavily on generation from intermittent renewable resources.

10. What potential stranded assets could be created with increased energy efficiency, distributed energy resources, and the move to 100% clean energy?

As a general matter, assets may become stranded if they become uneconomic or uncompetitive prior to reaching the end of their economic life (as assumed at the time of the investment) as a result of changes associated with the transition to a clean energy economy. In other words, these assets become uneconomic and non-performing before their capital costs are fully depreciated, creating a liability for their investors and/or future ratepayers. The assumption that certain assets have useful lives of 40 years or even much longer – and the practice of setting rates based on that assumption – is inconsistent with clean energy goals that will require those assets no longer to be in use as of a date that is earlier than the end of its useful life. Exactly which assets are at risk will depend on the specifics of how clean energy is defined. However, it seems likely that all infrastructure associated with fossil fuel combustion where carbon capture and sequestration is not an option is likely to present this risk, as well as all infrastructure that is prone to permitting methane to escape into the atmosphere. Given the technical realities of on-site natural gas combustion at customer premises and the distribution infrastructure that serves it, natural gas distribution infrastructure may be especially prone to becoming a stranded asset. Conversely, non-emitting electric generation and the infrastructure that makes it available and useful is unlikely to become stranded since electrification is expected to increase total electricity consumption and system utilization even as efficiency improvements reduce waste and distributed energy resources reduce demand for grid-supplied power.

12. What level of coordination is required between state and national standards (i.e. RGGI, California Car, etc.) to meet the EMP's goal? What steps could be taken to coordinate standards?

EDF commends New Jersey for initiating a regulatory process to rejoin the Regional Greenhouse Gas Initiative ("RGGI"). As a regional program, RGGI provides a model for coordination between state goals and regional realities. Regional market-based mechanisms, such as RGGI, that set a clear cap on carbon pollution from new and existing power plants and enable compliance through tradeable allowances are a cost-effective approach for New Jersey to achieve carbon pollution reductions with flexibility for regulated entities to pursue the lowest-cost abatement opportunities. New Jersey should set an emissions budget that drives meaningful reductions in carbon dioxide emissions beyond a transparently determined business-as-usual scenario, and declines over time to put the state on a trajectory to zero power sector CO2 emissions by mid-century. Rejoining RGGI with a meaningful emissions budget would enable New Jersey to reduce carbon pollution flexibly and cost-effectively.

RGGI carries significant climate and public health benefits — New Jersey should strive to maximize cost-effective carbon pollution reductions from the power sector through participation in RGGI. Emissions leakage is the potential for CO_2 emissions from power plants outside RGGI to increase as a result of the regional carbon cap. For New Jersey, leakage could occur if the embedded RGGI carbon price increases energy costs for RGGI generators enough to shift CO_2-emitting generation to sources outside RGGI. In this case, even if CO_2 emissions from generators in the RGGI region (including New Jersey) decline relative to business as usual, it is possible some absolute CO_2 reductions could be diluted by increases in carbon-emitting generation across the region from generators located in states outside RGGI.

In order to maximize low-cost CO_2 emission reductions through RGGI, New Jersey should take concrete steps to mitigate the potential for emissions leakage. Previously, New Jersey and the RGGI states opted to monitor for changes in power flows and CO_2 emissions for indications that leakage could occur, and to address leakage by expanding policies to reduce electricity demand in the long-term. However, demand reduction policies may not be sufficient to eliminate near-term leakage effects caused by changes in dispatch order from incorporation of the RGGI carbon price into energy bid offers. The RGGI carbon price could potentially lead to higher-emitting generators outside RGGI — which do not currently face the carbon price — becoming more highly favored in PJM's least-cost dispatch model and importing emissions that are not subject to the limit on carbon pollution into New Jersey.

New Jersey should strive to mitigate near-term leakage potential, including by evaluating policies that would cover emissions from electricity imported into New Jersey to serve New Jersey load.

III. Clean and Reliable Transportation Discussion Points

General

EDF is a member of ChargEVC and our recommendations align with their comments. We call particular attention to the Urban Focus section of CEVC's comments and the need to develop and execute transportation electrification efforts in communities that suffer disproportionate air quality impacts.

3. What is the role of clean transportation in freight movement? What should the State do to promote low-carbon freight/goods movement?

The state should develop policies and programs to accelerate the electrification of the medium/heavy duty vehicle market. Heavy duty vehicles – which range from box vans to buses to tractor-trailers – perform critical tasks for the economy but these vehicles are a major source of environmental harm. They account for a quarter of all transportation GHG emissions globally and are on pace to nearly double these emissions by 2050.[32] Emissions from diesel trucks degrade air quality at the local level and lead to tens of thousands of premature deaths annually.

15. What infrastructure investments, policies, and procedures are needed to support the future of clean transportation in the state? What infrastructure needs will the state have in the promotion of clean and alternative fuel vehicles?

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[32] *Nature*, 25 May 2017, doi:10.1038/nature22086

New Jersey does have an extensive passenger rail system that is electrified and highly efficient, with low CO_2 emissions per passenger mile. A low carbon economy must find ways of maintaining and upgrading this system. The advancement of the first phase of the Gateway Tunnel program is also vital so that the existing, Sandy-damaged, aging tunnels can be properly maintained.

IV. Reducing Energy Consumption Discussion Points

General

1. What energy efficiency, peak demand reduction, and demand response programs and systems will assist in helping keep energy affordable for all customer classes, especially as technology advances in areas such as electric vehicles or heating and cooling, which will potentially increase electric energy usage?

Under conventional utility regulation, electric utilities' ability to make money in the long term depends on their investment in infrastructure and on their sales. The history of the electric system has largely been a history of rising demand, as energy consumption fueled the country's industrialization and growth. Today, economic maturity and energy efficiency have tempered the growth of overall demand, but peak demand continues to rise, fueling an ongoing justification for continuing to invest in new capacity. Because building additional capacity enlarges the rate base (the invested capital with respect to which utilities are entitled to have an opportunity to earn returns), this business model inevitably gives utilities an interest in energy use (or at least peak demand) increasing over the long term.

In addition to these long term incentives in more infrastructure and more energy use, because electric utilities earn revenue on a per-kilowatt-hour basis, they have a short-term interest in selling as much energy as possible. An incentive to maximize energy sales may have made sense historically, when electrification was transforming the American economy, and it may still make some sense for vertically integrated utilities, which are at least partly in the business of generating and selling electricity. However, in the case of restructured utilities, the business model of which is limited to electric distribution, it makes little sense and is poorly aligned with the public interest, since it naturally undermines efforts to encourage utilities to support energy efficiency, as utilities are effectively penalized for selling less power than anticipated. This is especially contrary to the public interest in the context of the energy transition, where significant investment in new resources is anticipated to be needed, leaving even less headroom for wasteful practices.

Energy efficiency, peak demand reduction, and demand response all have a critical role to play in containing system costs. This is essential because obsolescence alone would otherwise be likely to drive increased system costs in the near future, and the urgent needs of the energy transition will require investments in new resources that may not be utility owned. These three areas of activity are significantly overlapping and cannot be fully isolated from one another, as illustrated below.

Energy Efficiency. The Clean Energy Act of 2018 mandates that electric and gas utilities achieve all cost-effective energy efficiency which will reduce energy consumption and, over time, provide savings to all customer classes. A comprehensive energy efficiency program package should be developed and should be informed by data and existing "best practices."

Additionally, appliance standards must be adopted and then properly implemented. Enforced appliance standards and building codes will increase energy consumption savings. Programs serving low income customers should be expanded.

Although the Clean Energy Act is a promising step forward, it does not address any of the fundamental issues in the utility business model that give rise to the throughput incentive. So even though the mandates may be achieved, the utilities will continue to have a financial interest in selling as much power as possible, despite this not being in the public interest. Revenue decoupling, which protects utilities against revenue "shortfalls" when less electricity is sold than was expected to be sold during the rate term, is an important step toward neutralizing this incentive. With decoupling in place, utilities can see good profitability from efficient practices even as they sell less energy. It's imperative to adopt decoupling in order to align electric utilities' financial interest with the public interest in keeping load growth and consumption in check, making room for the utility and other parties to invest in developing a decarbonized energy system.

That said, decoupling alone does not eliminate the utilities' upside interest in selling more energy than expected during a given rate term, and does not address the utilities' long-term interest in increasing their rate base by enlarging their systems. Additional reforms are necessary. The most urgent imperative is to work to neutralize the utilities' bias in favor of the traditional capital investments that drive their rate base growth and are the basis for earnings over the long term.

<u>Peak Demand Reduction</u>. The REV reforms that have been undertaken by the New York Public Service Commission can provide a useful template here. In REV, concerns about growing system costs driven by impending obsolescence and demand growth were among the leading drivers of reform and were among the chief reasons why the regulator vigorously pursued fundamental electric utility reforms. Therefore, strategies to contain peak demand itself and the costs of strategies to address growing peak demand are chief among REV reforms.

To modify the utilities' established practice of continually expanding infrastructure as the go-to means of meeting identified system needs, the NYPSC required all the utilities to seek to meet some such needs through non-traditional solutions: Non-Wires Alternatives ("NWAs"). Planning for and fostering NWAs supports the transformation to a clean energy economy in at least two ways. First, it can help contain system costs, freeing up money that would otherwise be spent on endless upsizing, to be used for clean energy transition purposes. Second, many technologies that can substitute for system enlargement are also directly supportive of the clean energy transition, whether because they decrease the need for electricity entirely (as in the case of energy efficiency) or because they increase the system's ability to handle high levels of penetration of intermittent resources.

The first and still most well-known NWA effort in New York State is the Brooklyn Queen Demand Management ("BQDM") initiative in the Con Edison service territory. The BQDM program illustrates nicely how NWAs can advance clean energy transition goals. Specifically, energy efficiency at a massive scale has driven BQDM's success—making the program a win for the utility (which has been granted an opportunity to realize earnings by deferring the need for the substation, as discussed below), the community (where customers are enjoying the benefits of efficiency, including lower bills, and avoiding the disruption of a major infrastructure improvement as well as the local emissions that would have come with a combustion-based solution), ratepayers at large (who have for now avoided adding $1.2 billion of capital improvements to rate base and still enjoy savings even after the utility realizes earnings), and also society at large, as everyone benefits from the reduced reliance on conventional fossil-fueled electric service. Other resources that are providing part of the solution or are expected to do so in the future include fuel cells, combined heat and power ("CHP"), smart thermostats, microgrids, solar photovoltaic panels, demand response, and battery storage, among others. Significantly, energy efficiency is a carbon-free resource, and many other resources that are expected to play a role in the BQDM program in the coming years are also low-carbon or carbon-free.

Moreover, to reduce the utilities' *drive* to rely on such infrastructure expansions as the basis for future earnings growth, the NYPSC gave utilities earnings opportunities related to managing peak growth. One such opportunity is NWA compensation based on avoided infrastructure investment. Through this mechanism, although building infrastructure to meet peak demand is one way for utilities to build future earnings, finding ways to build *less* infrastructure is another viable path. In addition, Earnings Adjustment Mechanisms ("EAMs"), whereby utilities can receive additional basis points by meeting certain targets, can be leveraged as an additional means to reward utilities for achieving peak reductions. This tool is being used, for example, in connection with peak reduction programs in place in the Con Edison service territory.

Finally, it is worth observing how the NYPSC is considering using the marketplace itself to manage peak demand growth. Specifically, as further discussed in our response to question 9 in the Building a Modern Grid Discussion Points section of this document, demand-based rates are receiving serious attention as a way to give mass market customers an incentive to manage their own peak demand and deploy their own energy management technology in an efficient manner.

<u>Demand Response</u>. Traditional demand response programs tend to involve only a narrow swath of market actors. However, innovative rate designs currently under development coupled with smart technology may in the future engage a much larger share of market participants in "price responsive" demand response to provide flexibility needed to integrate vast amounts of renewable but intermittent resources into the grid, as today's passive price-takers become full-fledged market participants. Innovative rate design will play an especially important part in demand response as electrification of vehicles expands. Specifically, ensuring that EV owners are charging during the moments of the day that are less constrained and thus less costly will help reduce strain on the system and reduce the need for infrastructure investments. This can be achieved by having time-variant prices, and in particular, coincident peak demand charges. Coincident peak demand charges incentivize customers to charge during off-peak periods, whereas non-coincident demand charges penalize customers for charging regardless of whether the charging happens during low cost and low congestion moments of the day.

2. With the coming requirement that all commercial buildings over 25,000 sq. ft. be benchmarked through EPA's Portfolio Manager, what programs should be created to help with benchmarking and reduction strategies?

The Institute for Market Innovation (IMT),[33] a national organization that works to unlock the potential of energy efficiency through solutions like benchmarking, identifies reporting and transparency as two critical components of successful benchmarking programs.[34] IMT has also developed a benchmarking toolkit[35] that provides guidance on how to use and deploy benchmarking data that will benefit cities, energy efficiency service providers, utilities and building owners.

New York City has required benchmarking using EPA Portfolio Manager for several years,[36] and many lessons learned there may be transferrable to New Jersey. We would recommend that New Jersey policymakers seek out IMT and New York City policymakers to advise as to best practices. In our own experience, one salient learning from the New York City experience is that to be effective, benchmarking results need to be transparent and readily accessible to the public (by street address and not by block & lot numbers) on a website.

3. What are the key non-energy benefits associated with energy efficiency? How can their value best be considered in cost-benefit analyses?

Non-energy benefits ("NEBs") of energy efficiency typically fall in three categories: utility, participant, and societal. Utility NEBs accrue to the utility and result from reductions in administrative costs such as collection costs related to fewer arrearages, uncollected bills, bad debt write off, termination and reconnections, collection notices, and safety calls. Participant NEBs accrue to occupants and include improvements in indoor air quality, health, safety, and comfort and reduced operations and maintenance costs. Societal NEBs accrue to society and include improvements to local air quality, environment, economy, and public health and safety.

Utility NEBs are well-studied and relatively easy to quantify. It's relatively more difficult to quantify and monetize participant NEBs. Nonetheless, participant NEBs should not be ignored in the cost-benefit analysis. There are several approaches available, such as proxies and alternative benchmarks, to approximate the value of some hard-to-quantify participant NEBs. There are robust approaches available to quantify certain societal NEBS such as the avoidance of emissions of greenhouse gas emissions (CO_2 and methane) and criteria air pollutants (SO_2, NO_x, particulates, VOCs). These emissions avoidance benefits should be valued at their social cost per ton of pollutant using the best available scientific estimates. For other societal NEBs, attempts should be made to obtain a direct estimate. If that's not possible, practical, or cost-prohibitive, then proxies derived from the relevant literature should be used.

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[33] *See* https://www.imt.org/.

[34] *See* Institute for Market Transformation, Energy Benchmarking and Transparency Benefits, available at https://www.imt.org/wp-content/uploads/2018/02/IMTBenefitsofBenchmarking_Online_June2015.pdf.

[35] The toolkit can be downloaded from https://www.imt.org/how-we-drive-demand/building-policies-and-programs/putting-data-to-work/.

[36] *See, e.g.,* New York City's Roadmap to 80x50, *available at* https://www1.nyc.gov/assets/sustainability/downloads/pdf/publications/New%20York%20City's%20Roadmap%20to%2080%20x%2050_20160926_FOR%20WEB.pdf.

Technology

6. What advances in technology should be considered as part of a strategy to reduce energy consumption? What technologies could complement and advance existing energy efficiency efforts?

> We would recommend that close attention be given to technology related to environmentally beneficial electrification technologies, including the most efficient ground source and cold climate air source heat pumps currently available, and that New Jersey plan to remain abreast of further developments in this area. It is important to recognize that although switching from on-site combustion to electricity involves fuel switching, it can actually constitute an efficiency measure where less fuel is used to generate the electricity than would otherwise have been burned on site. This runs contrary to the received wisdom, based on older technology, that electric heat and hot water are intrinsically inefficient compared to natural gas-based equipment – a material departure that has been made possible by improvements in electric generation coupled with improvements in heat pump technology and related technologies.[37]
>
> We also recommend giving serious consideration to technology that implements volt-VAR optimization, as described in our response to questions #16 in the Building a Modern Grid Discussion Group section of this document, and to the advanced leak detection technologies and practices described in our response to question #20 in that section. Both these technologies reduce the loss of energy by the energy infrastructure itself, before it even reaches the consumer.

12. Should the state require energy efficiency in particular projects receiving state incentives?

> Yes, the state should require any project receiving state incentives to install all cost-effective energy efficiency measures and meet the most stringent building codes and appliance standards.

V. Clean and Renewable Power Discussion Points

General

1. For the purposes of the Energy Master Plan (EMP) and reaching Governor Murphy's goal of 100% clean energy usage in New Jersey by 2050, how should clean energy be defined?

> Adopting a technology-specific definition of "clean energy" today would amount to picking winners and saddling New Jersey with a rigidity that cannot keep pace with technology change. Instead, we would recommend that the "100% clean energy" goal be understood in a principled, flexible manner, which will leave space for a variety of fuels and technologies to play a part in meeting the goal provided they can be used and operated in a manner that conforms with the adopted principles.
>
> Our proposed guiding principle would be that clean energy consists of a *portfolio* of resources that, at the level of the portfolio, does not emit net greenhouse gases, and that

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[37] *See* Dennis, K., Colburn, K., Lazar, J. (2016). "Environmentally Beneficial Electrification: The Dawn of 'Emissions Efficiency'." The Electricity Journal. Volume 29. July 2016. http://www.sciencedirect.com/science/article/pii/S1040619016301075.

individual resources do not contribute to local pollution in a manner that harms human health or ecosystems.

As an illustrative example, this principle suggests that natural gas from geological sources (as opposed to, for example, renewable natural gas) may continue to play a role even in 2050, but that the role it plays in 2050 should be GHG-neutral – i.e., there should at that point be no methane loss and no GHG combustion emissions that are not captured and sequestered or offset. This suggests that infrastructure development between now and 2050 should be undertaken with that 2050 end state in mind. Current infrastructure that is not susceptible to being used in this manner poses a significant risk becoming a stranded asset, and decisions about investing in such infrastructure should be weighed against alternative investments in a manner that fully reflects that risk.

2. Should the definition of clean energy contain flexibility between now and 2050 to allow for transitional fuels to be used and phased out over time? What intervening steps should be taken to complete the transition?

Yes. Our proposed approach to defining 100% clean energy in 2050 is intentionally flexible insofar as the particular solutions supportive of that goal would be expected to change over the coming decades as the deadline nears.

3. What is the most significant obstacle to getting to 100% clean energy by 2050? How can the state address it?

The most significant obstacle is the risk that policymakers will not treat energy transformation with the urgency that the latest science, as described in the October 2018 IPCC report, has shown to be necessary. There are always competing priorities, always other important, even urgent, matters requiring immediate attention. And even where policymakers recognize the urgency, individual jurisdictions may fail to do their part because each one knows it can't solve the problem alone and may decline to suffer the costs of trying to take action while others do not. To date, action to reduce emissions has been so minimal that (as described above) the "efficiency gap" – failure to reap even the lowest-hanging fruit, cost-effective energy efficiency – has been permitted to persist at an alarming scale.

At this point, time is climate. Economists have long warned that the longer we wait to act on greenhouse gases, the more costly they will become due to accumulation.[38] Delay is especially costly in the energy sector, where assets are long-lived and investments that are ill-suited to future needs can become stranded costs. 2050 is already startlingly close considering the long life of energy assets – while 2030, the earlier deadline highlighted in the new IPCC report – is close even compared to the life of some household appliances. The bottom line of the IPCC report tells us that we are running out of time, but based on history, there is a substantial risk that the urgency of the moment will continue to go unrecognized.

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[38] *See generally* I. Paul, P. Howard, and J. Schwartz, The Social Cost of Greenhouse Gases and State Policy (October 2017), available at https://policyintegrity.org/files/publications/SCC_State_Guidance.pdf.

Transition and Technology

4. How can the State immediately begin to transition to clean energy production and distribution? What intervening steps should be considered to clean existing technology? How should stranded costs be addressed?

> While achieving 2050 goals is essential, the transitional period is fraught with danger. The state will need to make sure that state-jurisdictional investments made today are not committing the state to future dependence on an energy mix that will be considered detrimental in the foreseeable future as such investments will both limit future optionality and also drive increased stranded costs. Moreover, because methane is a short-term carbon forcer, meaning it does enormous climate damage in the near term, it would be unwise to wait until later in the transition to comprehensively address methane leakage. It is critically important that New Jersey reduce methane emissions from the distribution segment of the supply chain, while ensuring, to the extent possible through state policy and regulations, that unnecessary expansion of new infrastructure neither locks in methane and CO_2 emissions nor crowds out renewable energy resources in the power sector (where those resources are available and effective).
>
> Fortunately, New Jersey has begun important work to advance leak detection and quantification to prioritize the replacement and repair of natural gas distribution pipelines. Specific information and recommendations can be found in the Building a Modern Grid section, Question #20.
>
> As gas and electric uses and markets increasingly converge, the electric grid and the companies that operate it have a key role to play in developing a clean energy system. Our responses to questions #2, 3, 4, 5, 6, 7, 16 and 17 of the "Building A Modern Grid Discussion Points" section of this document describe how a modernized grid that provides far greater flexibility is essential to supporting rapid deployment and successful management of intermittent renewable generation as well as storage and demand response resources, which together can reduce our reliance on natural gas.
>
> With respect to stranded costs, the first best approach is to minimize these going forward by ensuring that further investments are in fact necessary to serve not only current needs but the long-term future that the State envisions. The assumed economic life of new gas infrastructure and the associated depreciation schedule should take into account the state's near-term and long-term decarbonization goals and expected utilization rate of the asset by the current and future ratepayers. It might be reasonable to consider full depreciation of any new expanded capacity investment by 2050 and an accelerated depreciation schedule if current ratepayers are expected to utilize these assets at a higher rate than the future ones. This could, in turn, lead to fair natural gas rates for current and future ratepayers and mitigate stranded gas asset risk for future ratepayers. A similar approach can be considered for existing investments. We discuss some ways in which the State should foster heightened scrutiny of investment in new natural gas infrastructure to reduce overbuilding that unnecessarily increases stranded costs in our response to question 5, below.

5. How should the state analyze the construction of additional fossil fuel infrastructure during the transition? How can the state plan to accommodate this infrastructure in both its short-term and long-term clean energy goals? What statutory or regulatory changes will be needed for the state to make and implement these determinations?

Reconciling long-term clean energy goals with longstanding energy practices is a steep challenge for any state with responsible climate policy. However, it is essential that this challenge be undertaken. Although we have not previously been closely engaged in natural gas distribution infrastructure expansion in New Jersey, based on our work in other states, we have found that state-level regulatory practices may drive ever-increasing dependence on natural gas infrastructure. Natural gas distribution is often considered an unalloyed public benefit, to be increased in the ordinary course with scant analysis. Benefit-cost analyses undertaken in connection with their proposed expansion generally fail to consider costs associated with the emissions of carbon dioxide that result when natural gas is combusted, and to our knowledge never account for the cost of the methane emissions themselves, despite the very high short-term costs of those emissions. At the same time, gas distribution infrastructure is presumed to be very long lived – potentially recoverable through rates over more than half a century – which makes it look deceptively cheap upfront if in fact it is destined to be used for only a fraction of that time. These analytic conventions will need to be updated to reflect New Jersey's full understanding of the harm to the State from greenhouse gas emissions and its knowledge that conventional natural gas usage at end-use customer premises is expected to be much rarer or even non-existent in the foreseeable future. Benefit cost analysis practices need to be updated, and the state should conduct a comprehensive needs analysis to understand natural gas capacity, power generation and heating and other end-use demand and consider this in the context of the state's economy-wide decarbonization goals. In addition, utilities could be required to robustly demonstrate support for the proposed useful life of new distribution infrastructure that is to be constructed. This demonstration should include, among other things, an assessment of whether alternative resources are likely to offer a viable, competitive substitute for natural gas over the proposed economic life of the infrastructure.

In addition to updating how particular prospective natural gas infrastructure investments are analyzed, avoiding overbuilding of natural gas infrastructure requires utility regulators to be mindful of changing market structure and the attendant risk that some market actors face a different set of incentives than the regulators intend. Specifically, franchised public utilities and their affiliates may be able to transact in ways that transfer benefits from the captive customers of the public utility to the affiliate and its private shareholders. A pattern is emerging in which affiliates become owners of pipelines while simultaneously committing their franchise public utilities to fund the costs of such pipelines. EDF's advocacy played an important role in FERC's recent announcement that it will review and update its process for issuing certificates for new gas pipeline expansion. At the state level, utility regulators such as the NJ BPU must address the equitable allocation of risks and rewards underpinning such affiliate transactions. The BPU could make strides toward addressing this by applying heightened scrutiny to affiliate transactions, and reviewing affiliate contracts for transportation services before pipelines become used and useful.

State Policy

7. Evaluate existing clean energy policies and programs: where are they most/least effective, and are they aligned with the 100% clean energy by 2050 goal? If not, what modifications can be made, if any?

We understand that the state is undertaking a significant refresh at this time, and that prior to now, the state's programs and policies were not designed to align with the GWRA or the 100 by 50 goal that has now been adopted. Therefore, the misalignment between existing policies and programs and the state's 100 by 50 goal is likely to be significant. Generally, in our experience, energy policies and programs tend to be biased in favor of well-established practices and favor clean energy solutions that pencil out in the very near term. The most efficient mechanisms that could operate across the entire marketplace, such as an economy-wide price on carbon, are regularly bypassed in favor of second- and third-best solutions that may yield some benefits but create new inefficiencies.

With regard to a price on carbon: within the past week, William Nordhaus was awarded the Nobel Prize for his work developing the concept of pricing carbon as a key level for achieving emissions reductions efficiently. New Jersey has been entirely without a price on carbon for almost a decade, and its determination to rejoin RGGI is laudable. However, in light of the urgency of the climate crisis, we would like to take this opportunity to caution that RGGI alone will not provide a strong enough price signal to incentivize sufficient action in the decade we have to prevent a climate catastrophe, both because the signal is too weak, and because any electric-only price on carbon that is not complemented by similar measures in other sectors can be expected in effect to disincentivize environmentally beneficial electrification, potentially slowing emissions reductions or even increasing them.[39]

Therefore, we would urge the Energy Master Plan Committee to think holistically about the 100% clean energy goal and how to achieve it on schedule if not faster. While any shortcomings or misalignments involving current programs are important to address, we urge New Jersey policymakers taking this fresh look at this critical moment to look beyond the contours of legacy problems and adopt clean energy policies and programs that get the fundamentals right to unleash the rapid transformation that coastal states like New Jersey – and the planet as a whole – need right now.

Respectfully submitted,

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[39] For a further discussion of the tension between ambitious clean energy goals and carbon pricing limited to the electric sector, see James Bushnell, Energy Institute Blog: 100% of What? (October 8, 2018), available at https://energyathaas.wordpress.com/2018/10/08/100-of-what/.