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Mark D. Marini, Secretary
Department of Public Utilities
One South Station, 5th Floor
Boston, MA 02110

RE: Massachusetts Electric Company and Nantucket Electric Company each d/b/a National Grid, D.P.U. 15-155

Dear Secretary Marini:

Harvard Law School's Emmett Environmental Law and Policy Clinic (the "Clinic") respectfully submits these comments in the Department of Public Utilities ("DPU") docket 15-155, regarding an investigation into the propriety of tariff changes proposed by National Grid (the "Proceeding"). This Proceeding is one of several DPU proceedings and legislative initiatives that will influence the future structure of electricity systems and markets in Massachusetts. These developments have the potential to promote valuable innovation in the electric sector that will benefit consumers and the environment. As National Grid notes, this innovation will require cooperation between distribution system operators and customers to develop ways to "integrate customer-side resources into operation of the distribution system to access value on the grid from these resources."[1]

At the same time, because transitions to new energy systems tend to come with new costs,[2] decisions about the electric system raise fundamental questions about how to balance innovation with costs to individuals, particularly individuals who are less able to participate in or benefit from innovation. In this vein, and drawing on its experience working on distributed generation, grid modernization and energy justice issues for several years, the Clinic recommends reviewing the proposals in this Proceeding from an energy justice perspective. This approach encompasses considerations beyond the direct size of low-income rate discounts, including, for example, seeking to provide equitable distribution of and access to benefits from the energy system.

In addition, the Clinic proposes the creation of a new tariff for virtual power plants, which, as discussed below, are a natural evolution of the modernization of Massachusetts' electric system and will help Massachusetts achieve its environmental goals. A distribution tariff specific to

[1] Massachusetts Electric Company and Nantucket Electric Company, each d/b/a National Grid, Petition for General Distribution Rate Change, Exhibit NG-PP-1, 25-26, D.P.U. 15-155 (Nov. 6, 2015) [hereinafter "Exhibit NG-PP-1"].
[2] *See e.g., id.* at 25-26 ("the pricing to recover the costs of the integrated system will need to evolve to recognize the changing nature of the connecting customer.")

virtual power plants is not reflected in National Grid's proposals but would promote the deployment of distributed energy resources, and send a strong signal that the Commonwealth is a leader in electricity innovation.

I. ENERGY JUSTICE

A. Energy Justice Entails Protecting Consumers from Disproportionate Shares of the Costs to Maintain and Improve Energy Systems and Providing Equitable Distribution of and Access to Benefits from Energy Systems

There is no single definition of energy justice, but the Clinic submits the following as a starting point for consideration of energy equity issues in DPU proceedings:

> Building on the tenets of environmental justice, which provide that all people have a right to be protected from environmental pollution and to live in and enjoy a clean and healthful environment, energy justice is based on the principle that all people should have a reliable source of energy, protection from a disproportionate share of costs or negative impacts/externalities associated with building, operating and maintaining energy generation, transmission and distribution systems, and equitable distribution of and access to benefits from such systems.

Energy justice is an issue that needs to be considered in addition to environmental justice; while the concepts have commonalities, they can differ in the people they seek to protect, the harms they seek to avoid and the strategies they employ to achieve fair results. In the energy context, equity concerns often arise in efforts to "steer[] clear of a collision between the needs of low income households and the imperative of wiser energy policies,"[3] while ensuring that all members of society have access to safe, affordable and sustainable energy, regardless of their income, race, medical status or other condition.[4]

A common proxy for energy equity concerns is the energy burden borne by low-income households. An energy burden is the "percent of annual income a household must spend to buy utilities (not non-energy service) and all other residential fuels."[5] Energy burdens are higher for low-income households than other households primarily because their income is lower, but also in part because their homes tend to be older and less energy-efficient. The American Coalition for Clean Coal Electricity estimated that households earning less than $10,000 in 2012 paid 19.5% of their after-tax income on residential electricity, while households earning more than $50,000 paid 1.1%. The disparity increases when heating costs are considered; a 2008 study

[3] Patty Limerick & Jason L. Hanson, *High Energy Prices & Low-Income America*, CENTER OF THE AMERICAN WEST 3 (2008) http://www.centerwest.org/publications/pdf/eoc.pdf.
[4] Kirsten Jenkins et al., *Energy Justice: A Whole Systems Approach* 75 (2014) https://queenspoliticalreview.files.wordpress.com/2014/10/article-5-energy-justice-a-whole-systems-approach-p74-87.pdf.
[5] Meg Power, *The Burden of FY 2008 Residential Energy Bills on Low-Income Consumers*, ECONOMIC OPPORTUNITY STUDIES 2 (Mar. 20, 2008) http://www.opportunitystudies.org/repository/File/energy_affordability/Forecast_Burdens_08.pdf.

estimated that low-income consumers in New England had the highest energy burdens compared to the rest of the country, with nearly 40% of their incomes going to energy costs.[6]

Energy burdens can have disempowering and harmful effects on low-income populations. High energy burdens can force consumers to make difficult tradeoffs between paying energy bills and attending to other necessary expenses, such as medical care, rent or groceries. These choices jeopardize health, safety and housing stability. For example:

- A research project on housing challenges among low-income families in Boston found that high energy burdens led to illness and stress (*i.e.* asthma, malnutrition and mental health issues associated with large bills), financial challenges (*i.e.* high utility bills and utility-related debts/arreages that affect the entire household), and housing instability (*i.e.* shutoffs resulting from non-payment and difficulties securing proper housing due to high utility expenses or a history of utility debt).[7] The report found that children in families with high energy burdens are exposed to "nutritional deficiencies, higher risks of burns from non-conventional heating sources, higher risks for cognitive and developmental behavior deficiencies, and increased incidences of carbon monoxide poisoning."[8]

- According to a survey performed by the National Energy Assistance Directors Association in 2005, a significant proportion of households receiving federal energy assistance in the Northeast reported making budget trade-offs due to high energy costs: 73% reported that they reduced expenditures on household necessities because they did not have enough money to pay their energy bills; 20% went without food; 28% went without medical or dental care; and 23% did not make a full rent or mortgage payment at least once.[9]

Given these trade-offs, it is not surprising that low-income households tend to be more vulnerable to rising or fluctuating energy prices.[10]

Reducing energy burdens, including through tools like low-income rate discounts and energy efficiency programs, is a critical component of energy justice, but is only one of the objectives of energy justice, which include:

1. Reducing energy burdens on low-income consumers;

[6] *Id*. at 5.
[7] Diana Hernandez and Stephen Bird, *Energy Burden and the Need for Integrated Low-Income Housing and Energy Policy*, 2 POVERTY & PUBLIC POLICY 4, 11-12 (2010).
[8] *Id*. at 6.
[9] Lauren Smith, Child Health Impact *Assessment of Energy Costs and the Low Income Home Energy Assistance Project*, CHILD HEALTH IMPACT ASSESSMENT WORKING GROUP 2-3 (April 2007) http://www.hiaguide.org/hia/child-health-impact-assessment-energy-costs-and-low-income-home-energy-assistance-program-liheap.
[10] Cara Lampton *et al*., *Policies for Achieving Energy Justice in Society: Best Practices for Applying Solar Energy Technologies to Low-Income Housing*, CENTER FOR ENERGY AND ENVIRONMENTAL POLICY 3 (December 2010) http://ceep.udel.edu/wp-content/uploads/2013/08/2010_es_READY_AchievingEnergyJusticewithSolar3.pdf.

2. Avoiding disproportionate distribution of the costs or negative impacts associated with building, operating and maintaining electric generation, transmission and distribution systems;

3. Equitable distribution of and access to real benefits from a modern energy system, including electric generation, transmission and distribution systems; and

4. Ensuring a reliable source of electricity and protecting low-income households, including those on fixed incomes, from price fluctuations.

Thus, an energy justice analysis includes examining whether consumers have equal opportunities to take advantage of energy cost-saving measures, such as use of solar energy or programmable thermostats. In some instances, low-income households may be interested in taking advantage of new technology but will struggle with the initial investment required to access associated benefits. Policies informed by energy justice principles should account for these initial costs and consider mechanisms that allow low-income consumers to utilize new technologies without increasing their energy burden.

An issue that overlays all of the principles of energy justice is the need for education and outreach. Energy literacy programs are important because the learning curve for understanding and accessing the advantages of an evolving grid can be incredibly steep for any customer, and this is only exacerbated when consumers lack access to information on their energy systems or when they have other needs to prioritize.[11] Greater knowledge can empower consumers to take greater control over their energy usage and become more involved in energy decisions.

B. Consideration of Energy Justice Promotes the Goals of the Commonwealth and is Consistent with DPU Precedent

The Massachusetts Legislature has declared that "electricity service is essential to the health and well-being of all residents of the commonwealth, to public safety, and to orderly and sustainable economic development".[12] Consistent with that finding, the Legislature declared that "affordable electric service should be available to all consumers on reasonable terms and conditions" and that "electricity bills for low income residents should remain as affordable as possible."[13] Consideration of energy justice flows directly from these directives, and is reflected in DPU's mandates.

For example, the DPU is required to pursue issues relevant to energy justice, such as requiring distribution companies to provide discounted rates for low-income users.[14] With respect to decisions or actions regarding rate designs in particular, DPU is directed to consider:

> "[T]he impacts of such actions, including the impact of new financial incentives on the successful development of energy efficiency and on-site generation. Where the scale of

[11] Hernandez & Bird 6.
[12] 1997 Mass. H.B. 5117, § 1(a).
[13] 1997 Mass. H.B. 5117, § 1(a) and 1(n).
[14] M.G.L. ch. 164, § F(4)(i).

> on-site generation would have an impact on affordability for low-income customers, a fully compensating adjustment shall be made to the low-income rate discount."[15]

DPU recognizes the important role that it plays "in enforcing laws and regulations of the Commonwealth established to protect and support natural gas and electricity consumers, particularly low-income consumers,"[16] and that low-income consumers may face unique challenges from decisions impacting the energy system.[17] The DPU has also committed to exploring mechanisms "beyond those tools already available (*e.g.* low income discount rate) to insulate low income customers from bill volatility."[18] This is consistent with the Supreme Judicial Court's finding, in the context of upholding different treatment for different classes of customers in ratemaking decisions, that cost of service should not be the only consideration for the DPU. Rather, in determining whether rate classes are justified, DPU should also consider "[t]he nature of the use and the benefit obtained from it, the number of persons who want it for such a use, and the effect of a certain method of determining prices upon the revenues to be obtained by the city, and upon the interests of property holders."[19]

These examples of DPU's consideration of issues relevant to energy justice are illustrative, not exhaustive, but support DPU's consideration of all components of energy justice in its decision-making.

C. Proposals in National Grid's Ratemaking Proceeding Should be Evaluated from an Energy Justice Perspective

DPU should review the proposals in the Proceeding from an energy justice perspective. Examples of issues in National Grid's proposed ratemaking that implicate energy justice issues include:

- **Flat or fixed fees in energy bills**: National Grid proposes a rate structure that "will shift the recovery of costs from variable per kilowatt-hour ("kWh") charges to fixed customer charges."[20] This rate shift would also apply to low-income consumers in the R-2 category. Fixed customer charges could disproportionately affect the energy burden borne by low-income consumers because these flat charges will make up a larger percentage of their incomes.[21] Rate affordability is a core component of energy justice. The DPU should only approve rate structures that (i) take into account the unique challenges that low-income consumers face and (ii) provide methods through which disproportionate costs to low-income consumers can be offset.

[15] M.G.L. ch. 164, § 141.
[16] *See e.g.,* Order Expanding Low-Income Consumer Protections and Assistance, D.P.U. 08-4 (Sept. 15, 2008).
[17] *See e.g.,* Anticipated Policy Framework for Time Varying Rates, D.P.U. 14-04-B (June 12, 2014) ("the Department is mindful of the concerns raised on behalf of low-income customers and others who are unable to shift a significant portion of their consumption due to extraordinary circumstances, such as medical equipment requirements.")
[18] Order Adopting Policy Framework for Time Varying Rates, D.P.U 14-04-C, 11-13 (Nov. 5, 2015).
[19] *Am. Hoechest Corp. v. Dep't of Pub. Utilities*, 379 Mass. 408, 411-12 (1980) (citing *Brand v. Water Comm'rs of Billerica*, 242 Mass. 223, 227 (1922)).
[20] Exhibit NG-PP-1, 22 (Nov. 6, 2015).
[21] Higher flat customer charges can also disincentive energy efficiency measures.

Furthermore, by proposing a customer charge that is based on the *greater* of (i) total electricity consumption in the current month or (ii) the maximum monthly electricity consumption in the last eleven months,[22] National Grid's proposal creates an asymmetric payment structure that favors distribution companies. If a consumer's use goes up, the consumer may pay a higher customer charge immediately, but if a consumer's use goes down, the consumer will still pay the higher customer charge for eleven months. Depending on how the customer charge is initially assessed, and whether it "travels" with people when they move, this structure could have additional negative impacts on low-income consumers that are more likely to change residences within a twelve-month period and potentially never see the benefits of their energy use reductions.

- **Access fees for certain free-standing distributed generation assets:** The Access Fee proposed for stand-alone generators[23] could increase the price of community solar, thus reducing its affordability and limiting the benefits it provides to low-income consumers. Community solar is valuable because it provides access to an opportunity, and stream of potential benefits, that would otherwise generally be available only to homeowners that have control of their roofs. Thus, community solar is particularly important for consumers living in subsidized housing, leased properties or other buildings that may not allow residents to install solar panels on-site. Access to off-site solar may be more relevant in dense urban areas that receive less sunlight than in more open areas. A flat Access Fee for off-site energy negates the benefits that users would otherwise obtain from community solar facilities.

  Low-income community leaders have stated that community solar has helped low-income families reduce their electric bills, reduced harmful air pollution and created employment opportunities for low-income residents.[24] The DPU should broadly consider the impacts that the proposed access fees could have on access to energy benefits and ensure that low-income consumers have meaningful access to opportunities like solar energy.

- **Time Varying Rates**: National Grid's proposed rate structures include time varying rates for the R-4 category, which consists of residential consumers with high electricity use. The threshold energy usage for utilizing time varying rates generally precludes low-income consumers from participating in time-based pricing. However, research in pilot programs across the United States that employed dynamic pricing systems demonstrates that "low income customers are responsive to dynamic rates" and "many such customers can benefit even without shifting load."[25] This research found that between 65 percent and 79 percent of low-income consumers would benefit from dynamic pricing even

[22] Massachusetts Electric Company and Nantucket Electric Company, each d/b/a National Grid, Petition for General Distribution Rate Change, Proposed Tariff M.D.P.U. No. 1264, D.P.U. 15-155 (November 6, 2015).
[23] *Id*. at 70.
[24] Ben Hellenstein, *Community leaders say solar is working for low-income families*, Environment Massachusetts (Oct. 28, 2015) http://www.environmentmassachusetts.org/news/mae/community-leaders-say-solar-working-low-income-families.
[25] Ahmad Faruqui, Sanem Sergici & Jennifer Palmer, *The Impact of Dynamic Pricing on Low-Income Customers*, THE EDISON FOUNDATION & THE INSTITUTE FOR ELECTRIC EFFICIENCY (September 2010) *available at* http://www.edisonfoundation.net/IEE/Documents/IEE_LowIncomeDynamicPricing_0910.pdf.

without making changes to their current usage because low-income customers have flatter than average load shapes.[26] The DPU should take these findings into account when considering appropriate thresholds for the R-4 category.

Concerns about impacts of price fluctuations on low-income consumers can be addressed through mechanisms such as providing technology that enables access to real-time energy use and temporary bill protection, including through the use of "shadow" programs that allow consumers to see what their bills would have been with time varying rates. We recognize that time varying rates are also being considered in the DPU's grid modernization proceedings and encourage coordination between the proceedings.

Given the high energy burden felt by the Commonwealth's most vulnerable populations, the DPU should include a thorough energy justice analysis in its review in this Proceeding to avoid exacerbating energy burdens and to ensure equitable distribution of and access to benefits from the energy system across all residential consumers.

II. VIRTUAL POWER PLANTS

Virtual Power Plants ("VPPs") can lower technical and financial barriers to the deployment of Distributed Energy Resources ("DERs") in a manner that promotes Massachusetts' environmental and energy goals while avoiding costly investments or upgrades to existing electric distribution systems. VPP technology is rapidly developing and available today; DPU should take steps to ensure that Massachusetts' electricity markets can integrate VPPs so as to maximize these benefits. As discussed further below, because VPPs exchange electricity primarily over distribution lines, as opposed to traditional delivery of electricity that utilizes both distribution and transmission lines, a lower VPP-specific tariff is appropriate and should be considered as part of this proceeding.

A. Virtual Power Plants Promote the Use of Distributed Energy Resources and Provide a Range of Environmental and Energy Benefits

Virtual power plants are systems that operate, through ownership or by contract, multiple smaller-scale distributed energy resources as a single resource in energy markets using smart meters and software. VPPs coordinate, through the use of advanced software, metering and communication technologies, the exchange of energy services, including electricity, heating and cooling, between DERs and consumer energy loads.[27]

The exchange of electricity in a VPP would take place over existing distribution company distribution lines. A VPP would sell electricity produced by DERs to retail customers directly, at negotiated rates, thereby providing a financial incentive for DER deployment as the negotiated rate would likely be closer to the retail than wholesale rate.[28] A VPP and its customers would pay

[26] *Id.*
[27] The DERs utilized in VPPs can, *inter alia*, include solar power, natural gas fired combined heat and power units, electric batteries and thermal batteries.
[28] Retail sales of electricity by a VPP at or near retail rates would not implicate federal jurisdiction. The Federal Power Act gives the Federal Energy Regulatory Commission jurisdiction over sales of electricity at wholesale, 16

the distribution company for the use of its distribution lines, but such payment should be at a special VPP rate that is lower than the normal distribution rate to reflect the fact that VPPs only use local distribution lines, not the full distribution system.

VPPs further lower technical and financial barriers to DER deployment by:

- Aggregating the energy services that DERs provide so that they appear to the grid as a single entity, thus allowing DERs to reach a sufficient scale that the per unit electricity capital cost is minimized; and

- Dispatching combined DERs collectively so that VPPs respond to a single control signal from the distribution utility and/or Independent System Operator ("ISO") and thereby participate in the forward capacity and demand response markets, and provide ancillary services, such as frequency regulation.

Figure 1 presents a graphical depiction of the functions performed by VPPs.

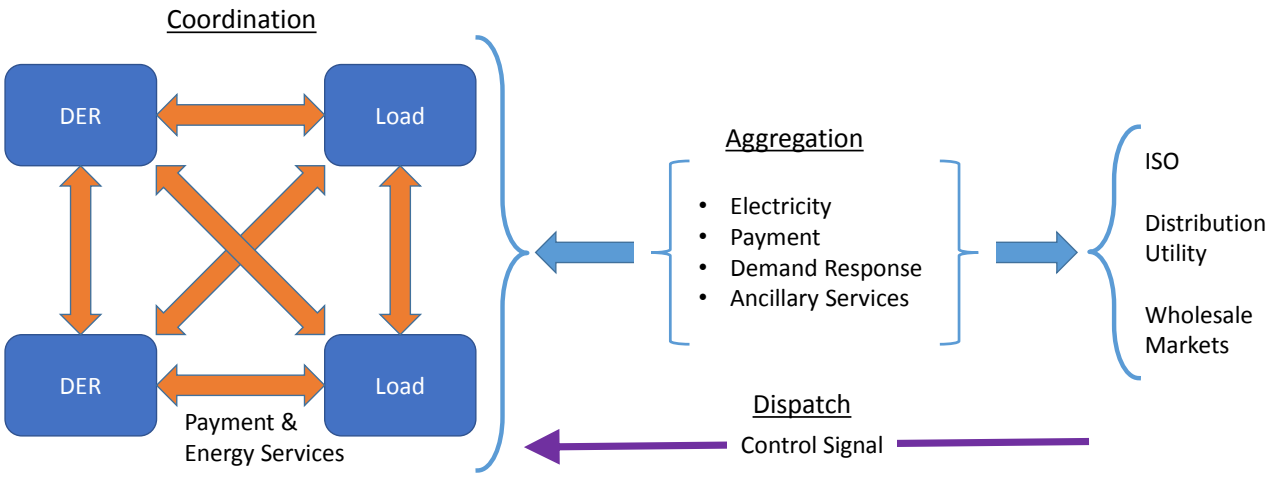

Figure 1. A graphical depiction of the three functions performed by a virtual power plant: coordination, aggregation and dispatch.

VPPs provide additional benefits, such as:

- Promoting Massachusetts' goals of reducing greenhouse gas ("GHG") emissions, which include reducing emissions 25% by 2020 and 80% by 2050,[29] by increasing the amount

U.S.C. § 824 (b)(1), which is defined to be the sale of electric energy to any person for resale. 16 U.S.C. § 824 (d). A VPP would not sell electricity for the purpose of resale.

[29] Massachusetts Global Warming Solutions Act, 2008 Mass. Laws ch. 298.

of electricity produced by renewable sources and combined heat and power generating units;

- Reducing the need for additional infrastructure for the generation and distribution of electricity. For example, the New England ISO has posited that "today's higher prices also indicate the need for additional gas infrastructure *or investment in alternative sources of energy* to offset the demand for natural gas."[30] Generating power closer to loads can reduce the need for expensive infrastructure investments, thereby lowering rates for ratepayers in general;[31] and

- Improving the resiliency and reliability of the grid, consistent with DPU's grid modernization initiatives, by deploying additional DERs onto distribution systems without costly investments and upgrades to such systems.[32]

VPPs are not a hypothetical concept; they are being demonstrated in real-world commercial operation today, especially in Europe, and large industrial conglomerates are offering VPP enabling technology. For example: (i) in 2013 the Dutch island of Ameland started construction of a VPP using 6 megawatts ("MW") of solar photovoltaics and 45 fuel-cell-based micro combined heat and power ("CHPS") units;[33] (ii) since 2012, a municipal utility in Munich, Germany, has operated a 20 MW VPP consisting of six CHP plants, five hydropower plants, and a windfarm;[34] and (iii) a 42 MW VPP, powered by wind, bio-mass and a fleet of electric cars, is serving 2000 households on the Danish island of Bornholm.[35] A recent example in the United States is Con Edison's proposal to build a VPP demonstration project, utilizing aggregated distributed solar and storage assets in homes in New York, as part of the New York Public Service Commission's Reforming the Energy Vision (REV) proceedings.[36]

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[30] *2015 Regional Electricity Outlook*, ISO NEW ENGLAND, at 22 (2015) (emphasis added), available at http://www.iso-ne.com/static-assets/documents/2015/02/2015_reo.pdf.

[31] *See e.g.*, Order Adopting Regulatory Policy Framework and Implementation Plan, New York Public Service Commission Case 14-M-0101, 20 (Feb. 26, 2015) ("While much of the aging infrastructure will need to be replaced ... DER can reduce near term needs in targeted areas and long term needs throughout the system.")

[32] *See e.g.*, Investigation by the Department of Public Utilities on its own Motion into Modernization of the Electric Grid, D.P.U. 12-76-B, 10 (June 12, 2014) ("A modernized grid will facilitate the reduction of peak demand by allowing retail customers to respond to price signals . . . and reduc[e] the need for new generation, transmission, and distribution investments.")

[33] David Appleyard, "Dutch VPP Using Solar PV and Fuel Cell Tech - Renewable Energy World," November 14, 2013, http://www.renewableenergyworld.com/articles/2013/11/dutch-vpp-uses-pv-and-fuel-cell-hybrid.html.

[34] 07/01/2012 | Sonal Patel, "The Rise of the Virtual Power Plant," *POWER Magazine*, http://www.powermag.com/the-rise-of-the-virtual-power-plant/. Siemens, "Stadtwerke München and Siemens Jointly Start up Virtual Power Plant," ctc_xhtml_presshome, http://www.siemens.com/press/en/pressrelease/?press=/en/pressrelease/2012/infrastructure-cities/smart-grid/icsg201204017.htm.

[35] Jean Kumagai, "Virtual Power Plants, Real Power," *Spectrum, IEEE* 49, no. 3 (2012): 13–14; "EcoGrid EU," http://www.eu-ecogrid.net/ecogrid-eu.; Jean Kumagai, "The Smartest, Greenest Grid," April 29, 2013, http://spectrum.ieee.org/energy/the-smarter-grid/the-smartest-greenest-grid.

[36] ConEdison, *REV Demonstration Project Implementation Plan Clean Virtual Power Plant* (Nov. 20, 2015), available at http://www3.dps.ny.gov/W/PSCWeb.nsf/All/B2D9D834B0D307C685257F3F006FF1D9?OpenDocument.

In addition, commercial solutions for VPP control now available. For example, Siemens offers a commercial cloud-based web service for municipal utilities to manage their residents' DERs as a VPP,[37] while Bosch offers what it calls a "turnkey software platform" to operate VPPs more broadly.[38] GE recently spun-out a company, called "Current," that will provide hardware and software solutions to companies seeking to become "active grid participants" and that could be used to build and operate VPPs.[39] Likewise, Encorp offers a virtual power plant software solution.[40]

B. Virtual Power Plants Are a Natural Evolution of the Commonwealth's Existing Grid Modernization and Greenhouse Gas Emission Reduction Policies

Massachusetts has long been at the forefront of grid modernization efforts. This leadership has been displayed, *inter alia*, by (1) the Restructuring Act of 1997, which separated generation from distribution and introduced retail competition into electricity markets, and (2) the Commonwealth's long standing policy of encouraging the deployment of DERs. These DER deployment policies are evidenced by, for example: (i) the creation and continued revision of a model distributed generation interconnection agreement;[41] (ii) the Green Communities Act of 2008,[42] which expanded net metering and virtual net metering for some types of DERs; (iii) the DPU's Grid Modernization Order,[43] which ordered the distribution companies to develop a plan for integrating DERs; and (iv) the 2012 Energy Bill,[44] which also expanded net metering and ordered the DPU to develop an interconnection timeline for distributed generation facilities. Thus, as a natural evolution of Massachusetts' efforts to introduce retail competition and encourage distributed generation, VPPs build on existing features of the electric system and ongoing efforts to modernize the grid.

C. Virtual Power Plants Can Connect to Distribution Systems under Current Laws and Policies

VPPs generate or otherwise procure electricity but do not own or operate distribution facilities; thus they need to use the existing distribution lines owned by distribution companies. Under the Massachusetts Electric Industry Restructuring Act of 1997, the DPU is "authorized and directed

[37] "Siemens Offers Cloud-Based Web Service for Virtual Power Plants," http://www.siemens.com/press/en/pressrelease/?press=/en/pressrelease/2014/infrastructure-cities/smart-grid/icsg201402046.htm&content[]=ICSG&content[]=EM&content[]=EMSG. (Feb 10, 2014).
[38] Bosch, "Optimizing the Grid and Energy Trading," https://www.bosch-si.com/solutions/energy-management/virtual-power-plant/virtual-power-plant-manager-software.html.
[39] Katherine Tweed, "GE Launches $1B Energy Services Company, Current," October 7, 2015, http://www.greentechmedia.com/articles/read/ge-launches-1b-energy-services-company-current.
[40] Encorp, "Virtual Power Plants," http://www.encorp.com/VPP.pdf.
[41] The first model distributed interconnection agreement was promulgated by the DPU in 2002. *See* Investigation by the Department of Telecommunications and Energy on its own motion into Distributed Generation, DTE 02-38-B (Feb. 24, 2004). The model agreement was most recently revised in Investigation by the Department of Public Utilities on its own Motion into Distributed Generation Interconnection, Order on the Model Interconnection Tariff, (DPU 11-75-G, May 4, 2015).
[42] An Act Relative to Green Communities, M.G.L. Session Law Ch. 169.
[43] Investigation by the Department of Public Utilities on its own Motion into Modernization of the Electric Grid, D.P.U. 12-76-B, 2 (June 12, 2014).
[44] An Act Relative to Competitively Priced Electricity in the Commonwealth, M.G.L. Session Law Ch. 209, § 49.

to require electric companies to accommodate retail access to generation services and choice of suppliers by retail customers."[45] This law grants retail customers the right to procure electricity services from their choice of suppliers, whether it is the default service provider or a competitive supplier. This right to customer choice only makes sense if generators and competitive suppliers have access to the distribution company's distribution lines.

The DPU has so interpreted the statutory mandate. Per DPU's regulations, distribution companies must "establish *non-discriminatory* Interconnection Standards that govern the connection of Generation Facilities to its Distribution Facilities."[46] Interconnection standards must "ensure that all Generation Facilities have fair access on reasonable terms to the Company's Distribution Facilities."[47] The DPU has implemented this regulation by, *inter alia*, promulgating a model interconnection tariff for distributed generation, also known as the "Standards for Interconnection of Distributed Generation."[48] In addition, the DPU approved Terms and Conditions between distribution companies and competitive suppliers that require the distribution companies to give licensed competitive suppliers access to distribution company lines.[49]

i. ***Virtual Power Plants Could Connect to Distribution Systems as Generators***

In the event that a VPP owns or leases DERs directly, the VPP would qualify under Massachusetts law as a "generation company," a "generation facility," and a provider of "generation services" so that the VPP would have rights as a generator to use a distribution company's distribution lines. (Owners of DERs that are aggregated by a VPP could similarly connect to distribution systems.) A "generation company" is defined as "a company engaged in the business of producing, manufacturing or generating electricity or related services or products, including but not limited to, renewable energy generation attributes for retail sale to the public."[50] A "generation facility" is defined as "a plant or equipment used to produce, manufacture or otherwise generate electricity and which is not a transmission facility."[51] A "generation service" is defined as "the provision of generation and related services to a customer."[52] All three of these definitions would encompass a VPP.

ii. ***Virtual Power Plants Could Connect to Distribution Systems as Competitive Suppliers***

As a supplier of retail electricity to retail customers, a VPP would also qualify as a competitive supplier under Massachusetts law, DPU regulations, and Supreme Judicial Court precedent so

[45] Mass. Gen. Laws Ann. ch. 164, § 1A (West).
[46] 220 CMR 11.04(4) (emphasis added).
[47] *Id.*
[48] The most recent Model Interconnection Tariff was issued by Investigation by the Department of Public Utilities on its own Motion into Distributed Generation Interconnection, Order on the Model Interconnection Tariff, D.P.U. 11-75-G (May 4, 2015).
[49] *See e.g.*, Massachusetts Electric Company & Nantucket Electric Company, Terms and Conditions for Competitive Suppliers, M.D.P.U. No. 1201.1 (May 1, 2014).
[50] M.G.L. ch. 164 § 1.
[51] *Id.*
[52] *Id.*

that a VPP would have rights as a competitive supplier to access a distribution company's distribution lines. A "supplier" is defined by statute as "a supplier of generation service to retail customers."[53] Because a VPP provides generation service to retail customers, it would qualify as a supplier. The DPU takes an even broader view of "competitive supplier," defining that term to cover any entity that is licensed to sell electricity to retail customers other than distribution companies or municipal light companies.[54] The SJC has defined competitive suppliers as "firms that generate or otherwise procure electricity without owning or operating the means to distribute electricity to consumers."[55] Because VPPs generate or procure electricity but do not own or operate the means to distribute electricity, VPPs would meet this definition, and thus could utilize DPU-approved Terms and Conditions between distribution companies and competitive suppliers that require the distribution companies to give licensed competitive suppliers access to distribution company lines.[56]

A VPP's operation as a competitive supplier is consistent with the DPU's Model Terms and Conditions for Competitive Generation Service,[57] which forms the basis for each distribution company's relationship with competitive suppliers. The Terms and Conditions do not preclude exchange of electricity over distribution lines and VPPs can satisfy the licensure requirements for competitive suppliers.[58] Licensure would require a VPP to be a participant in the New England Power Pool ("NEPOOL"),[59] and the NEPOOL Agreement explicitly contemplates distributed generation resources as being NEPOOL participants.[60]

D. A Specific Virtual Power Plant Distribution Tariff Would Promote the Financial Viability of Distributed Energy Resources and Send a Strong Signal that the Commonwealth is a Leader in Electricity Innovation

As described above, an important feature of VPPs is that they exchange electricity primarily over distribution lines, without using transmission lines. However, under the current rate structure, retail customers procuring services from VPPs would pay the same rate for distribution to the distribution company as customers obtaining generation services from distant competitive suppliers. A specific rate-class for VPP distribution would address this disparity and thereby improve the economic viability of VPPs in Massachusetts.

The DPU has the authority to govern distribution companies' "rates, prices and charges" under M.G.L. c. § 94, which courts construe broadly as allowing the DPU jurisdiction over the entire rate structure and reasonably related terms and conditions in service contracts or filed

[53] *Id.*
[54] 220 CMR 11.02.
[55] *NSTAR Elec. Co. v. Dep't of Pub. Utilities*, 462 Mass. 381, 383 (2012).
[56] VPPs operating as competitive suppliers would have to comply with consumer protection regulations promulgated by the DPU (220 CMR 11.05) and the Attorney General (940 CMR 19.00).
[57] 220 CMR 11.04 (2)(c) (providing that each distribution company shall file, for Department approval, terms and conditions governing the manner in which Distribution Service is provided to Distribution Customers, and the Terms and Conditions must be consistent with the Model Terms and Conditions for Distribution Service established by the DPU.)
[58] 220 CMR 11.05(2).
[59] 220 CMR 11.05(2)14.
[60] New England Power Pool Second Restated NEPOOL Agreement, § 1.15, available at http://www.nepool.com/uploads/Op-2d_RNA.pdf.

schedules.[61] Courts have held that the DPU can consider the public interest in exercising its regulatory power over rates and its authority to do so is implicit throughout the statute.[62] For example, the Supreme Judicial Court ruled that the DPU has the authority to approve a special, reduced rate for low-income elderly customers, because such rate coincides with the public interest.[63] Furthermore, courts have held that the DPU can discriminate between "different classes of customers, reasonably classified" in rate making under § 94, based on "some or all of such factors as size, location or nature of business."[64]

Setting a lower distribution rate for customers procuring electricity services from VPPs is in the public interest and recognizes that customers of VPPs use the distribution system differently than other distribution company customers. VPP customers do not use the full portion of the distribution and transmission lines: delivering electricity to VPP customers only requires low-voltage, local distribution lines, because electricity is delivered to customers from a local generator, such as solar panels or CHP generators. The smart metering function of VPPs allows local delivery: using advanced software, VPPs would track energy production from DERs and energy usage within their service territory. When the DERs could satisfy demand, the VPP would communicate that to the grid so that additional energy would not be sent over transmission lines to reach the VPP's customers. Thus, VPP customers place smaller demands on the larger grid.

VPP delivery rates that reflect the true costs of delivery would comply with the judicial directive that public utilities may "charge rates which are compensatory with the full cost incurred by efficient management, [but] they may not recover costs which are excessive, unwarranted, or incurred in bad faith."[65] Otherwise, VPP customers would be paying for more than what they receive when procuring electricity from local, distributed generation sources. Setting a VPP-specific tariff that reflects true costs of delivery would result in lower distribution rates, and thus lower energy bills for VPP customers, which will encourage the development of VPPs. Incentivizing the development of VPPs through separate tariffs for VPP customers will promote the public interest through the environmental, electric system and financial benefits discussed above that VPPs could bring to Massachusetts.

E. A Virtual Power Plant-Specific Tariff Is a Better Way for DERs to Pay for Their Use of Distribution Company Distribution Lines Than the Access Fee Proposed by National Grid

National Grid has proposed a fixed "access fee," in an amount directly proportional to capacity, for DERs "where there is no on-site load present at the service location other than the parasitic

[61] *See e.g., Boston Real Estate Bd. v. Dep't of Pub. Utilities*, 136 N.E.2d 243, 248 (1956).
[62] *See Boston Real Estate Bd. v. Dep't of Pub. Utilities*, 136 N.E.2d 243, 254 (1956) ("The controlling consideration of the public interest in the exercise of the department's statutory regulating power is implicit throughout the statute. It is the standard which supports the grant of power over rates and regulations in general, and it is not necessary to specify further.").
[63] *Am. Hoechest Corp. v. Dep't of Pub. Utilities*, 379 Mass 408, 409 (1980).
[64] *Id.* (quoting *Brand v. Board of Water Commissioners of Town of Billerica*, 242 Mass 223, 227 (1992)). *See also Boston Edison Co. v. Dep't of Pub. Utilities*, 375 N.E.2d 305, 333 (1978).
[65] *Bay State Gas Co. v. Dep't of Pub. Utilities*, 947 N.E.2d 1077, 1085 (2011); *Boston Gas Co. v. Department of Pub. Utils.*, 441 N.E.2d 746 (1982).

load of the [DERs] . . . for the use of the Company's distribution system by the [DERs] for the purpose of exporting electricity generated by the [DERs] into the electric distribution system" through either net metering or the Power Purchase Rate P tariff.[66] National Grid posits that, because some DERs, including those that use virtual net metering, do not pay National Grid for using the distribution system, the "access fee" "for the recovery of a Customer's proportionate share of the Company's costs of constructing and maintaining its system in providing this [distribution] service to the Customer."[67]

While distribution companies like National Grid should be paid for use of their distribution systems, a fixed access fee is a blunt, and potentially inaccurate, method for calculating the cost of such use. For example, under National Grid's proposal, a 10 kilowatt ("kW") solar panel in an open, sun-filled field would pay the same access fee as a solar panel in a dense, shaded urban environment even though the urban solar panel would produce less power, and use the distribution system less, than the open field solar panel. As another example, a 10 kW solar panel would pay the same access fee as a 10 kW solar panel combined with an electric battery, even though the solar panel/battery combination would likely place less stress on the distribution system as it would provide a more constant supply to the grid.

In the event that a VPP were subject to the access fee,[68] charging for actual use of the distribution system on a kWh basis via a VPP-specific tariff would (i) be more representative of the actual costs that a DER imposes on the distribution system than a fixed rate and (ii) create a rate structure that better captures the value that DERs can provide by, for example, displacing investment in new transmission and distribution infrastructure. A rate structure that imposes a cost per kWh on use of the distribution system would also incentivize the development and installation of modern storage and other technologies that displace use of the distribution system, and thereby, further reduce the need for distribution and transmission upgrades.

F. National Grid's Terms and Conditions for Distribution Service Should Support the Installation And Operation of Innovative Meters in Connection with Virtual Power Plants

A modern grid will require innovative smart meters that can: (i) measure two-way power flow; (ii) measure power flow in real time; and (iii) communicate with each other and with the grid as a whole. National Grid's Terms and Conditions for Distribution Service may unnecessarily limit meter innovation and should be revised. (The consideration of smart meters in DPU's grid modernization proceeding does not preclude addressing meter-related issues in this proceeding.)

At present, and as proposed, National Grid's Terms and Conditions for Distribution Service provides that meters requested by customers or competitive suppliers will be selected and owned by National Grid but procurement and installation costs will be borne by the customers or

[66] Massachusetts Electric Company and Nantucket Electric Company, each d/b/a National Grid, , Proposed Tariff, Access Service Agreement For Distributed Generation, D.P.U. 15-155, (Nov. 6, 2015).
[67] *Id.* at 1.
[68] A VPP would likely not pay the access fee as the DERs would be located on sites that would consume a portion of the electricity produced by the VPP's DERs.

competitive suppliers.[69] Even assuming VPP-appropriate meters are selected, this arrangement could impede innovation as it requires up-front investments by VPP developers without any assurance of returns.

As an alternative, the DPU should consider terms that allow customers and competitive suppliers to: (i) select the meters for VPPs, subject to minimum safety and accuracy standards; (ii) pay National Grid to install the meters; (iii) retain ownership of the meters and the right to ask National Grid to uninstall the meters. Retaining ownership would allow the customer or competitive supplier to resell or salvage meters no longer used in a VPP, and thereby recoup, at least partially, their investment in such meters. Such recoupment would facilitate innovation.

* * *

Thank you for your consideration of these comments. The Clinic appreciates the opportunity to submit these comments and welcomes the opportunity to participate further in efforts to promote energy justice and electric system innovations in Massachusetts. Please direct any follow-up communications to Aladdine Joroff, 617-495-5014 (ajoroff@law.harvard.edu).

Sincerely,

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[69] Massachusetts Electric Company & Nantucket Electric Company, Terms and Conditions for Distribution Service, M.D.P.U. No. 1192, §4A (Dec. 1, 2010).