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September 17, 2015

Via Electronic Mail and US Mail

Debra A. Howland, Executive Director
NH Public Utilities Commission
21 S. Fruit Street, Suite 10
Concord, NH 03301-2429

Re: IR 15-296, ELECTRIC DISTRIBUTION UTILITIES, Investigation into Grid Modernization

Dear Ms. Howland,

Enclosed please find 7 copies of Comments on Scope of Investigation into Grid Moderization.

Please add myself: clifton.below@gmail.com to the service list in this docket.

Yours truly,

Clifton Below

Clifton Below

Enc.

Certificate of Service

I hereby certify that on this 17th day of September, copies of this filing are being sent by both regular and electronic mail to the Public Utilities Commission, and electronically to all persons, including the OCA, listed on the Commission's on-line service list for Docket No. IR 15-296.

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State of New Hampshire
Public Utilities Commission

IR 15-296

ELECTRIC DISTRIBUTION UTILITIES, Investigation into Grid Modernization

Comments on Scope of Investigation

I suggest several elements that should be of particular focus in this investigation: dynamic pricing/smart rates, enabling better integration of distributed energy resources and an examination of how a modernized grid might help enable cost savings to customers such as through increased demand response and distributed storage and generation resources. The investigation should also examine how we can make progress on these issues within the New Hampshire context where universal roll-out and installation of smart meters is not allowed by statute and we like to do things as frugally as possible using collaborative efforts while also fostering competitive markets, innovation, and entrepreneurship, as well as customer choice.

Currently the future of net metering is fast emerging as a major public policy issue in New Hampshire. It seems increasingly likely that the legislature may act on this issue in coming months in a way that involves the Commission in the development of sustainable net metering tariffs that allow the value of such resources, including solar photovoltaic in particular, to be fully realized while treating all customers and the distribution utilities fairly in the process. This investigation could provide a very valuable opportunity to develop some background and a framework to inform such future possible proceedings as well as the other requirement placed on the PUC by SB 614, Chapter 219:1, III, NH Laws of 2015, which states the Commission “shall establish an ‘electric peak time reduction goal’ on or before July 1, 2016.”

One particular resource and source of expertise that I would like to call to the Commission’s attention is the Electric Power Research Institute’s work on the “Integrated Grid” that overlaps substantially with the concept of grid modernization as described in NH 10-Year State Energy Strategy, OEP, 9/14. More information on their work in this area can be found at: http://integratedgrid.epri.com/. A key part of their work is piloting certain technologies and ideas and this investigation might help inform where some new pilots of promising approaches to grid modernization might make sense in New Hampshire.

A number of years back when I was a member of EPRI’s Energy Efficiency and Smart Grid Public Advisory Group as a NH Commissioner, I had the opportunity to tour an early smart grid pilot in Boulder Colorado, where, with a substantial investment, a high speed two way communications and system monitoring network was being developed over the distribution grid. One of our group asked the electric utility representatives what was the most surprising and useful information that the utility had learned from all the new data that was streaming in. They said that before implementation of their smart grid they had been having a fairly high failure rate on distribution transformers. One of the first things that they noticed and could act on from their new data was how much overvoltage much of their system was near the ends of distribution feeders. Prolonged excess voltage at transformers turned out to be the cause of their high and costly failure rate. This had been occurring because the utilities voltage push from central station power plants and substations out to distribution feeders was based on engineering models instead of real time distributed data. They quickly figured out that the large amount of net metered solar in Boulder residential neighborhoods, where the same residents often didn't run air conditioning or much any load during the day, was shifting the voltage balance in the system causing the overvoltage. By turning down the voltage from central stations and substations based on real time data they were able to realize significant savings in energy consumption, on the order of a few percent as I recall, plus substantially prolong the life of transformers and avoid damage to business and consumer electronics from excessive voltage.

To make such a utility investment in NH, where the communication and data collection network may not exist, may have costs that are difficult to justify, but there may be ways to realize some of these benefits from improved real time information at a much lower and net beneficial cost. Utility interactive inverters on PV systems synchronize with the power characteristics of the distribution grid at their point of interconnection, meaning they match the voltage and frequency of grid power, or they shut down. Enphase Energy, a major manufacturer of microinverters for PV systems, including many in NH, has pointed out that they collect near real time data from most of their installations (by customer choice) and could readily and transparently provide such real time data on voltage levels to utilities at what should be a much lower cost than deploying a whole new network. Minimally, utilities could realize some energy and asset maintenance savings for all customers from "conservation voltage" adjustments to their engineering models, but they could go further. Some inverters, such as Enphase's, could actually provide voltage regulation services to the grid by instructing their inverters to work in a way to help increase or decrease voltage when the distribution line voltage is too low or too high. This is an example of a potential value of solar and grid modernization that is not being realized or recognized in NH today and may well be cost-effective. For more information on this see: http://www.cpuc.ca.gov/NR/rdonlyres/3669D606-639D-4D0C-AE9B-CE3E9547A396/0/Enphase_Data_Access_DRP_Slides2.pdf

Another example of how this investigation may help inform future proceedings and work is to look at how grid modernization might support improving the value of solar through better price signals such as dynamic pricing. This may be an area ripe for some pilots. As it is now there is no financial incentive to orient solar in any particular direction other than to optimize KWH production. For example a roof with two solar location options, one to the southeast and one to the southwest, could produce the same value to the customer-generator under current tariffs, while in reality a system oriented to the southwest may produce much more actual value than one oriented to the southeast, or even one oriented to the south, simply because of a higher coincidence with afternoon peaks that drive both generation capacity and transmission charges at the wholesale level. Hourly generation prices in the ISO-NE market also are higher on average in the afternoon than in the morning due to higher (cooling driven) loads. An hourly dynamic pricing option for net metered customers or those with some storage or demand response capability, especially if it included transmission costs, could provide valuable price signals that make the system more efficient and less costly in both the short and long term by reducing the need to increase capacity to meet peak demand as well as actual charges from the wholesale market.

As it is now although transmission charges to the distribution utilities are based on their share of the coincident hour of peak demand for each month, all customers (at least for Liberty Utilities) are charged based only on their energy consumption (KWH) and not their share of coincident peak. This is, in part, because of the lack of smart meters, but could at least be piloted on a voluntary basis for customers, net metered or not, who elect and might pay for smart meters and already have internet connections that might allow for cost-effective data collection.

Finally I offer one more example of how this investigation might examine barriers to realizing valuable distributed energy resources. A number of states and utilities have developed tariffs, policies and the enabling technologies to make thermal energy storage for air conditioning loads that shifts cooling loads off peak cost-effective. Back at the 2007 summer meeting of NARUC, I organized and moderated a panel on this topic that was followed by a tour of an ice storage facility in NYC skyscraper, of which there a fair number now.

In my current work as the managing partner of a commercial building in downtown Lebanon we have been investigating options to replace our 27 year old inefficient DX rooftop air conditioning units, one 50 tons and another that has 15 tons of cooling capacity. Air conditioning accounts for about 80% of our peak demand. We have been giving serious consideration to ice storage to the point of engaging structural and geotechnical engineers who have concluded that we can structurally support the necessary increased weight on our roof. I have found that even though we are on the G-2 rate, and dynamic pricing options are typically NOT available to us through competitive suppliers, much less default service, there is at least one supplier who could get us hourly pricing that would allow us to realize savings from shifting about half our total load to off-peak hours and up to 80% of our total building peak load off the monthly and annual coincident hourly peaks. However, we would not realize any savings in transmission and distribution charges, even though there would be real savings to the system as a whole. These two financial factors may be enough to tip the balance away from us making this increased private investment choice that would be beneficial to the grid. This particular choice to invest in significant (and dispatchable) storage may only come along every 25-30 years in the life of the building at equipment replacement time (and only this one time in the rest of my life). This investigation should look into how grid modernization could help us take advantage of such real life beneficial technologies and choices that are available today and in the near future and not miss such opportunities.

For background on this technology and some policy implications here are the hyperlinks to those TES presentation from that NARUC panel:

- **Off-Peak Cooling with Thermal Energy Storage (TES): Overview** *(ppt-662016)*
  Clifton C. Below, Commissioner, New Hampshire Public Utilities Commission
- **Ice Storage for Peak Load Reduction** *(ppt-1735680)*
  Chris Smith, NYSERDA
- **Thermal Energy Storage and Peak Load Reduction** *(ppt-3731456)*
  Mark M. MacCracken, PE, LEED, Pte, CALMAC Mfg. Corp.
- **Clean Energy & Storage Innovations at Work** *(ppt-3721728)*
  Gregory Tropsa, President ICE Energy

These presentations also be accessed by scrolling down to Summer Committee Meeting (2007) at: http://www.naruc.org/Committees/CommitteePresentations.cfm?c=50.