State Commission Staff Surge Call: Distribution System Data

On December 14, 2020, NARUC facilitated a state commission staff "surge" call to discuss distribution system data collection and sharing practices. As distributed energy resources (DERs) have proliferated around the country, DER developers and customers have generally supported making distribution system-level data more granular, transparent, and widely available. Distribution system data can facilitate DER installations by identifying optimal locations in which (a) DERs could be accommodated without distribution system upgrades or lengthy interconnection studies, or (b) DERs could help defer or lessen the need for system upgrades. However, demands for more visibility into the distribution system must be weighed against privacy and security concerns, costs of additional software, as well as the costs of collecting, validating, disseminating accurate data, and additional labor costs. On this call, commission staff from states with regulated utilities implementing hosting capacity analysis or other distribution system data initiatives shared their approaches to data collection and sharing.

Vermont

Vermont has a very active net metering program and a high solar saturation rate. During Vermont's transition to a low-carbon grid, there was a concern about over-concentrating distributed generation (DG) in certain locations. To address this concern, the Vermont Public Utility Commission (PUC) had to provide granular and transparent data to the developer community to facilitate the development of DG broadly across the state. Vermont's largest investor-owned utility (IOU), Green Mountain Power, with funding from the U.S. Department of Energy (DOE), conducted a distribution grid-level study of the capacity of different distribution circuits to host DG. The study focused on distributed solar and led to the development of a tool known as the Solar Map. The Solar Map visualizes solar capacity on the distribution grid on a circuit-by-circuit level, and is color-coded to show the degree of saturation per substation.

The Solar Map was considered a revolutionary project that served the PUC well. For example, the Solar Map helped DG development continue despite instances of transmission groundswell overvoltage violations in the state's highly saturated circuits. The PUC wanted to continue development on these circuits, but also avoid having the next incremental system pay for upgrades. In order to continue this development, the Solar Map was also used to develop a tariff that added an additional fee per kilowatt on top of the normal net metering interconnection charge. The tariff was successful in allowing more DG on circuits with transmission groundswell overvoltage violation faults. This example demonstrates how providing transparent data allowed developers to focus on circuits that have available capacity and enabled the PUC to spread out the cost of substation upgrades across net metered systems, rather than halting DG development altogether. One obstacle of this approach is that smaller municipal utilities and electric cooperatives do not have the capacity to collect such granular data, raising questions about the role of public dollars and/or DOE funding to support smaller utilities in data collection and analysis processes.

In addition to distribution constraints, data can be used to also address transmission constraints. In northern Vermont, where there is too much generation compared to the load, transmission constraints arose and the system operator was forced to limit market participation.

On a slightly larger scale, the Vermont Department of Public Service (DPS) has been engaging with stakeholders over the last year on efforts to make energy system data more available and transparent. Through these stakeholder conversations, a non-profit created an energy dashboard, but lacked a sustainable funding source to continue maintaining the dashboard indefinitely. As a result of this effort, the Vermont

PUC took a critical look at how it collects, manages, and publicizes data, recognizing two clear needs. First, the PUC saw a need to create modernized data infrastructure. The PUC recognized the internal data burden for entities from which data is collected, and has been thinking about how to streamline data collection through automated processes and standardized templates. Second, the PUC acknowledged the need to make data more readily available to further transparency so that stakeholders working with the data could work off of an agreed-upon baseline. This data project has focused on the electric sector, and the PUC is working with regulated utilities, regional planning commissions, and local non-profits to track progress on and take action to meet clean energy objectives. This includes not only data on DG, but also power supply, building efficiency, and the energy transformation projects. Energy transformation projects are projects which reduce fossil fuel consumed by distribution utility customers.

Hawaii

There are several driving factors for increased distribution system data in Hawaii. The first driving factor is the high penetration of DERs in the state. As Hawaii has looked into implementing a performance-based regulation framework, there has been strong emphasis on improving the integration of DERs into utility operations, how DERs can be used for grid services to meet the state's Renewable Portfolio Standard, and how DERs can reduce costs for customers. Another driving factor stems from Hawaiian Electric's (HECO) commitment to retiring a large coal plant on Oahu by 2022. This retirement creates a near-term need for added capacity and grid services, which the PUC is interested in meeting cost-effectively with DERs. Additionally, distribution system data needs intersect with a number of ongoing dockets, primarily the Integrated Grid Planning (IGP) and DER dockets. Lastly, as a vertically integrated state, the price signals for electric distribution are potentially less transparent for valuing the services DERs can provide. This has contributed to increased interest in accessing distribution system data.

Requests for more transparency have increased. These requests have come from groups such as the DER industry, state and county governments, the University of Hawaii, and utilities. The DER industry, for example, has been heavily involved in docketed proceedings and have requested more data within the IGP process. The PUC recently granted parties access to HECO's RESOLVE modeling, under the conditions that the parties sign a non-disclosure agreement and designate a representative to run the model. Requests have come from the state energy office in order to model the energy system to inform policy, and from local governments for load and grid information to manage facility energy usage and incorporate data into local resilience planning.

The Hawaii PUC has made distribution system data available in two main ways. Similar to Green Mountain Power in Vermont, HECO publishes locational value maps (similar to hosting capacity maps) on their website. The maps are updated on a daily basis and provide a visual representation of the amount of hosting capacity on each island. The commission is also making the data available through the IGP process. Over the past two years, HECO has convened multiple stakeholder working groups under the IGP process. The two primary groups that deal with distribution data are the Distribution System Planning Working Group and the Forecast Assumptions Working Group. All materials from the working groups are presented publicly on HECO's website and includes data which underlay the IGP models – namely LoadSEER, RESOLVE, and PLEXOS. Challenges have emerged with presentation of the data. Data were initially presented in the form of graphs and outlines, and were hard-coded in Excel which made it difficult to interpret assumptions and inputs. The PUC continues to work through these challenges.

Minnesota

The motivations for increased distribution system data in Minnesota are similar to those in Hawaii and Vermont. In addition, several drivers specific to Minnesota were shared on the call. One need for this data is to calculate the value of solar. While this only applies to Xcel Energy's community "Solar Gardens," it offers an alternative compensation method which is available to utilities more broadly. Additionally, the data can be used by customers and developers to understand avoided cost compensation rates that go into DER revenues. Data are also needed to evaluate investments being made, and this need has been a major focus of integrated distribution planning efforts. The data help evaluate whether utilities are adequately planning for changes from customer choice, increased use of DERs, the optimization of existing assets, and the replacement of aging assets.

All utilities in the state report on the DG that is applying for connection to their grid. This includes the number of applications, completion date, ownership models, technology, and capacity. As this data collection is long-standing, it can be used to report temporal trends and be shared with the Midcontinent Independent System Operator (MISO) for their transmission-level DER planning.

Regulated utilities provide integrated distribution plans to the Minnesota Public Utilities Commission (PUC) with baseline info on utility systems. This includes information such as whether they have SCADA visibility on distribution wires, the number of substations, and historical and forward-looking investments. Some utilities also provide preliminary hosting capacity information. One utility in Minnesota is transitioning from annual to quarterly updates on hosting capacity maps. Other utilities provide less comprehensive analyses of hosting capacity via daytime minimum load values.

The PUC is gathering information from utilities by requesting that they conduct DER scenario analyses and provide input on emerging issues such as the IEEE 1547-2018 Standard for Interconnection and Interoperability of Distributed Energy Resources with Associated Electric Power Systems Interfaces. While not explicitly DER data, this provides transparency into how the utility is viewing and planning for the future. The PUC also collects data from utilities from non-wires analyses, transportation electrification plans, and integrated resource plans (IRP).

The PUC recognizes the importance of creating data architecture and a standard for data reporting to help make data more publicly available, and has advanced this effort by creating an annual reporting template. As a result, the commission saw an increase in reporting by utilities. The consistent format has been beneficial to both utilities and the commission for reporting and analysis.

There has been an increase in requests for transparency, frequency, and granularity of information from local governments, clean energy advocates, and the DER industry. The PUC has responded to these requests by requiring publicly accessible maps and setting terms and cost caps for data requests. To address potential associated security and customer privacy concerns, the PUC recently opened an investigation into the security of public maps and data and to establish and clarify customer privacy policy standards.

Nevada

Senate Bill 146 (2017) called for the Nevada Public Utilities Commission (PUC) to create a plan to analyze the effective deployment of DERs to help meet or reduce electricity demand in the state. The PUC interpreted this legislation as requiring regulated utilities to develop distribution resource plans (DRP) to accompany their IRPs. Traditionally, before the grid needs assessment and the DRP, the commission would

not be able to see any distribution-level projects until the utility had already implemented them and were seeking cost recovery. The new process was a way to allow the commission to see how the planning process functions. So far, the data have been underutilized outside of the utility, despite being very public and transparent.

Distribution system data is fairly transparent and readily available. Data are used for hosting capacity analysis and grid needs assessment, both of which are important for grid forecasting. The PUC is looking out six years in the future to forecast feeder-level load and DER adoption. The PUC is attempting to account for multiple factors including customer growth, load growth, adoption rates, DER profiles, and customer consumption profiles. This allows utilities to see where the constraints are and decide how to respond. In forecasting how many DERs are predicted to connect to the grid, the PUC takes a very granular approach. First, the PUC identifies the DER technical potential, i.e. the total DER capacity that could be installed in an area based on available or projected technologies without any consideration of cost of willingness of users to adopt technology. This is narrowed down by economic potential (a cost-effectiveness test) and further by achievable DER potential (what is realistically achievable given real-world constraints, market barriers, policy goals, and adoption rates). Lastly, the forecast incorporates adoption probability based on program funding levels and marketing programs, with a recognition that there is some level of uncertainty.

Distribution data is currently being updated on a monthly basis, and efforts are underway to move to daily updates of the hosting capacity and feeder data. However, compared to other states, there is not as much public demand for the data, so the pressure to update more frequently is low.

Hosting capacity maps are available and open to the public, and only require a two-step verification process through a mobile app. They are color-coded and allow for searches down to individual feeders and substations. Additionally, maps can be filtered by year and have an option for PV hosting capacity analysis based on thermal steady-state voltage.

Discussion

There was a question for Hawaii and Nevada from Minnesota about the cost of frequent updates for hosting capacity maps. Cost has been a major obstacle in Minnesota, and there is a debate about whether the utility is accurately presenting its costs. In Nevada, it is the feeder data that is being updated frequently. This does not end up being a large cost for the utility. The associated costs are more upfront with buying software and training staff. Similar to Nevada, the maps in Hawaii show a percentage of available capacity, and can also be updated at low cost.

Minnesota PUC staff offered a follow-up comment to the state's presentation. The Minnesota PUC is about to start collecting data on distribution sub-level reliability. This will allow for more detailed information on the causes of outages, specifically SAIDI/CAIDI/SAIFI for Xcel's service territory. This is useful for PUCs to track whether utility smart grid investment are improving reliability. This also allows the PUC to see variations in reliability among lower-income or Black, Indigenous, or People of Color communities and verify that distribution system investments are equitable across customer classes.

There was a question about whether there was any interest in expanding transparency for other utility infrastructure beyond the electric sector. Hawaii PUC staff responded that there are plans to incorporate the heating and transportation sectors, especially as the state moves toward economy-wide low-carbon goals. Since the data for the electric sector is more readily available, most states are starting with electric utilities.

The final question addressed whether it was appropriate to have different types of data collection and transparency across utilities or sectors. Minnesota PUC staff advocated for a standard approach, particularly over time. However, this approach should not come at the expense of leaving useful data on the table, so it may be necessary to consider allowing some differences between utilities.

Conclusion

The discussion among state PUC staff demonstrated that there is considerable value and use for increasing distribution system data and facilitating data that is more granular, transparent, and accessible. The need for this data has been driven by high penetration of DERs, changing policy goals, and increased requests for more transparency and engagement from non-utility stakeholders in many of the states. From the experiences shared, distribution system data is commonly used to develop hosting capacity maps and forecast models, and inform resource plans. The emerging opportunities for data exist not only at the distribution-level, but also at the transmission level to enhance planning, as noted by Minnesota and Vermont. In addition, distribution system-level data can be used to evaluate equity and reliability of utility investments across the distribution system.

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