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THE FUTURE OF ELECTRIC UTILITIES – PART 2

By John Lester

Decades ago, as noted in Part 1 of this white paper, there was a lot of work involved in keeping an electric utility running – making sure there was enough coal or nuclear power for generation, and building and maintaining transmission and distribution lines. These days, the number of new issues that keep electric utilities busy has become mind-boggling.

In this two-part paper, we look at the “future of electric utilities” – what new trends and technologies are currently in place and how their evolution will impact utilities in the coming few years.

While there are dozens of issues that must be studied and managed, this white paper is looking at ten in specific, and the paper is divided into two parts.

In Part 1, we looked at at generation-related topics: coal, solar, solar & storage, microgrids, and virtual power plants.

Here, in Part 2, we will look at non-generation-related topics: transmission build-out, electric vehicle charging infrastructure, grid hardening and resilience, the smart grid, and customer-owned generation.

6 - TRANSMISSION BUILD-OUT

There is a huge need for "transmission build-out" on a nationwide basis, but a lot of roadblocks in terms of regulations, etc.

According to a July 2023 report from Grid Strategies, titled “Transmission Congestion Costs Rise Again in U.S. RTOs,” annual internal market congestion costs rose significantly in 2022, after nearly doubling from 2020 to 2021 across the Regional Transmission Organizations/Independent System Operators (RTOs/ISOs).

“Congestion costs are incurred on the U.S. electric transmission grid when there is inadequate capacity to deliver the lowest-cost generation to load (consumers),” said the report. “Higher cost generation is dispatched instead, raising prices that are then charged to consumers.”

The report went on to note that total reported congestion costs increased by 100 percent from 2020 to 2021, and by about 56 percent from 2021 to 2022. In fact, 2022 congestion costs doubled the 2021 five-year average and tripled the five-year averages from 2016 to 2019. “This trend reflects the greater frequency and higher cost of thermal generators running in place of renewables curtailed due to inadequate transmission capacity, among other factors,” said the report.

As Finley Engineering sees it, there is little doubt that additional transmission is needed. Beyond the obstacles to overcome with the RTOs, the bigger challenge may be securing the right-of-way (ROW) in an environment where many property owners do not want transmission lines to cross their properties. As a result, there will be an increasing effort to use existing ROWs and overbuild those existing paths.

7 - ELECTRIC VEHICLE CHARGING INFRASTRUCTURE

As the sale of electric vehicles (EVs) continues to increase, electric utilities need to gain access to additional generation in order to meet the growing demand for EV charging infrastructure. There has been a lot written about the growing popularity of electric vehicles (EVs) in recent years, and the importance of electric utilities being prepared for this growth, especially as it relates to having the generating capacity and the specific infrastructure in place to meet the growing demand for EV infrastructure charging of these vehicles.

Just how much of a demand is there these days for EVs and the related charging infrastructure?

According to a September 2023 report from the U.S. Energy Information Administration (EIA), hybrid, plug-in hybrid, and battery-electric vehicle sales in the U.S. have increased in recent years as sales have decreased for non-hybrid gasoline- or diesel-fueled vehicles. According to the EIA, using data from Wards Intelligence, hybrid, plug-in hybrid, and battery-electric vehicles collectively accounted for 16 percent of light-duty vehicle sales in the U.S. in the second quarter of 2023 (2Q23). Manufacturers reduced the number of non-hybrid internal combustion engine (ICE) vehicle models from 318 to 297 between 2021 and 2Q23, and they increased the number of battery-electric models from 34 to 55.

And a May 2023 EIA report projected that EVs will account for between 13 percent and 29 percent of new light-duty vehicle sales in the U.S. in 2050, and between 11 percent and 26 percent of on-road light-duty vehicle stocks

As Finley Engineering sees it, the continued growth of the sale of EVs will require additional generation on the grid. This will be a big challenge, with generation capacity coming off the market at a time when the demand increases from EVs.

8 - GRID HARDENING & RESILIENCE

There is growing demand (from customers and government regulatory agencies alike) for more grid hardening and resilience? What impact will this have on electric utilities?

An August 2023 report published by the North American Electric Reliability Corporation (NERC), titled, “Collective Focus Imperative for Mitigating Emerging Risks to Grid Reliability,” identified five significant evolving and interdependent risks to grid reliability: energy policy, grid transformation, resilience to extreme events, security risks, and critical infrastructure interdependencies. In terms of the first risk: “Energy policy is a new risk profile and has broad implications across the risk profiles, since it catalyzes changes and has the potential to amplify their effects,” said the report. “Consequently, energy policy can drive change in bulk power system (BPS) planning and operations in short time periods, affecting reliability and resilience.”

Finley Engineering believes that grid hardening and resilience may be among the top challenges for muni's and co-op's. It will become increasingly important for distribution utilities to invest in their infrastructure going forward in order to achieve higher levels of reliability, grid hardening, and resiliency. We all need to consider improving our efficiency and consider options for making electric grids smarter.

9 - THE SMART GRID

What role will the smart grid play in the future?

According to SmartGrid.gov, the smart grid offers a number of benefits to electric utilities and their customers, including: more efficient transmission of electricity; quicker restoration of electricity after power disturbances; reduced operations and management costs for utilities, and ultimately lower power costs for consumers; reduced peak demand, which will also help lower electricity rates; increased integration of large-scale renewable energy systems; better integration of customer-owner power generation systems, including renewable energy systems; and improved security.

Finley Engineering believes that smart grid technologies will continue to increase in importance. In fact, this may be more important for muni's and co-op's than for the bigger utilities. Many medium-sized utilities have begun to embrace some of these new technologies, yet others have concerns about costs and the complexity of the system. As the cost of the electronic equipment continues to become more affordable, Finley believes that there will be some creative solutions for handling the potential complexity of the systems will come along with the smart grid.

10 - CUSTOMER-OWNED GENERATION

The continued growth of customer-owned generation, especially community solar, commercial solar, and residential solar, can be a challenge for power demand for electric utilities.

According to an October 2023 report from Wood Mackenzie, residential solar set a quarterly record in Q2, with 1.8 GWdc of capacity installed. A record 607 MWdc was installed in California ahead of the switch from net metering to the less favorable net billing regime.

And according to a September report from the EIA, over the past decade, U.S. solar capacity, large-scale and small-scale, has boomed. The majority of small-scale solar is residential rooftop solar installations. The report noted that, “The United States added 6.4 GW of new small-scale solar capacity in 2022, an annual record and 17% more than was added in 2021 (5.5 GW).”

Another September EIA report estimated that the U.S. added 6.4 gigawatts (GW) of small-scale solar capacity in 2022, the most ever in a single year. It noted that rooftop solar panels installed on homes make up the majority of small-scale solar capacity in the U.S., and that small-scale solar power systems are also used in the commercial and industrial sectors. In specific, according to the report, U.S. small-scale solar capacity grew from 7.3 GW in 2014 (the year that EIA started publishing these estimates) to 39.5 GW in 2022,more than a five-fold increase.

As Finley Engineering sees it, as the growth of net metered solar and energy storage capability continues across all sectors (Community, Commercial, and Residential) and grid technology progresses, the power market will likely begin to shift beyond just a change in the primary sources for power generation.

The change may move from a power provider generating and delivering electricity to customers who pay the bill (one-way), to a market in which the customers can also become a supplier in a reciprocal relationship (two-way) with a utility.

In other words, if utilities could work in collaboration with customers by creating rates and processes that benefit the utility and customers, a win-win can be created for both parties.

The challenge may become how utilities could leverage these distributed resources to benefit both parties for the benefit of all their customers. This two-way relationship would also require a connected grid and SCADA control system to optimize these distributed resources, so that the overall supply remains reliable, stable, and affordable.

Municipal and cooperative utilities are in an excellent position to move in this direction, considering that their customers are essentially their owners. This is a logical step for would provide local capacity at a time where central station capacity is beginning to decline.

Otherwise, the future growth of net metered resources may begin to diminish the potential revenues of utilities going forward, even when the overall demand might increase with electrification.

We can address the challenge and solve the problem IF we begin to rethink the relationship between utility and customer.

PERSPECTIVE

As Finley's clients look at how the significantly-changing non-generation landscape is changing and what they may need to do in order to be able to provide sufficient, reliable, and cost-effective generation to their customers, Finley stands ready to help these clients make the best decisions for their specific utilities and customer base.

About Finley Engineering & Consulting

Finley Engineering is a full-service engineering consultancy with a successful history of providing expertise in communications technology and energy engineering services for a wide variety of clients such as independent telecom providers, electric cooperatives, municipalities, competitive providers and government entities.

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