February 2021

The Economics of DER and the Rise of the U.S. Prosumer

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Inside…

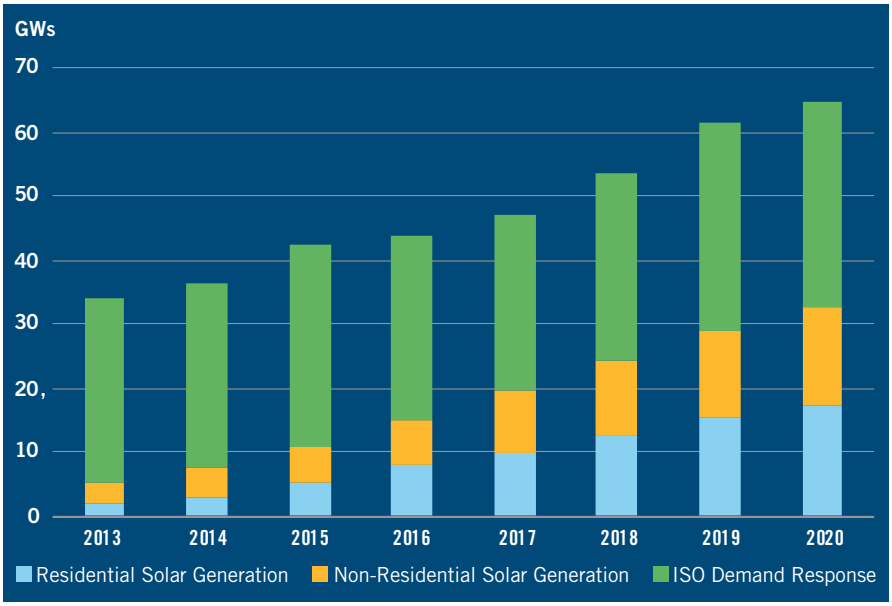
Key Points:

- Over the past decade, retail electricity prices have continued to rise despite declining costs associated with generating electricity. Although the portion of total electricity costs attributed to power production has decreased by nearly 70%, the rising costs of delivery have outpaced these declines, contributing to a net increase in consumer bills of roughly 1.3% per year.
- Consumers have noticed, so the prospect of lower-cost, localized, clean generation in the form of distributed energy resources (DER) has piqued their interest. Consumer adoption of DER is poised to accelerate as cost-cutting pressure, environmental issues, and reliability concerns shift into high gear.
- DER can serve to either replace or limit the demand from traditional sources of centralized power generation. While more than half of the 65 GWs of installed capacity already participates in U.S. wholesale markets, increased investment and new policies could expand the rank six-fold by mid-decade, greatly increasing supply-side competition.
- As greater numbers of Americans produce and consume their own power, these "prosumers" will increasingly be a force to be reckoned with. The potential cost to do otherwise is staggering.
- Rural communities likely stand to benefit from the increase in DER development. Given the successful track record with consumer alignment and behind-the-meter innovations, electric cooperatives could utilize these resources to further insulate their communities against escalating future delivery costs.

Stealth DER

Commenting on the passage of the long-awaited FERC order 2222, enabling distributed energy resources (DERs) to compete in wholesale power markets, former chairman Chatterjee emphasized, "DERs can hide in plain sight in our homes, businesses and communities, but their power is mighty." He suggested 65 to 380 gigawatts (GWs) of DER capacity would be in operation by mid-decade. The sheer range referenced in his comment speaks volumes about "hiding in plain sight" and the stealth nature of this resource. The upper boundary eclipses

EXHIBIT 1: U.S. DER Participating in Wholesale Markets



Source: Distributed Solar Generation (SEIA), Demand Response (FERC)

Most market observers, including Wood Mackenzie, suggest that the largest and most promising DER segment is one that consumers have the most control over – demand response or more broadly, load flexibility. Both Wood Mackenzie and the Brattle Group see upwards of 200 GWs of demand response being available in the market between 2025 and 2030. According to the Brattle Group, 20% of peak demand could be met or eliminated through load flexibility, with a 40% increase in current capacity achievable through modest refinement of existing programs and additional customer outreach.[3]

the current amount of installed U.S. coal and nuclear power plant capacity. Either outcome (65 or 380 GWs) dramatically reduces dependence on existing centralized generation, but the relative size and composition of this supply matters when assessing the disruption potential.

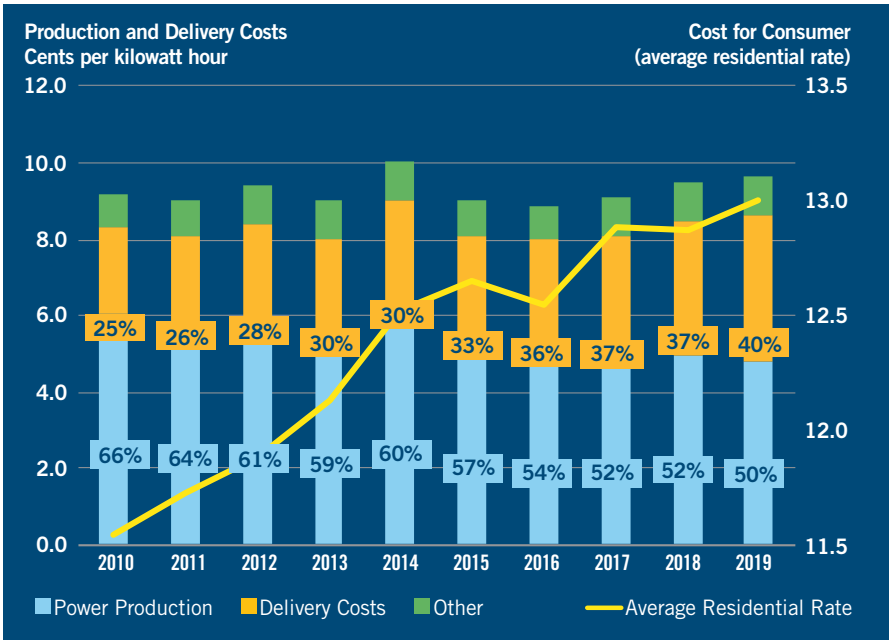
Yet, the record-keeping on U.S. electricity customers who limit consumption, self-generate, or store electricity is sparse. The lack of transparency sets the scene for even greater disruption, as system operators, generators, and distributors (the entirety of the upstream supply-chain) scramble to accommodate a vast number of customer-controlled resources that could surface overnight.

Based on our assessment, there is roughly 65 GWs of customer-controlled resources that can currently substitute for centralized utility-scale generation, with half of this capacity coming from registered wholesale demand response programs[1] and the other half derived from solar distributed generation *(Exhibit 1)*. Accounting for unregistered demand response, non-renewable distributed generation, and battery storage, the count rises to about 100 GWs. Yet, near-term potential for DER is enormous. Wood Mackenzie's first-ever comprehensive assessment released last summer suggests that total U.S. DER capacity could climb to an astonishing 387 GWs by 2025.[2]

Future growth in demand response is anticipated to come from residential consumers. While these electricity users account for just one-third of current demand response, new technologies are expected to accelerate growth with smart thermostats and grid-responsive water heaters paving the way. This news is particularly encouraging for rural electric cooperatives, given the load profile and pioneering work achieved in early residential demand response from these organizations.

Yet, real questions persist on just how "flexible" consumers will prove to be given the growing need to backstop variable renewable supply. Further, operators have raised concerns that demand response might not show up for grid relief at levels necessary to sustain reliable operations. In light of grid stress-tests that occurred last year, divining which source of DER will prove the most reliable is not just an academic question. At present, California regulators are grappling with whether to push for large-scale power plants and batteries to prevent a repeat of rolling blackouts this summer or turn to behind-the-meter resources such demand response. Interestingly, the state's suppliers are actually leaning toward demand response.[4] Either way, the solution California ultimately arrives at might influence future growth.[5]

EXHIBIT 2: Regulated Utility Cost of Electricity



Source: FERC, EIA and CoBank estimates

The rise of DER will impact and potentially alter traditional models of generation, transmission, and distribution throughout the industry, including municipal utilities and electric cooperatives. The future state of the industry – where upstream electricity suppliers take on a very different role – might unfold faster than anticipated. As explained in Deloitte's recent findings, the pandemic and the need to work and learn from home has possibly sparked a greater need for resiliency, which is now intertwined with the notion of self-sufficiency and DER adoption.[7]

DER Adoption

There are a number of drivers bolstering DER adoption: Federal and state regulatory policies, falling costs associated with renewable generation, and a desire for low-carbon electricity, for example. Yet, consumers could probably take advantage of some or all of these without bypassing their existing supplier. So, what lies at the heart of an estimated 57% of electricity customers seeking to self-generate?[6]

For the past decade, Deloitte has surveyed businesses and residential consumers annually to gauge their motivation for managing their own energy. Cost-cutting has consistently been cited as the number one factor. However, as environmental concerns have risen, consumers have increasingly adopted renewable generation, with cost not necessarily serving as the primary driver. More recently, Deloitte has added a third important behavioral trend on their watch-list, which is an increased desire for self-sufficiency and resiliency. As a greater number of consumers seek more agency over their electricity supply, we see passive electricity customers evolving into active "prosumers" who produce and consume energy.

Consumer Control

The three primary factors in the making of a prosumer – escalating consumer costs, increased recognition of climate change, and reliability or resiliency – are remarkably connected. As Deloitte emphasized in their latest instalment, severe natural disasters and longer duration outages have motivated many electricity customers to seek greater resiliency and explore cost-effective options beyond their electricity providers.

Starting with costs, residential and commercial consumers have witnessed steady increases in their monthly bills over the past decade despite advancements that have slashed the cost of generating power. Ten years ago, shale technology had already unlocked vast quantities of low-cost natural gas, decisively switching the country away from (already low-cost) coal and toward (even lower-cost) natural gas as the dominant source of generation.[8] More recently, the plummeting costs associated with building new zero-fuel-cost renewables have accelerated development of new wind and solar capacity, further driving down generation costs. Yet, most consumers have not witnessed a direct pass-through from these power generation savings. Over the past decade, average U.S. residential prices have steadily risen by 12.7% or an average annual increase of 1.3% each year.

While the portion of total electricity costs attributed to power production has decreased over the past decade – from 50% to 70% for most utilities – rising delivery costs have more than offset these savings *(Exhibit 2)*.

Several years ago, EIA noted that retail electricity prices were not closely following the costs of fuels used to generate electricity mainly because of changes in the other costs involved with delivering electricity.[9] The agency highlighted that upward pressure on customers' bills were largely the result of rising transmission and distribution costs associated with replacement of aging infrastructure and connection to new renewable supply.

The investment required for sustaining and reinforcing or hardening existing delivery infrastructure is poised to amplify these costs. According to a 2015 U.S. Department of Energy (DOE) technology assessment, electricity infrastructure is aging and a sizeable share of existing facilities are nearing the end of their useful life. 70% of power transformers are 25 years of age or older, 60% of circuit breakers are 30 years or older, and 70% of transmission lines are 25 years or older.[10] Over the past decade, 99% of actual customer outage minutes have been attributed to failures related to transmission and distribution – mostly affected by severe weather events – rather than insufficient generation.[11] A cycle of rising costs and declining reliability would encourage greater DER adoption.

Conclusion

G&Ts and distribution cooperatives need to evaluate new services. A decade ago, it was thought that improvements in distributed technology like rooftop solar and behind-the-meter battery storage would make power utilities increasingly irrelevant. Mounting costs for those remaining consumers that stayed with their utility would bring about some form of "utility death spiral," whereby increasing DER adoption would occur as buyers sought out lower-cost solutions. While this hasn't yet happened, even the more benign state of customer-owned DER has created unforeseen system costs.

Further, a recent NREL study suggests the problem isn't going away anytime soon with even greater costs ahead for suppliers that ignore DER expansion. NREL estimates in the next 15 years, poor DER-adoption forecasts could cost utilities as much as $7/MWh of served load - or roughly one quarter of current wholesale electricity prices - from suboptimal asset investments,[12] meaning generation and transmission assets developed without regard to expanding DER substitutes could become stranded.

Yet, pathways toward a more compatible future are unfolding. States are evolving new visions for DERs with regulators actively considering how to reframe utility business models to better integrate these resources. Utility pilot programs are also building the bridge toward better prosumer collaboration with technology and incentive structures enabling beneficial load flexibility. There is also the fact that a majority of U.S. companies that have made the commitment toward 100% renewable electricity have made little forward progress on procurement.

For rural electric cooperatives and their members, open and transparent strategic planning is essential in figuring out DER compatibility and how traditional business models will evolve. The primary role of traditional suppliers might include managing distributed resources owned by their consumers. A move toward a service-based business model could open additional opportunities.

Rural communities could also benefit with buffers against escalating future delivery costs. A future of change brings greater optimism for rural electric cooperatives that have a successful track record with member engagement – a critical element for thriving in this evolution. ■

Sources Used

[1] The Energy Policy Act of 2005 requires FERC to keep tabs on demand response and advanced metering. Similarly, EIA has required utilities to report energy efficiency and demand response since 2013.

[2] Wood Mackenzie, "The next five years will see massive distributed energy resource growth," 23 June 2020.

[3] Brattle Study: "Cost-Effective Load Flexibility Can Reduce Costs by More Than $15 Billion Annually," June 2019.

[4] Edison International, "Reimagining the Grid," December 2020. While utility-scale renewables growth will still boom, DER, including rooftop solar, batteries and electric vehicles (EVs), can be central to protecting reliability.

[5] See Greentech Media, "California's Big 2021 Decision on Grid Reliability: Expand Supply or Manage Demand?," 5 January 2020.

[6] Two recent studies by Accenture and Deloitte both referenced 57% of customers citing interest in solar generation. See Accenture, "Power Surge Ahead – How Distribution Utilities can get Smart with Distributed Generation," 2017. And, Deloitte Resources 2020 Study, May 2020.

[7] Deloitte Resources 2020 Study, May 2020.

[8] According to EIA, in 2000 shale gas provided only 1% of U.S. natural gas production; by 2010 it was over 20%.

[9] See EIA, "Electricity prices reflect rising delivery costs, declining power production costs," 7 September 2017.

[10] U.S. Department of Energy, "Quadrennial Technology Review 2015, Chapter 3: Enabling Modernization of the Electric Power System," 2015.

[11] Rhodium Group, T. Houser, J. Larsen & P. Marsters, "The Real Electricity Reliability Crisis," October 3, 2017.

[12] NREL, "An Overview of Distributed Energy Resource (DER) Interconnection: Current Practices and Emerging Solutions," Horowitz et al. 2019.

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