



Valuing and Compensating Distributed Energy Resources in ERCOT Executive Summary

The competitive Texas energy market continues to drive innovation in the electric grid, and the traditional model of large generators serving passive consumers is evolving into a more dynamic power system. Today some homeowners, businesses and industrial facilities may generate their own electricity from rooftop solar panels or fast-starting natural gas micro-turbines while others may manage their energy consumption with energy efficiency and demand response. As solar and other technology costs continue to decline and Texans place greater value on energy resilience and environmental impacts, more consumers are investing in Distributed Energy Resources or DER.

Texas Clean Energy Coalition (TCEC) conducted informal consultations with a broad, inclusive roster of stakeholders to discuss this emerging trend and what it means for Texas consumers. Working with a team of economists from The Brattle Group and former Public Utility Commissioner Ken Anderson, TCEC facilitated stakeholder sessions in April 2018 and February 2019 to discuss issues relating to the growth of DER and their integration into the Electric Reliability Council of Texas (ERCOT) grid.

The new study, “Valuing and Compensating Distributed Energy Resources in ERCOT,” blends Brattle’s research with stakeholder input to enhance the current understanding of DER in ERCOT. The study focuses on rooftop and community solar, distributed storage, small generation, energy efficiency and demand response (EE/DR) and provides a comprehensive snapshot of the rapid growth of DER, issues in evaluating the economics of DER, and the pros and cons of three methods of compensating DER. This study is designed to capture the current status of DER in ERCOT and identify further study of market dynamics and policy choices that can accelerate the growth of DER. Possible future topics for more research and stakeholder engagement include how DER can impact: resilience during cyberattacks or natural disasters like hurricanes and winter storms; grid reliability; carbon emissions; and consumer choice.

DER has been growing rapidly in the ERCOT grid in recent years, and ERCOT and industry stakeholders expect the growth in DER to continue. The Public Utility Commission (PUC) and ERCOT are taking steps to better understand this fast-growing sector of the Texas energy market. Both agencies require reporting of some distributed generation to facilitate improved visibility of these assets. In addition, ERCOT is working with regulated Transmission & Distribution Service Providers (TDSPs) to map all the registered DER between 1 MW and 10 MW to the transmission system.

Some highlights on the growth of DER in ERCOT are:

- Between 2015 and 2017 DER in ERCOT increased by 62%, and by the end of 2018, there were about 1,300 MW of DERs in ERCOT.
- Small DER of less than 1 MW, primarily rooftop solar installations and some natural gas-powered microgrids, is not required to be reported. However, based on the small <1 MW DER that was reported to ERCOT, the category nearly doubled between mid-2016 and the end of 2018. Throughout 2018, most unregistered new small DER <1 MW was solar.

The study found that various forms of DER make different contributions to the ERCOT grid. For example, battery storage provides on-demand power but to date has technical limits in terms of charging and discharging capacity, while solar and wind power varies with the time of day and weather conditions.

Similarly, distributed solar power tends to have better coincidence with late-afternoon peak demand than wind power and has no carbon emissions, while natural gas-powered microturbines provide on-demand power but emit some carbon, although much less than coal-powered electric plants. Many potential system (as opposed to customer) values have been suggested for DER including avoided or deferred costs of new transmission or generation assets, resilience and market price reductions, but existing studies of the value of DER vary widely in their valuations based on the components included in the value calculation and the methodologies used.

ERCOT's 2016 Long Term System Assessment (LTSA) shows the potential transmission benefits of DER. In a scenario with high use of distributed generation and energy efficiency, the growth in peak electric demand declined by 13% between 2017 and 2031, compared with the Current Trends case. Also, the report found reductions in reliability project needs in 2031 in the North/North Central and South/South Central regions. In South Texas, a 370-mile-long 345kV path (potentially costing consumers \$500 million) can be avoided or deferred with high penetration of DER.

Some DER in ERCOT is compensated for all the energy produced, but this is not typically the case for small DER <1 MW. Since future DER growth in ERCOT is likely to include many of these small installations, further stakeholder engagement is needed to explore optimal ways to compensate them for energy produced, thus incentivizing more DER. However, it is important that any compensation plan should recognize the value of DER to the system and avoid cost shifting so that DER can contribute to the ERCOT grid.

Each of the three modes of compensation for DER that were surveyed present different mechanisms and face practical and/or political challenges.

- Net energy metering (NEM) rewards DER generation at the full retail rate by netting each customer's total DER generation against their total electricity consumption. However, when NEM is combined with volumetric rates per kWh, system costs can be shifted from consumers with DER to those without. Some states are abandoning NEM.
- A Value of DER (VoD) tariff is straightforward in that it pays DER for the energy and other attributes it adds to the system. However, establishing a VoD requires complicated calculations and is expensive to implement because it requires separate meters for generation and consumption. A VoD also does not work for EE/DR, because these activities cannot be metered separately from the customer's demand.
- Three-part rates have a customer fee, a per-kWh volumetric charge and a demand charge based on maximum kW demand. Three-part rates attempt to align the cost of serving customers with electric rates, but they are disfavored by Texas industry stakeholders who expressed concern about the demand charge component and potential confusion for residential customers.

Another step in the emerging role of DER is already underway. ERCOT is considering a change to settle DER at nodal prices, which would provide better price signals for DER and support grid reliability and efficiency. Giving DER the ability to respond more accurately to market price signals can further enhance the value of DER on the ERCOT grid.

As noted above, this study provides the foundation for further stakeholder engagement around issues that can accelerate the growth of DER. From our stakeholder discussions, several issues for further studies and engagement emerged, including:

- Evaluate how time-variable pricing would better align the economics of various DERs with system needs and costs;
- Explore ways to increase transparency and flexibility for market participants, such as improving price signals so that DER can be located optimally, and solutions to manage when electric vehicles (EVs) charge their batteries and to harness EV batteries as energy storage assets; and
- Investigate implications of a three-tiered approach to DER integration that emphasizes the competitive energy market and Non-Wires Alternatives as proposed by a Texas stakeholder in an ongoing PUC proceeding.