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Encouraging the Development of Distributed Energy Resources in Texas

Expanding clean energy resources, reducing pollution and addressing energy poverty

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About Environmental Defense Fund

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Executive Summary

Since its creation more than 20 years ago, the Electric Reliability Council of Texas (ERCOT) competitive electricity market has earned a reputation as the most competitive electricity market in the world. ERCOT, the grid operator, has integrated large quantities of wind power and is at the forefront of integrating a significant amount of solar generation. ERCOT kept the lights on through the past three summers when reserve margins hit historic lows.

ERCOT also is integrating electricity storage resources into the grid, which are projected to grow rapidly over the next decade. These sources of electricity – utility-scale wind, solar and storage – are now the lowest cost generation resources in the ERCOT competitive market and account for 95% of the generation resources in the development queue. Two-thirds of this potential generation is utility-scale solar.

The changing generation mix in ERCOT can benefit Texans locally and statewide. Large wind and solar power projects are consistent sources of income for state and local governments, school districts and farmers in West Texas. They benefit the rest of the state too, by keeping costs down, which has enabled many industrial customers to return operations that had been moved overseas back to Texas. In addition, these resources are displacing older coal-fired resources that primarily use imported coal, are the largest emitters of air pollution and greenhouse gases in the state, and use twice the water as all other generation resources combined. Many of these coal-fired resources will surpass their usual retirement age over the next decade.

Critics of wind and solar generation are quick to highlight their intermittency. The wind does not blow the same all the time, and the sun does not shine on the ground the same all the time. They argue that coal-fired generation should be maintained even if it requires subsidies that would cost Texas businesses and consumers billions of dollars a year.

ERCOT has already shown that it has sufficient tools to address intermittency and maintain reliable grid operations. However, Texas can choose to address this intermittency with an additional tool that is emerging: the state's vast quantity of homegrown distributed energy resources (DERs), specifically electric energy storage, distributed generation – especially rooftop and community solar – demand response, energy efficiency, and electric vehicles and their charging equipment. All of these exist today, and all of them can add electricity to the grid or reduce the need for electricity on the grid during peak periods. Some can do so instantly or on short notice. They use no water and create no emissions, and they can increase grid reliability and resilience. Additionally, DERs have the potential to become an economic driver across the state of Texas if incorporated into economic development strategies.

Beyond grid and environmental benefits, DERs offer social and economic benefits to Texas customers. DERs are local and require local workers to install and maintain them. Used strategically, they have the potential to reduce Texans' energy bills, especially for the 3.7 million Texas households that experience energy poverty.

This report was begun long before the police killing of George Floyd in Minnesota, the protests it sparked and the public demand for reforms of policies that were either born from racism or the perpetual impacts of racism throughout our society.

Energy and race are not often addressed together. But they can and should be. In Texas, Black and other communities of color are more likely to face energy poverty, more likely to live near fossil fuel power plants, and more likely to suffer the adverse health effects of local air pollution. They're also the most likely to suffer the consequences of a changing climate – from higher temperatures, more frequent drought, and more frequent and stronger storms.

In short, they have a huge stake in Texas' energy future. But they are sorely underrepresented in energy discussions and decision making. DERs alone will not solve these inequities.

But because they create local jobs, improve local air quality, increase grid reliability and resilience, and keep energy costs down, DERs could play a role in a larger effort to address energy equity across the state. State leaders and local decision makers should prioritize action on this issue.

This report includes strategic policies that could be developed and implemented by state and local officials, and even electric utilities in certain instances, to unlock the wide range of benefits DERs can provide and make them more affordable and obtainable for more Texans.

Summary of Recommended Strategies

A host of decision makers across Texas – from the state legislature, the Public Utility Commission of Texas (PUCT), Electric Reliability Council of Texas, individual cities and counties, and utilities – can play a role in increasing the deployment of DERs across Texas.

How they are deployed and whether they are deployed as part of a broader strategy to increase grid resiliency, reduce climate and local air pollution, and address energy poverty will determine whether this promising new energy resource reaches its full potential.

Following is a summary of Environmental Defense Fund's recommendations. A more through discussion of each strategy can be found on page 21.

- The developers of clean DERs, utilities and non-governmental organizations should initiate a public education and marketing campaign in select Texas markets to promote the availability and benefits of clean DERs. Local decision makers, particularly city and county officials in and around Houston, Dallas-Ft. Worth, Austin, San Antonio, and targeted counties in South Texas, should encourage deployment of clean DERs to build community resilience, grow their economies and address energy poverty.

- The Texas Legislature, PUCT and local governments should eliminate all state and local policies, regulations, and practices that impede or prohibit customer investment in and use of DERs.

- The Texas Legislature should adopt policies that provide state-funded financial incentives for clean DERs that are comparable to those being provided to other forms of electricity.

- The Texas Legislature should authorize the use of on-bill financing for the upfront cost of clean DERs in each retail electricity market in Texas.

- The PUCT should adopt policies that allow DERs to be used as alternatives to expanded transmission and distribution infrastructure.

- The PUCT and ERCOT should develop and implement reforms that would allow DERs to directly participate in the competitive market. Texans would save $5.47 billion over a 10-year period or $456 per household if DERs were better integrated into the competitive market.[1]

- The PUCT and ERCOT should adopt regulations and market protocols that allow the aggregation of DERs to participate in ERCOT as "virtual power plants" and empower residential customers and small businesses to participate in "out of market" demand response programs.

- The Texas Legislature, PUCT and ERCOT should adopt policies to substantially increase statewide energy efficiency and demand response investments and outcomes.

- Non-governmental organizations, universities and think tanks should develop pilot projects to demonstrate how community solar – and DERs in general – can provide clean energy to low-to-moderate income (LMI) households and communities of color while reducing energy cost burdens.

- Clean DERs already provide Texans with 205,600 jobs. The adoption of the recommendations included in this report by state policymakers and local decision makers will increase the deployment of these resources and their associated jobs. In their deliberation, policymakers and local decision makers should ensure that the development of clean DERs are targeted to address energy poverty experienced by LMI communities and the continuing energy, economic and equity challenges faced by African Americans and Latinos in the state. Further, Texas leaders should encourage utilities and state and local agencies to coordinate the delivery of housing, energy assistance programs and the installation of clean DERs to optimize the provision of these services to these constituencies to reduce utility bills, improve employment opportunities and ensure energy equity.

[1] *The Value of Integrating Distributed Energy Resources in Texas*, Texas Advanced Energy Business Alliance (November 2019). Available at https://www.texasadvancedenergy.org/#report.

Distributed Energy Resources (DERs)

The 20th century electric grid was built to generate electricity at large central station facilities and move it to customers through the transmission and distribution grids. This paradigm is evolving as technological advances make it increasingly economical for consumers to manage their energy consumption and become decentralized "prosumers" – consumers who also produce electricity through DERs.[2]

Clean DERs encompass a wide spectrum of technologies – some physical and some virtual. On one end of the spectrum are generating resources, like solar and wind. On the other are resources that reduce energy consumption, like energy efficiency and demand response. Energy storage falls somewhere in between, because it can operate as both a supply of energy to the grid and as a reducer of demand. This paper addresses DERs across the spectrum.

[2] In Alison Silverstein's recent report for EDF, "*Resource Adequacy Challenges in Texas, Unleashing Demand-Side Resources in the ERCOT Competitive Market*," Section 5.2 on pages 36-41 describes a variety of DERs in more detail than discussed here.

- Rooftop solar is the most common and recognizable DER available to individual residential and business customers.
- Community solar enables many customers to use solar energy generated at an off-site, but nearby, solar installation. It is an attractive option for customers who live in multifamily housing, as well as renters and homeowners who are unable to install solar on their property for a variety of reasons.
- Demand response is a virtual DER that reduces energy use of participating customers during peak demand periods or when energy prices are high. Demand response programs can be run by utilities or third-party companies that aggregate "conservable" energy among their customers.
- Energy efficiency measures and technology reduce the amount of energy required to meet customers' needs.
- Energy storage technologies capture and convert electricity produced at one time for use at a later time. As the deployment of electric vehicles and charging stations develops, these will function as another form of storage in the competitive market.[3]

It is important to recognize that the deployment of a DER must start with the customer. Individual customers must make the decision to invest their money for the equipment and services necessary for the DER to be installed and operational. In other words, because they are not in the business of generating electricity at the outset, customers must see the value to them, whether economic or otherwise, to make the necessary investments. A number of factors can drive DER customer demand: environmental consciousness, desire for energy independence, energy resiliency and potential savings on energy bills. For larger customers, additional potential considerations include reducing transmission and distribution demand charges by limiting demand at potential times of Four Coincident Peak (4-CP), participation in Emergency Response Service (ERS), the potential to provide ERCOT certain ancillary services for the wholesale market, and load zone-level wholesale price response in the real-time market.

DERs have a proven track record in Texas, and their numbers are increasing. Still, the total capacity of installed DERs in Texas (1,700 MW total; 1,050 MW of clean energy DERs) pales in comparison to the amount of utility-scale generation (82,000 MW expected to be available for summer 2020).[4] In other words, there's remarkable room for growth.

Expanding deployment of all forms of clean DERs in the ERCOT competitive market will ensure the continued transition of the Texas electric grid to clean energy, curb climate and local air pollution, and provide additional resources that can support the integration of utility-scale wind and solar projects into the ERCOT wholesale market.

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[3] See, e.g., "EMotorWerks Is Using Its Network of 10,000 EV Chargers to Bid Into Wholesale Markets," Greentech Media, Sept. 25, 2018. Available at https://www.greentechmedia.com/articles/read/emotorwerks-wholesale-markets-ev-charger-network. Aggregation of electric vehicle car charges used to provide demand response in California's proxy demand resource (PDR) market.

[4] "Distributed Generation (DG) in ERCOT" (as of end of 2019). Available at http://www.ercot.com/content/wcm/lists/200196/DG_and_DR_in_ERCOT_FINAL2.pdf.

The Broad Benefits of DERs

Although customers make the initial decision to invest in a DER, the entire grid benefits from that investment, as do the state economy and local communities. ERCOT and the PUCT have recognized that DER investments benefit all electricity customers because of their ability to supply electricity to the grid or reduce demand, especially at times of high stress.[5] For example, the peak output of rooftop solar

[5] See, e.g., *Review of Summer 2019 ERCOT Market Performance,* PUC Project No. 49852, ERCOT's Revised Presentation for the October 11 PUC Workshop (October 11, 2019) at 26. Available at http://interchange.puc.texas.gov/Documents/49852_8_1036860.ZIP, and ERCOT, "Preliminary Review of Controllable DG Response during EEA Events 8/13/2019 and 8/15/2019," presentation to Supply Analysis Working Group on August 30, 2019. Available at http://www.ercot.com/content/wcm/key_documents_lists/172738/Aug_1315_DG_response_v6.pptx.

tends to coincide with peak demand in Texas during hot summer days. As a result, the growth of rooftop solar is especially helpful to reducing (or limiting the growth of) peak system demand. The physical proximity of DERs to their potential end users also can add resilience and reduce demands on the transmission and distribution grid.

In addition to the benefits they can provide to their owners and the grid, clean DERs are capable of providing significant benefits to the state and the areas where they are located. These resources are virtually emission-free and consume almost no water and can be a key component of a viable community resilience strategy.

Clean DERs also provide good paying jobs for local residents and can be part of a city or community economic development strategy. Currently, clean DERs employ 205, 600 Texans. Job growth is this sector was 4% from 2018-2019 and is projected to grow 5% in 2020. Most of these jobs are located in Texas' largest five counties (Harris, Dallas, Travis, Tarrant and Bexar). Nearly 170,000 Texans work in energy efficiency; 13,200 work in grid and energy storage; and 17,300 work in low- and zero-emitting vehicles.[6] With the recent announcement of Tesla's planned expansion in Texas, that number will increase.

The ERCOT region serves approximately 90% of the electricity demand in Texas. The competitive market it manages encompasses three-fourths of the state, including the Houston and DFW metropolitan areas. The entire ERCOT region, as well as the competitive market, are gradually transitioning to a low-carbon, clean energy market that costs less, consumes less water and significantly reduces local air pollution. These changes are primarily occurring due to the growth of utility-scale wind and solar power.

In 2019, utility-scale wind power provided almost 20% of the electricity used in the region; utility-scale solar provided a little more than 1%.[7] Combined, that's more than all coal-fired generation. And they are growing rapidly. At the end of May 2020, utility-scale solar provided almost 2% of the energy in the ERCOT region, and utility-scale wind had increased from 20% to 26% of the state's energy. In its May 2020 Seasonal Assessment of Resource Adequacy (SARA) and Capacity, Demand, and Reserves (CDR) Report, ERCOT projected continued growth of utility-scale wind and solar generation will increase its forecast reserve margin to 12.6% in Summer 2020 and range between 15% to 19.6% through 2024.

To date, all customers have benefited from the cost savings derived from the development of utility-scale renewable resources in ERCOT. But while large electricity users (commercial and industrial facilities, cities, towns and school districts) have benefitted from this energy revolution through direct participation, small businesses and millions of residential Texas customers have not had the same direct access — especially LMI households, communities of color and other underserved population groups. Consequently, Texas' growing clean energy economy is on a path that could reinforce the energy inequities that already exist. Available data suggest that clean DERs have the potential to augment and support the development of additional utility-scale wind and solar resources and address these serious equity challenges here in Texas, across the United States and around the world.

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[6] Figures from Texas Advanced Energy Business Alliance, 2020. See www.texasadvancedenergy.org.

[7] ERCOT Demand and Energy Report (2019). Available at http://www.ercot.com/content/wcm/lists/172485/DemandandEnergy2019.xlsx.

Using DERs to Reduce Energy Poverty

Thoughtful applications of clean DERs may present a meaningful opportunity to address energy poverty in Texas. Energy poverty describes a circumstance in which the personal cost of home energy consumption needed to maintain a healthy lifestyle creates a significant or unnecessary economic burden.[8] It may result in the inability to make payments on energy bills, forgoing other basic necessities, or a restriction of necessary household energy consumption that may lead to negative social and public health outcomes.[9]

Low income energy customers, that is, those earning up to 80% of an area's median income, represent 41% of Texas households (pre-pandemic) and spend a disproportionate amount of household income on energy. A household is said to have a high energy burden if the annual costs of energy exceeds 6% of

[8] TEPRI, About Energy Poverty in Texas. 2018. Available at http://www.txenergypoverty.org/wp-content/uploads/2018/10/TEPRI-Brief-Addressing-Energy-Poverty.pdf.

[9] Prince, H. Harmon, D, 2019. "Texas Energy Poverty Profiles Project." Lyndon B. Johnson School of Public Affairs. Available at https://raymarshallcenter.org/files/2019/06/final_TEPRI_PRP_April_15_2019.pdf.

the household's income.[10] The "energy burden" is especially high for these low-income Texans – 9% compared to 2% for non-low-income households.[11]

Energy poverty is one of many issues that disproportionately affect communities of color, pointing to the multifaceted nature of racial injustice and its many consequences. Research indicates that African Americans are more likely to live in older, energy-inefficient homes with structural deficiencies, outdated appliances and faulty energy systems. This, in turn, generates increased costs and decreased comfort, conditions closely linked to adverse physical and mental health outcomes.[12]

Along with utility bill assistance, consumer education and engagement, and housing investments, equitable deployment of clean DERs may be integrated into a long-term strategy to reduce energy poverty in Texas while also creating new pathways for participation in the advanced clean energy economy.

Low-income individuals typically are less likely to participate in clean DERs due to critical barriers such as lack of access to capital, lower credit scores and lower rates of homeownership. Unless these gaps are addressed, the transition to clean energy resources could widen the energy burden gap between high- and low-income households, exacerbating existing inequalities, widening racial disparities and leaving many of our fellow Texans behind.

We see several important applications by which DERs may reduce Texans' energy burden and address energy poverty:

1. *Lower cost electricity service:* By optimizing system performance and monetizing grid benefits, electricity providers may be able to offer lower cost electricity to all customers, including low-income customers, which may result in energy burden reduction.

2. *Community solar models* may be designed to offer low-cost electricity subscriptions while circumventing traditional barriers for low-income households, including access to capital and home ownership.

3. *Behind the meter interventions:* Energy efficiency improvements in high energy burden homes, coupled with their participation in demand response programs, could significantly reduce their electricity costs while delivering broad benefits to the state as a whole. Similarly, rooftop solar may provide cost savings if there is sufficient access to capital for investment or other financing options, such as on-bill financing.

4. *Participation in the energy economy:* Clean DERs present meaningful opportunities for good jobs and inclusion in the energy economy. Targeted investments in STEM education and energy workforce development in underserved communities present pathways to increase household

[10] Hernández and Bird, 2011.

[11] These figures are determined using data from the Department of Energy's Low-Income Energy Affordability Data (LEAD) Tool (2019).

[12] Lewis, J., Hernandez, D., & Geronimus, A.T. (2020). Available at https://link.springer.com/article/10.1007/s12053-019-09820-z.

income thereby reducing energy burden. Energy efficiency and solar installation and maintenance jobs are, by their very nature, local jobs and are well suited for community college training programs that already manage workforce programs.

LMI Energy Efficiency

A recent Texas Energy Poverty Research Institute (TEPRI) study aimed to identify pathways to ensure the benefits of distributed energy resources flow to communities that need them most.[13] The analysis showed energy efficiency and rooftop solar have the potential to reduce energy costs burdens and carbon emissions if deployed with those specific objectives. The work revealed that the energy affordability gap can be eliminated with targeted energy-efficiency improvements and offered key insights about building types and ages and which types of retrofits may be most beneficial.[14]

Furthermore, for households that rent, incentives are split between renters and landlords which decreases the likelihood that energy efficiency measures or rooftop solar will be installed because in most, but not all, cases the renter, not the landlord, pays the energy bills.[15] Finding ways to align existing programs with the needs of low-income households and their landlords is crucial to addressing energy poverty through clean DERs to ensure they benefit both landlords and tenants.

LMI Community Solar

It is important to restate community solar's potential to provide benefits to low-income customers, reach underserved communities, and address energy poverty at a scale larger than may be practical with individual on-site clean DER deployment.[16] Texas demonstrations already exist in areas that are not open to competition in ERCOT, and stakeholder discussions in targeted venues have indicated that innovative financing and coordination of project participants can make this a reality in competitive market areas as well.

Supporting the initial development of individual "seed" projects in these communities can increase familiarity with clean energy technologies, as represented by the development of local community solar installations. In addition, the fact that many solar developers want to hire local talent where they operate can help amplify familiarity with, and acceptance of, DERs in these target areas.

Specific additional program strategies that could enable a community solar project to successfully address the needs of LMI communities include:

- Opportunity Zones that resulted from the Tax Cuts and Jobs Act of 2017, which are designated low-income census tracts and allow individuals who invest there to defer capital gains tax by

[13] TEPRI 2019-2020 Pathways for DERs to Reduce Energy Burdens in Houston. See http://www.txenergypoverty.org/2020/05/tepris-pathways-for-ders-to-reduce-energy-burdens-webinar-recap/.

[14] The energy affordability gap is the difference between the current energy burden and an energy burden of 6%, which is considered affordable.

[15] McKibbin 2015; Hernández and Bird 2011.

[16] Prince, H. Harmon, D, 2019. "Texas Energy Poverty Profiles Project." Lyndon B. Johnson School of Public Affairs. Available at https://raymarshallcenter.org/files/2019/06/final_TEPRI_PRP_April_15_2019.pdf; "Low-Income Community Solar Landscape: Lessons Learned from a review of existing low-income community solar models," 2019. Texas Energy Poverty Research Institute. Report.

holding investments in these census tracts for a certain period of time. These could be particularly beneficial to the development of community-scale DER resources.

- Receipt and effective use of grants from local government and/or philanthropic organizations to reduce the cost of community solar for LMI communities.

- Partnerships with host sites that allow on-site savings realized by the host site to be shared with a targeted LMI community.

- Use of a collateral risk fund in connection with aggregating LMI participants to support a community solar project. This could be a rolling fund that provides deposits on behalf of participants to serve as collateral on behalf of customers who may default. This would decrease risk for the financier.

- LMI communities and communities of color should be a marketing priority. A concerted effort to reach these market segments should include tactics that increase their familiarity with energy management and generating DER technologies, and engage trusted local community and "grassroots" leaders who can generate positive word of mouth testimony.

- Local DER developers should also be encouraged to increase the racial diversity of their employees.[17]

To make advances in these areas, Texas must broaden the ecosystem of organizations working together to address energy poverty. An organized and effective network of stakeholders is required to enable solution development with high likelihood of adoption. Texas should build a coalition of state partners, utilities, housing providers, local agencies and community-based organizations to come together to develop recommendations around equitable DER participation and deployment through collaboration, objective alignment, and data-driven, evidence-based decision making and action.

Thoughtful, objective and organized approaches that incorporate the above elements and pair rigorous data analysis with cross-sector stakeholder engagement and solutions development, will make meaningful impacts towards innovations that will scale and create opportunity for underserved communities through clean DERs in Texas.

[17] Sunter, D. Castellanos, S. Kammen, "Disparities in rooftop photovoltaics deployment in the United States by race and ethnicity," Nature Sustainability (January 10, 2019). Available at https://www.nature.com/articles/s41893-018-0204-z.

Factors Limiting DER Growth in Texas

Five key factors have discouraged or slowed the development of clean DERs in Texas:

1. Cost;
2. Customer Awareness and Demand;
3. State and ERCOT Barriers;
4. Regulatory and Local Barriers; and
5. Location Barriers.

Cost

Cost is the single greatest limiter of DER growth in Texas.

Over time, DERs can provide customers an attractive return on investment compared to purchasing all their power from their electricity company. But because of Texas' generally low electricity prices and the upfront costs of installing clean DERs, that return takes time to realize.

For example, in 2018 the average cost for small rooftop solar systems (6 kW) in Texas was approximately $2.53 per kW, with an installation cost of between $10,794-$13,146.[18] While residential customers in the United States recover the cost of their solar investment over seven to eight years, available data suggests Texas residents have a typical payback of 10 years or more.[19]

For individual customers of any income level, this is a significant investment. That is why a significant proportion of the clean DERs currently in operation in Texas are in the service areas of Austin Energy and San Antonio's CPS Energy. These municipally-owned utilities have each committed to increase on-site DER installations and provide customers a variety of financial incentives to reduce the costs of installing them.

The lack of statewide (ERCOT-wide) financial incentives for DERs provided by the state, electricity providers or other entities has undoubtedly contributed to the modest pace at which they are being deployed throughout the state. This is especially true for LMI customers.

Customer Awareness and Demand

Low customer awareness of available DER technologies, benefits and financing options remain a challenge throughout much of the general population. It is particularly prevalent in LMI communities and communities of color, where families are not exposed to DER technologies as regularly as their more affluent counterparts.[20] This not only suppresses demand but can also reduce community-wide acceptance of these new technologies.[21]

The La Loma Community Solar project in Austin, Texas, (See Appendix – DERs in Action for more information) provides a stark example of this dynamic. Before it came online, La Loma offered all Austin Energy customers an opportunity to receive solar electricity that cost less than the existing retail rate. When the project opened, a waiting list had formed for the 50% allocated for general Austin Energy customers, but there were still spots remaining in the 50% of the project reserved for limited-income members.

Disparities in rooftop solar adoption rates also have been identified between communities of color and predominantly white communities, even when adjusted to account for income. A recent study published in *Nature Sustainability* suggested two potential causes. First, as noted above, communities of color may lack familiarity with the technology. Second, there is a significant lack of racial diversity within the

[18] EnergySage, "How much do solar panels cost in the U.S. in 2019?," updated July 2, 2019. Available at https://news.energysage.com/how-much-does-the-average-solar-panel-installation-cost-in-the-u-s/. In one study, the estimated cost per kW for Texas in 2018 was estimated to be lower than this average at $2.53/kW. *See* Fu, Feldman, and Margolis, *infra,* at 28.

[19] EnergySage, "How to calculate solar panel payback period (ROI)," updated May 26, 2019. Available at https://news.energysage.com/understanding-your-solar-panel-payback-period/.

[20] SmartGrid Consumer Collaborative, "The Empowered Consumer" (2016). Available at https://www.tdworld.com/sites/tdworld.com/files/uploads/2016/04/SGCCTheEmpoweredConsumerExecutiveSummary.pdf; See also, T&D World, "Consumer Awareness for Smart Energy Services and Technologies at an All-Time High," (May 18, 2016). Available at https://www.tdworld.com/asset-management-service/consumer-awareness-smart-energy-services-and-technologies-all-time-high.

[21] For example, a survey conducted by the Texas Energy Poverty Research Institute (TEPRI) of customers in San Antonio indicated that fewer than 20% of low-income respondents were familiar with community solar, and over 60% had never heard the term. "Low-Income Community Solar Landscape: Lessons Learned from a review of existing low-income community solar models," 2019. Texas Energy Poverty Research Institute. Report.

renewable energy workforce – a clear illustration of the energy inequity that exists in the clean energy sector.[22]

State and ERCOT Barriers

State policies are not aligned to provide robust support for the growth of DERs. Texas has more potential to produce oil, natural gas and utility-scale wind and solar power than any other state. But though Texas has provided robust support for oil and gas development and also authorized opportunities for ad valorem tax abatements for utility-scale wind and solar development, there is no state-wide support for development of DERs. Texas has more energy efficiency, demand response and small-scale solar potential than any other state, yet Texas ranks 49th among the states relative to energy efficiency investments, and no statewide incentives support the growth of demand response or distributed solar generation.

In addition to the lack of supportive policies, some policies impose barriers to the growth of clean DERs. These barriers include a lack of transparent distribution grid planning processes, uncertainty regarding the ownership of clean DERs that could compete with traditional options to assure grid reliability, and utility hesitation to contract with third parties who own DER assets. Further, most clean DERs have extremely limited opportunity to participate in the ERCOT wholesale market, which reduces their revenue potential for individual owners.

Comparable financial incentives and elimination of these barriers would significantly increase the deployment of clean DERs within ERCOT and among integrated utilities outside of this region, which is necessary in order for Texas to fully transition to a clean energy economy and ensure grid reliability.

Regulatory and Local Barriers

Several regulatory barriers and local policies and practices limit the growth of clean DERs. These include efforts by integrated utilities outside of ERCOT and distribution utilities within the ERCOT competitive market to impose excessive charges and fees on clean DER customers.

For example:

- Oncor, the distribution utility in the DFW region, and El Paso Electric Utility Company (EPE), an integrated utility outside of ERCOT, have attempted to establish rate structures three times in the last five years that would impose extra costs on DER customers.[23]

- Some municipally-owned utilities and electric cooperatives prohibit customers from using power purchase agreements or other third-party financing models to address the upfront costs of installing solar and storage DERs.[24,25]

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[22] Sunter, D. Castellanos, S. Kammen, "Disparities in rooftop photovoltaics deployment in the United States by race and ethnicity." Nature Sustainability, January 10, 2019. Available at https://www.nature.com/articles/s41893-018-0204-z.

[23] *See*, *Application of Oncor Electric Delivery Company, LLC for Authority to Change Rates*, Docket No. 46957 (Oct. 13, 2017); *Application of El Paso Electric Company to Change* Rates, Docket No. 44941 (Aug. 25, 2016); and *Application of El Paso Electric Company to Change* Rates, Docket No. 46831 (Dec. 18, 2017).

[24] For example, SunRun offers its BrightSave Monthly solar leasing plan in Texas (https://www.sunrun.com/solar-plans-and-services/monthly-solar-lease).

[25] Third-party ownership is specifically allowed by Texas Utilities Code § 39.916(a)(2).

- A number of municipalities, homeowner associations (HOAs) and local taxing jurisdictions have taken actions inconsistent with provisions of the Texas Property Code that restrict the extent to which HOAs can prevent a residential customer from installing solar generation at their premises and provisions of the Texas Property Tax Code which states that an on-site installation of a solar or wind generation resource will not increase the appraised taxable value of an individual's property.[26] In the latter case, some taxing jurisdictions have concluded that this exemption does not apply when the owner leases a DER or purchases the energy from a DER through a power purchase agreement with the installer or other third party.

Location Barriers

Even when cost, policy and regulatory barriers are not an issue, physical and ownership barriers may prevent a customer from installing an on-site generating DER. Tree cover, roof orientation or other structural limitations may limit the ability to deploy an on-site generating DER. A national study of the potential of rooftop solar found that only 26% of the total rooftop area of small buildings (< 5,000 square feet) is suitable for solar panels.[27]

In addition, installing energy efficiency improvements or on-site generation may not be allowed on shared property, such as a condominium or business park. Renters face a similar barrier; they simply do not have the authority to make on-site capital improvements (more than half of LMI households in Texas are renters).

Taking into account physical and ownership limitations, a national study estimates that nearly 50% of residential and commercial customers are unable to host on-site solar generation resources.[28] These are issues that, at present, do not have direct solutions. But innovative strategies like community solar can increase the options available to customers and can specifically circumvent important barriers faced by LMI communities.

[26] Texas Property Code Section 202.010 and 202.011, Tax Code Section 11.27.

[27] Gagnon, Margolis, Melius, Phillips, and Elmore, *Rooftop Solar Photovoltaic Technical Potential in the United States: A Detailed Assessment*, National Renewable Energy Laboratory (January 2016). Available at https://www.nrel.gov/docs/fy16osti/65298.pdf.

[28] Feldman, Brockway, Ulrich, and Margolis, *Shared Solar: Current Landscape, Market Potential, and the Impact of Federal Securities Regulation,* National Renewable Energy Laboratory (April 2015). Available at https://www.nrel.gov/docs/fy15osti/63892.pdf.

Strategies to Increase Clean DERs in Texas

Despite significant barriers, residential and commercial customers are investing in and installing clean DERs. Yet, even as the pace of development increases, the adoption rate remains relatively low compared to DER potential in Texas.

Overall, clean DERs are water- and emission-free and most are cost-effective. Generally, energy efficiency and demand response are the most economical resources because they reduce or eliminate the need for additional generation resources and the purchase of additional energy in the first place. In the ERCOT market, residential and business customers increasingly are financing the installation of on-site and community solar installations, as well as stand-alone or collocated storage resources, with different rates of installation depending on local market conditions.

EDF recommends a number of strategies on which interested stakeholders, including non-governmental organizations, customers, businesses, utilities, and state and local officials should focus their attention over the next several years in order to support growth of DERs in Texas. These are the most promising opportunities to increase clean DERs in Texas in ways that reduce electricity cost, save precious water supplies, create thousands of new jobs, improve grid reliability and resilience, and provide direct benefits to LMI customers and communities of color.

Near-Term Strategies

A number of targeted strategies could spur increased DER deployment quickly, in the next few years. They include:

- Increasing Customer Awareness of DERs;
- Aligning State Policies and Market Protocols to Support DER Deployment;
- City and County DER Collaborative;
- Expanding Community Solar;
- Growing Demand Response "Outside" ERCOT; and
- Leveraging Energy Storage to Increase Impact of Clean DERs.

Increasing Customer Awareness of DERs

Early adopters are driving DER growth in Texas, but a broader customer base is evolving. Based on the rate of growth of rooftop solar ERCOT has observed to date, even a moderate projection of future growth could lead to the installation of 2,560 MW within the ERCOT market by 2025. Though lower costs and increased familiarity can be expected to support the continued growth of residential on-site generation like rooftop solar, a broad-based marketing and education initiative will be necessary to extend this growth into other market segments. Companies that sell energy management technology and generating DERs have a clear interest in educating potential customers. But so, too, do the rest of us who will benefit from a faster and more robust expansion of clean DERs.

In addition to the impact of seeing more households with rooftop solar, the development of community solar projects in or near urban communities also can help increase residents' familiarity with this new technology, including LMI communities and communities of color. Increasing customer familiarity with clean DERs is one of the benefits expected to be realized from the Sunnyside Energy Project (See Appendix – DERs in Action for more information), a large community solar development in Houston. Sunnyside is an historic, predominantly African American community that includes a large number of LMI citizens. Local residents will learn first-hand about solar energy as well as have the opportunity to save on their energy bills.

In addition to exposure to clean DERs through local development, outreach and meetings facilitated through community groups and non-traditional partners that are not directly tied to the utilities, such as organizations that serve low income and communities of color, United Solar Neighbors, DER technology providers, energy efficiency providers or other such market participants with whom the community has a greater sense of trust, can help spread information and generate local interest in employment and deployment opportunities that can result from the increased deployment of DERs.

Aligning State Policies and Market Protocols to Support DER Deployment

State officials have a clear role in adopting policies to advance the growth and deployment of clean DERs. As discussed above, state policies are not aligned to provide robust support for the growth of DERs. To date, local communities have taken the lead to encourage the growth of clean DERs among their citizens, but there are no broad statewide policies that support the growth of DERs. The following are key initiatives that could address this:

- As customers increasingly consider new technology options for customer-sited generation and storage and the falling prices of these technologies, it is imperative that the PUCT ensure that DER interconnection rules at the state and local distribution service provider level, as well as distribution utility rate structures, do not stifle DER adoption.

- During the 2021 Legislative Session, the Texas Legislature should adopt customer protections to prohibit state policies or regulations and local practices by cities, homeowner associations, local taxing jurisdictions, municipally-owned utilities and electric cooperatives, that stifle the growth of clean DERs.

- ERCOT should take a leading role in exploring opportunities to harness distributed energy storage, building energy management systems to support grid reliability and respond to expected generation ramps, such as reduced solar output in late afternoons and early evenings as the sun sets. Other energy markets are exploring the opportunity to aggregate and deploy DERs to support reliable grid operations as they continue to integrate larger amounts of intermittent renewable resources. ERCOT should do the same on an expedited basis.

City and County DER Collaborative

Local decision makers, in partnership with local utilities and Retail Electric Providers (REPs) in the ERCOT competitive market, should consider fostering city-county collaboratives to expedite DER deployments, especially increasing energy efficiency investments, catalyzing energy equity efforts, and growing climate solutions that can benefit LMI households and communities of color.

Mayors, county judges and various other local officials in Texas' largest urban centers and in South Texas are positioned to expedite the deployment of clean DERs, but they just might not realize it yet. Large cities and counties are powerful economic engines. They own and operate large portfolios of office buildings, water and wastewater facilities, airports, parking lots, parks, vacant properties, correctional facilities and hospitals. Many of these facilities or locations can participate in demand response initiatives, and all of them have rooftops, empty space or vacant land that may be suitable for the deployment of clean DERs, including solar and electric energy storage. Cities and counties have the opportunity to work collaboratively with participants in the ERCOT market not only to encourage the use of these facilities and locations to develop clean DERs, but also to leverage their significant purchasing power and resources to design broader initiatives that can benefit their citizens, especially LMI households and communities of color. For example, these communities could leverage community block grants, various housing assistance programs and the potential for their facilities to support the development of clean DERs to reduce the local government's and customers' energy costs, and create new local jobs.

Additionally, these local governments own and operate thousands of vehicles and exercise significance influence in the selection of governing boards for transit, port and housing authorities. They procure large quantities of electricity and other energy that emit large quantities of climate and local air pollution that could be replaced through electrification. These factors offer cities and counties the leverage needed to reduce their operating costs while simultaneously cutting carbon and other air pollutants emitted by their facilities and vehicles.

In the next few years, approximately 80% of Texans will live in the metropolitan areas of Houston, Dallas-Fort Worth, San Antonio and Austin. Further, a large proportion of the state's Latino population resides in these rapidly growing cities and counties in South Texas. Most of Texas' LMI households and communities of color reside in these regions as well. Large-scale deployment of these resources could create thousands of jobs and enable these political subdivisions to leverage clean energy for LMI households and communities of color within their jurisdictions.

Expanding Community Solar

Community solar is a promising solution for Texans who cannot, for a variety of reasons, install rooftop solar. In fact, it has the potential to spark the greatest near-term increase in installed clean energy DERs. In addition, community solar projects are cost-effective and can be used strategically to reduce energy cost burdens and make clean energy available to LMI households and communities of color.

Community solar developments can leverage economies of scale that reduce a project's cost of construction and maintenance. Additional strategies can further reduce costs, including finding less expensive real estate for the placement of a generating DER, aggregating potential customers to support a new development, using new financing opportunities and generating multiple revenue streams to maximize its potential benefits.[29] Together, these approaches would reduce the cost of an installation's electricity for the benefit of subscribing customers.

The Big Sun Community Solar Program in San Antonio is one example of how leveraging multiple revenue streams can reduce the total cost of a clean DER.[30] Revenue from leases of covered parking (created through the installation of elevated solar panels in a parking lot) is used to bring down the price customers pay to participate in the program. CPS Energy estimates its program is 39% less expensive than installation of more traditional rooftop solar.[31]

Community solar also avoids potential barriers associated with on-site construction at a home or business. Because it is constructed off-site, projects do not conflict with potential municipal construction limitations or restrictions imposed by homeowners' associations. In addition, community solar addresses physical and ownership limitations that can impede the development of on-site generating DERs, while still enabling customers to support the development of clean energy resources.

Developing a community solar project in ERCOT's competitive market involves different challenges relative to projects developed in non-competitive markets. A local municipal electric utility or electric cooperative, for example, may own and operate the project in their service area and deliver and sell the electricity the project generates to its participating retail customers. In ERCOT's competitive market, more parties must be coordinated to achieve the same result. For example, one entity may build and own and/or operate the project, but the electricity must be sold to a retail electric provider (REP), who will pay a distribution utility to deliver the electricity to the REP's participating retail customers.

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[29] See, e.g., Herman Trabish, "As CCAs take over utility customers, local renewable generation emerges as the next big growth driver," Utility Dive (October 8, 2019). Available at https://www.utilitydive.com/news/as-ccas-take-over-utility-customers-local-generation-emerges-as-the-next-b/564422/. It should be noted that the limitations of the electricity markets discussed in this article are not a barrier to using the same customer aggregation model in ERCOT.

[30] https://www.bigsunsolar.com/.

[31] *Id.*

These unique characteristics of community solar, especially in ERCOT's competitive areas, provide an opportunity to reduce their initial costs and leverage additional value streams to reduce the net cost of electricity from the project. In addition, as a result of changes ERCOT has adopted that will impact the settlement processes for smaller systems interconnected on the distribution grid, there is a need to ensure strategies are in place to minimize wholesale market complexities that may result from those changes.[32]

Aggregating customers to support the development of community solar projects has proven effective in non-competitive, such as Austin (Austin Energy[33]) and San Antonio (CPS Energy,[34]) and also for large utility-scale generation projects.[35] Notably, Austin Energy has used community solar to provide targeted lower-cost electricity to LMI customers.[36] However, this approach remains elusive for projects on the distribution grid in the rest of ERCOT and presents an additional opportunity for development of strategies to encourage such aggregations.

Growing Demand Response "Outside" the ERCOT Market

Demand response is a virtual DER that reduces energy use of participating customers during peak demand periods or when energy prices are high. Demand response programs can be run by utilities or third-party companies that aggregate "conservable" energy among their customers and bid them into ERCOT's ancillary services markets or Emergency Response Service (ERS). Aggregation and deployment of demand response without bidding the resource into the ERCOT wholesale market can be considered to be "outside" the ERCOT market.

To date, most demand response in the ERCOT region has focused on large commercial and industrial customers who have more opportunities to participate in the ERCOT wholesale market. Some of these customers also engage in demand response activities outside ERCOT's wholesale market. For example, customers with a peak demand of 700 kW or higher have an incentive to minimize their demand during ERCOT's 4-CP events in order to reduce their transmission and distribution charges.[37] Finally, some

[32] See NPRR 917, Nodal Pricing for Settlement Only Distribution Generators (SODGs) and Settlement Only Transmission Generators, approved August 13, 2019. Available at http://www.ercot.com/mktrules/issues/NPRR917#keydocs. This change to ERCOT's protocols impacted how ERCOT determines the price received by a registered distributed generation resources on the distribution grid for the electricity they generate. The result was to add new financial risks to these resources. In the absence of an adequate solution to these new risks, the development of community solar projects may be limited to instances in which the DER resource is less than 1 MW in capacity or can be located behind a host customer's connection with the distribution grid and limited to a size that injects little, if any, electricity to the electric grid.

[33] See https://austinenergy.com/ae/green-power/solar-solutions/for-your-home/community-solar.

[34] See "CPS Energy to Provide Additional 5 MW of Community-Owned Solar Power," May 7, 2019. Available at https://newsroom.cpsenergy.com/cps-energy-to-provide-additional-5-mw-of-community-owned-solar-power/.

[35] Customers also can aggregate their purchasing power for large utility-scale projects as well. For example, Apple, eBay, Samsung, and Sprint recently joined together to collectively support the development of a 500 MW wind project. Patrick Barnard, "White Mesa Wind Finds Major Corporate Offtakers," Windpower (November 6, 2019. Available at https://nawindpower.com/white-mesa-wind-finds-major-corporate-offtakers.

[36] See earlier discussion regarding Austin Energy's La Loma Project. See also Austin Energy's Multifamily Shared Solar Program. Available at https://austinenergy.com/ae/green-power/solar-solutions/for-your-multifamily/mf-shared-solar.

[37] In 2018, ERCOT estimates there was as much of 2,021 MW of demand reduction in response to 4-CP pricing and as much as 2,748 MW demand reduction in 2019. ERCOT, 2019 Annual Report of Demand Response in the ERCOT Region-Revised, March 2020, at 14-15. Available at http://mis.ercot.com/misdownload/servlets/mirDownload?mimic_duns=000000000&doclookupId=719820599.

business customers, via their retail electric provider, participate in demand response activities, that allow them to arbitrage the difference between the energy that has been procured for their use and the real time price of energy.

Though demand response among larger customers continues to grow, the opportunity for residential and small commercial customers to provide demand response in the ERCOT market has been limited to a small portion of ERCOT's ancillary services market and ERS. For more than a decade, ERCOT has been investigating the opportunity to integrate DERs into its competitive wholesale market.[38] These efforts have largely failed, though, due to stakeholder opposition surrounding how loads should be compensated for not consuming electricity. Some REPs, municipal electric utilities and electric cooperatives offer programs and rate plans that enable the service provider to reduce the customers' usage at the provider's request. Due to the proprietary nature of these programs, there is limited information available about their success. Taken together, ERCOT estimates as much as 3,209 MW of demand response capacity was deployed in the summer of 2019.[39] Compared to the amount of load on the grid, there clearly is an opportunity to develop this capability.

As the ERCOT market has evolved, it has not taken full advantage of the potential for residential and small commercial demand response. ERCOT has estimated that residential and small commercial load related to air conditioning is more than 50% of the peak summer demand.[40] This represents a significant opportunity to manage demand to match available generation resources, and due to the impact of COVID-19 causing more people to work from home, may be an even larger potential resource than previously estimated. Though ERCOT efforts to enable these aggregations to bid into the wholesale market have failed, other energy markets are allowing these aggregated resources to be bid into their wholesale markets.

An opportunity is developing to use aggregated residential and small commercial customer load "outside" the ERCOT market. Smart thermostats and appliances and other energy management tools enable customers to be aggregated and provide demand response on a level equivalent to "virtual power plants" – energy resources large enough to provide (or negate) the amount of power that a traditional power plant could provide. Retail electric providers and other load serving entities have realized that the aggregated demand response of their residential and small commercial customers can benefit them by becoming a hedge against the need to purchase additional energy from the expensive spot market. New third-party providers are considering whether they can provide such demand response resources to load serving entities in the ERCOT market. In either case, all customers participating in these demand response programs have the potential to receive some compensation.

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[38] See, e.g., Draft Whitepaper, Load Participation in ERCOT's Security Constrained Economic Dispatch (October 20, 2010). Available at http://www.ercot.com/content/meetings/dswg/keydocs/2010/1105/LRISP_WhitePaper_102010_(draft).doc. In addition to multiple discussions regarding enabling loads to participate in SCED, ERCOT also has looked at the potential to implement Multi-Interval Real Time Market (MIRTM). See, e.g., Mickey, Joel, Multi-Interval Real-Time Market Overview, Presentation to ERCOT Board of Directors October 13, 2015. Available at http://www.ercot.com/content/wcm/key_documents_lists/76342/5_Multi_Interval_Real_Time_Market_Overview.pdf.

[39] ERCOT, 2019 Annual Report of Demand Response In the ERCOT Region-Revised, March 2020, at 15. Available at http://mis.ercot.com/misdownload/servlets/mirDownload?mimic_duns=000000000&doclookupId=719820599.

[40] *See, e.g.,* Project No. 42636, *Commission Comments on the Proposed EPA Rule on Greenhouse Gas Emissions for Existing Generating Units,* Electric Reliability Council of Texas, Inc.'s Presentations as Presented at the Commission's August 14, 2014 Workshop, Aug. 20, 2014, at 14. Available at http://interchange.puc.texas.gov/Search/Documents?controlNumber=42636&itemNumber=16.

A focused effort is required to work with REPs, customer advocates such as the Office of Public Utility Counsel, and other stakeholders to remove potential regulatory barriers to the development of third-party demand response aggregation of residential and small commercial customers. Potential barriers include issues such as access to real-time customer data and attempts by incumbent wholesale market participants to obstruct growth. As the success of these demand response efforts grows, the potential will increase for ERCOT to renew its efforts to bring these demand response measures "into" the market and provide increased reliability services to the grid, but the increased regulatory requirements could inhibit the voluntary nature of customers' participation.

In addition, state leaders should recognize the opportunity for demand response coupled with other clean DERs to be aggregated and used as "virtual power plants" that can be as reliable and more cost-effective than large conventional power plants. The Texas Legislature should adopt legislation in 2021 that removes state and local policies, regulations and practices that stifle the growth of DERs and limit the development of these "virtual power plants." The Texas PUC and ERCOT would then need to promptly follow and put in place the rules and market protocols to fully implement this legislation.

Leveraging Energy Storage to Increase Impact of Clean DERs

Historically, electricity has been unlike any other commodity in that it cannot be stored for later use. The development of increasingly lower-cost energy storage technology, however, is setting the stage for a fundamental transformation of the electricity market where electricity can be generated at times when costs are low (or nonexistent) and used at other times to quickly support grid reliability, as well as be deployed when demand is highest. The benefits of this shift extend from individual residential customers to utility-scale generation resources.

Smaller scale energy storage resources (less than 1 MW capacity) not only ensure a steady supply of electricity to the host customer, but also can augment participation in demand response opportunities described above. Larger storage resources (1 to 10 MW capacity) that are connected to the distribution grid have the potential to contribute to the reliability of the ERCOT system, just as fossil fuel generators have for decades.[41] Regardless of size, storage can provide a variety of services on-site, including back-up power in the event of emergencies, improved power quality, a more stable release of power from associated generation resources, and as a component of demand response systems.

In some markets, these resources can be used to provide reliability services to the transmission and distribution grid to delay or avoid the need for investment in traditional infrastructure upgrades.[42] They also can be interconnected in unique ways to meet a customer's needs, including the ability to "live off the grid."

[41] On September 26, 2019, ERCOT issued a market notice prohibiting the interconnection of additional distributed energy resources, including storage resources that intend to provide energy or ancillary services to ERCOT's wholesale market. This notice is available at http://www.ercot.com/services/comm/mkt_notices/archives/4288. ERCOT has submitted for approval NPRRs to implement interim Protocol changes to address the reliability issues that caused it to issue this prohibition.

[42] This path for the growth of DERs remains stalled in ERCOT, though, due to uncertainty regarding ownership of these devices and a lack of utility willingness to collaborate with third party owners to obtain the potential services.

Customers and their vendors are investigating the full array of opportunities for the use of energy storage technologies, and ERCOT staff and market participants are considering rules that will govern the interconnection and participation of larger energy storage resources in the wholesale market.[43]

In addition, the PUCT has opened a rulemaking in which it intends to address how energy storage resources and other technologies can provide reliability services that delay or eliminate the need for traditional investment in the transmission and distribution grids.[44] Even if this proceeding is terminated, a subsequent proceeding likely would be opened that will provide an opportunity to develop requirements for allowing energy storage resources to be used in the parts of ERCOT where regulated utilities operate.

Electric vehicles provide a unique form of energy storage. Although the adoption of electric vehicles in the ERCOT region remains relatively low, it is expected to grow, and discussions regarding the potential opportunities to harness these new distributed resources have already begun.[45] In addition to benefiting the electric grid, electric vehicles may help Texas address key environmental issues to support the state's robust industrial sector. Available data suggest these vehicles will grow rapidly over the next five years. Since electric and other zero emission vehicles emit no tailpipe emissions and can substantially reduce priority and climate pollution across the energy supply chain, especially if they are charged with clean energy, broad deployment of these vehicles have the potential to bring about substantial reductions in ozone precursors and GHGs in the state's transportation sector and ensure the long term viability of Texas' robust industrial sector. The transportation sector is currently the leading emitter of these pollutants. Thus, Texas should prioritize electrification of vehicles and other energy end uses in ways that can improve transmission and distribution assets, rather than merely increasing electric load in ways that might exacerbate reliability problems. Price incentives to encourage charging at night when electricity demand is less also is needed to eliminate the potential reliability challenges the electrification of end uses could bring about if not effectively managed.

[43] ERCOT started considering amendments to its Protocols to address issues related to the integration of energy storage resources in the Battery Energy Storage Task Force (BEST Force). ERCOT has filed several NPRRs to address many of the issues discussed in the BEST Force.
[44] *Rulemaking to Address the Use of Non-Traditional Technologies in Electric Delivery Service,* Project No. 48023 (pending).
[45] *See Review of Issues Relating to Electric Vehicles,* Project No. 49125 (pending).

Longer-Term Strategies

Beyond the near-term strategies outlined above, substantial policy and ERCOT market changes are needed to ensure the significant and sustained growth of clean DERs required to fully transition Texas to a low-carbon, clean energy economy.

A properly structured national carbon strategy may be the most effective policy to drive DER deployments, but thoughtful and long overdue state policies and local initiatives could also ramp up the installment of clean DERs.

We propose the following longer-term strategies:

- Increasing State Financial Incentives for DERs;
- Creating the Model for On-Bill Financing;
- Bold Energy Efficiency and Demand Response Initiatives;
- Optimizing DER Deployment to Address Energy Poverty; and
- Wholesale Market (ERCOT) Reforms.

Increasing State Financial Incentives for DERs

The state provides tangible financial support to all forms of energy production in the state except clean DERs. We recommend efforts to spur state-wide financial support for DERs on three fronts:

1. Direct financial support in the form of fixed rebates and/or tax incentives comparable to the financial incentives already being provided to support other forms of energy;

2. The establishment of project financing options; and

3. Policy that would provide clean DER owners equitable and adequate compensation for the electricity they do not immediately use as it is produced.

When state policymakers move forward to provide financial incentives to increase the deployments of clean DERs, they should ensure these resources are readily accessible to lower income households and communities of color to support energy equity.

Creating the Model for On-Bill Financing

Inside and outside Texas, electricity providers are developing innovative ways to make investing in DERs easier. For example, the Roanoke Electric Cooperative in North Carolina has implemented an on-bill repayment program that allows business and residential customers to finance energy efficiency investments and repay their debt via the savings achieved through their monthly energy bill. Some of the electric cooperative's low-income households have qualified to participate in this program.

In the ERCOT region, Pedernales Electric Cooperative has adapted the Roanoke on-bill payment program to help its customers finance rooftop solar. CPS Energy and the Kerrville Public Utility Board also have used innovative financing programs to provide more cost-effective access to clean energy to LMI households.

Executing such financing options inside ERCOT's competitive market is problematic. Financing agreements normally require a long-term relationship, but the competitive market in Texas allows customers to switch providers freely. Further, it is unclear who would own, bill or collect the debt in a competitive market.

This promising financing tool needs a Texas-specific business plan that addresses the unique challenges presented by our competitive market and proposes legal, regulatory and customer-protection policies and strategies to ensure statewide implementation.

Bold Energy Efficiency and Demand Response Initiatives

State officials should maximize energy efficiency and demand response by increasing the state's energy efficiency standard to at least 1% annually and setting a demand response target to 10% of peak demand by 2030.

Energy efficiency improvements are the cheapest source of electricity savings, as they permanently reduce energy use while saving customers money and cutting climate and health pollution. This policy change will create thousands of additional jobs in an industry that already employs almost 170,000 Texans. State officials and utilities should prioritize energy efficiency investments for Texans experiencing energy poverty to reduce their utility bills and improve their employment opportunities.

Likewise, demand response shaves electricity use during peak demand when power prices are highest, providing meaningful opportunities to save consumers money and improve grid reliability. Both tools are underutilized in Texas, and as more people continue to work from home as a result of the COVID-19

pandemic, the need to increase the state's focus on energy efficiency and demand response has grown dramatically.

For example, ERCOT's peak demand was 74,820 MW in August 2019, and ERCOT's latest forecast for peak demand for summer 2020 (75,200 MWh) would set a new record.[46] ERCOT forecasts continued growth and projects summer peak demand of 84,193 MW by 2025. However, Texas' energy efficiency standards only requires annual savings of 0.4% — despite the fact that the Department of Energy recently estimated Texas has more energy efficiency potential than any other state and could save 12.3% of annual state electric sales across all sectors in 2025 and 18.8% in 2035 if it were to implement high-quality and cost-effective energy efficiency efforts. Likewise, various independent studies have shown Texas has some of the most robust demand response potential in the nation and that its levels could be economically grown to more than 20% of peak load.

Optimizing DERs to Address Energy Poverty

The quality of life of millions of Texans is diminished by energy poverty. In addition to spending 6% or more of their limited incomes on household energy, many are unemployed or underemployed and live in homes in varying levels of disrepair. A targeted energy optimization strategy involving simultaneous deployment of clean DERs in the homes of low-income Texans, particularly energy efficiency, demand response and solar, can be an effective strategy to address energy poverty.

This energy optimization strategy should include several key elements:

- Coordinated planning and implementation of housing, community development block grants and energy financial assistance programs with the deployment of clean DERs in order to extend clean energy and its benefits to lower income Texans;
- Regulations that would ensure that energy efficiency measures that qualify for TDU programmatic support are expanded to include sensors and automated energy uses, communications and controls, and coordinated with demand response and demand flexibility opportunities to support grid operations as well as customer energy savings;
- Texas should encourage customers who wish to add rooftop solar to first complete an energy efficiency audit and undertake energy efficiency improvements to the host facility; and
- Texas should adopt, fund and expand programs that engage and support these communities, including energy bill discounts, energy efficiency investments and demand response programs, community solar, clean energy job training, and climate change adaptation and relocation assistance.

Wholesale Market (ERCOT) Reforms

Increased deployment of clean DERs depends on their ability to provide a greater value to customers than the cost to install and maintain them. That value could be increased if DERs could participate in the ERCOT market, which itself stands to benefit significantly from greater visibility into the generation capacity and stability they offer. Significant reforms will be required to allow DERs the ability to effectively engage directly in the ERCOT market. In addition, as more DERs seek to participate directly in the ERCOT market, ERCOT will need greater visibility into the distribution grid so that it can better model DERs and forecast how they will impact the larger grid when they operate.

[46] ERCOT Final Seasonal Assessment of Resource Adequacy for Summer 2020 (May 13, 2020). Available at http://www.ercot.com/news/releases/show/206275.

Recently, some entities have captured additional value by enabling clean DERs to participate in electricity wholesale markets by aggregating generating DERs and electricity storage resources and bidding the aggregated resources into a wholesale electric market (See "Sunrun: Solar and Battery Storage as a Virtual Power Plant" in Appendix – DERs in Action for more information). Beyond generating additional revenue for DER owners, this approach partially resolves concerns around a lack of visibility of individual DER resources by giving the grid operator an understanding about how they will operate and when.

Integrating DERs into the competitive market will provide significant benefits for all Texans. The Texas Advanced Energy Business Association released a report in November 2019, which concluded "Texas would benefit substantially consumers by better integrating DER resources into T &D planning and wholesale energy markets. The total value of better integration is $5.47 billion over a 10-year period (2019 present value), or $456 per household."[47]

In order to enable increased participation of clean DERs in the wholesale market — directly or through aggregations — and ensure the grid operator has the necessary data to maintain grid reliability, the PUCT should adopt policies requiring distribution system operators to provide ERCOT greater visibility into the distribution grid so that it may incorporate these DERs into its modeling and effectively maintain grid reliability. [48] In addition, ERCOT should support a renewed focus on modifying ERCOT protocols to allow the aggregation and integration of clean DERs into the wholesale market.

Every one of the strategies discussed above can encourage the deployment of clean DERs in Texas. As further discussed in the Appendix of this report, the development of DERs has the potential to benefit all Texans, including LMI customers.

[47] *The Value of Integrating Distributed Energy Resources in Texas*, Texas Advanced Energy Business Alliance (November 2019). Available at https://www.texasadvancedenergy.org/#report.

[48] This was an issue under consideration by ERCOT's DREAM Task Force (Distributed Energy Resource and Ancillaries Market Task Force). Available at http://www.ercot.com/committee/dreamtf.

Conclusion

Texas should be proud of the success of the robust competition in the ERCOT wholesale market. To date, however, most efforts to establish successful competition has been focused on utility-scale generation resources that have primarily benefitted large electricity users.

DERs offer Texas a new option that benefits customers, local communities and economies, and the grid itself.

They can maximize the use of clean, renewable energy, spark local job growth, reduce local air pollution and climate emissions, address energy poverty and keep energy costs down, and supplement other energy sources to increase the reliability and resilience of ERCOT's grid.

Appendix – DERs in Action

Following are short synopses of several notable DER initiatives from around the country. Several of them are mentioned in earlier sections of this paper.

Aliso Canyon – CA – DERs Relieve Strain on Generation[49]

Southern California Gas Company's natural gas storage facility in Aliso Canyon was the site of the nation's largest-ever natural gas leak in 2015. It spewed natural gas for four months and forced the evacuation of thousands of residents. In that time, over 109,000 metric tons of methane emissions were leaked, carrying the same short-term climate impact as the CO2 emissions from 1.97 million passenger vehicles. Beyond the environmental and health impacts caused by the gas leak, the facility's closure also meant that utilities could have run out of fuel for peaker plants during summer months, which would have caused weeks of rolling power outages. DERs helped prevent that possibility. Battery procurements supplied about 100 MW of energy storage, and demand response programs were offered to tens of thousands of customers in the region to reduce demand during certain time periods. The estimated cost of containing, repairing and maintaining the underground storage site is over $1.055 billion, though this cost could have been higher if not for the DERs that provided, or relieved, crucial capacity to ensure grid reliability for millions of customers.

Con Edison – NY – DERs Replace Need for Distribution Substation[50]

Launched by Con Edison in 2014, the Neighborhood Program aims to motivate and compensate commercial, industrial and residential customers who reduce energy usage during periods of high demand in order to alleviate stress on the grid. Through the launch of this program, the utility suspended the construction of a $1.2 billion substation in Brooklyn by tapping into a portfolio of existing DERs including energy efficiency, demand response, combined heat and power, and batteries with energy management programs. "Our long-term plan is for Con Edison to become a distributed system platform, or DSP, where we'll be integrating all distributed energy resources in one place," said Shira Horowitz, manager of demand response programs at Con Edison.

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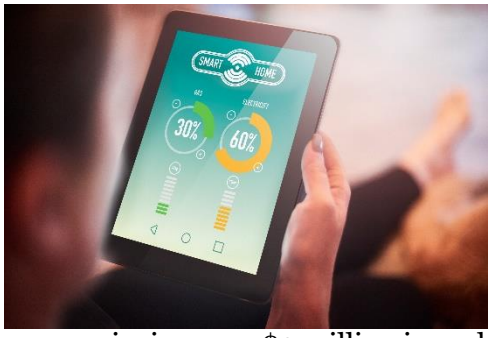
[49] California Air Resources Board, "Aliso Canyon leak emitted 109,000 metric tons of methane," Press Release October 21, 2016. Available at https://ww2.arb.ca.gov/news/aliso-canyon-leak-emitted-109000-metric-tons-methane;
Jeff St. John, "SoCal Gas Reaches Aliso Canyon Settlement as Costs Top $1 Billion," GTM (August 8, 2018). Available at https://www.greentechmedia.com/articles/read/aliso-canyon-costs-top-1b-as-socal-gas-storage-hubs-troubles-remain

[50] Robert Walton, "Integration is the next step in demand side management: Here's how 3 utilities are pursuing it," Utility Dive (December 5, 2018). Available at https://www.utilitydive.com/news/integration-is-the-next-step-in-demand-side-management-heres-how-3-utilit/543636/;
Consolidated Edison Company of New York, "Non-Wires Solutions," Presentation (April 17, 2019). Available at https://www.coned.com/-/media/files/coned/documents/business-partners/business-opportunities/non-wires/con-edison-non-wires-webinar.pdf

Not only has the program produced massive savings, but by reducing energy use, grid reliability has been significantly strengthened. So far, the program has achieved 52 MW of load-relief commitments, and that number is projected to increase to 63 MW by 2021.



California - Distributed Smart Home Devices as Virtual Power Plants

In California, OhmConnect is using an electricity-saving software platform that connects networks of people, devices and digital electric use meters to provide dispatchable demand response – a result that functions like a "virtual power plant." OhmConnect's free program pays people to reduce their electricity use during a few specific hours each week. With over 100,000 active users enjoying over $9 million in cash-outs over the past three years and more than 27,000 connected devices in California, OhmConnect users are getting paid for delivering clean "virtual power plants." In August 2018, the company delivered a 100 MW virtual power plant to the California grid and is expected to more than double.

Households in high-energy burden, disadvantaged communities are proven to be amongst OhmConnect's most successful customers. Currently, OhmConnect's 25,000 users and 3,000 WIFI-plugs and smart thermostats in California's top 25% most burdened communities demonstrate huge potential and a gap. Devices triple users' ability to save electricity, yet only 7% of homes in high-burden communities have a device, approximately one-third the rate (31%) of low-burden communities. Though proven to be very cost-effective, there are still barriers to achieve increased enrollment and more device use in California's disadvantaged communities.

Thus far, OhmConnect has been bidding capacity services in the California PUC's pilot Demand Response Auction Mechanism. The company also provides virtual power plant services to community choice aggregation companies and can provide bill management services directly to customers with a real time price.

Austin Energy - TX - La Loma Community Solar[51]

The La Loma community solar project was completed in East Austin in 2018 and reserved 50% of its capacity for low-income customers. This installation serves as a model for promoting clean and equitable distributed energy in multiple ways: it offers low-income customers energy at a rate one-quarter cent lower than the standard grid rate (non-LMI customers pay 1.3 cents more); it was developed in a historically underserved neighborhood; it involves improving the bike trails and surrounding park to promote community engagement with the installation; and it includes an on-site 1.6 MWh storage system.

[51] Braden, A. 2018. "La Loma Community Solar Lights up in East Austin." Austin Eco Network. Available at https://austineconetwork.com/la-loma-community-solar-lights-up-in-east-austin/.

Houston, TX - Sunnyside Energy Project (Community Solar)[52]

Sunnyside Energy Project is a 70 MW array of solar panels that will replace a former landfill in a historically disadvantaged Houston neighborhood. The project will generate enough electricity to power 12,000 homes, provide power to an electric vehicle charging station, offer a battery back-up to the Sunnyside Community Center, and give electricity discounts to low-income residents. The project is intended to revitalize a 224-acre piece of formerly blighted land and allow Houston residents and non-profits to leverage the benefits of local solar power for their homes and businesses, even if they are not suitable for on-site solar installations. The project aims to be carbon negative by its fifth year of operation.

Vermont – Green Mountain Power Aggregation of Distributed Storage to Replace Peaker Plants[53]

Green Mountain Power (GMP) already had an incentive program for customers to lease Tesla Powerwalls (stationary battery storage) and has added an incentive program to allow customers to purchase their own storage systems. Customers participating in these programs will increase their energy resilience. At the same time, GMP will be able to access these storage devices during peak demand times to meet the needs of the utility. All GMP customers will benefit since the costs of the programs are expected to lower energy costs overall for the utility's customers.

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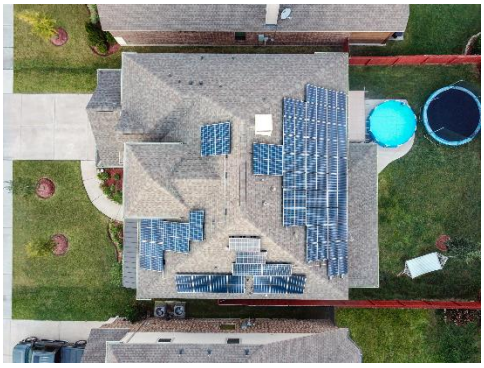
[52] Alvaro Ortiz, "Houston Plans Large Solar Farm To Revitalize Sunnyside Neighborhood," Houston Public Media (September 4, 2019). Available at https://www.houstonpublicmedia.org/articles/news/local/2019/09/04/344931/large-solar-farm-will-combat-climate-change-revitalize-south-houston-neighborhood/, and C40 Reinventing Cities, "Sunnyside Landfill" Webpage. Available at https://www.c40reinventingcities.org/en/sites/holmes-road-landfill-1271.html.

[53] Gheorghiu, Iulia, "Green Mountain Power Expands BYOD and Tesla Battery Programs as it Targets Fossil Peakers," Utility Dive (May 26, 2020). Available at https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwjsgOWvlaPqAhVXJzQIHcdPBtoQFjAAegQIBBAB&url=https%3A%2F%2Fwww.utilitydive.com%2Fnews%2Fgreen-mountain-power-to-roll-out-byod-and-tesla-battery-programs-as-it-targ%2F578573%2F&usg=AOvVaw3poPgp-qmXbWtxd8SVKQv2.

Whisper Valley – TX - Streamlining Customer Procurement to Reduce Installation Cost[54]

Whisper Valley is a 2,000-acre master-planned community east of Austin, Texas, that is committed to sustainability, affordability and cutting-edge technology. Every home is connected to an ultra-efficient geothermal heat pump system and is pre-wired for rooftop solar. The high efficiency of the homes in this development is the result of a partnership with EcoSmart Solution, LLC. The integration of energy efficient strategies into the initial construction of the homes, coupled with pre-wired solutions for rooftop solar and the availability of rooftop solar installation at the time of home construction, have resulted in a very cost-effective solution for buyers of the homes in this development. The result of this coordination is the creation of Texas' first net-zero-capable community.



Sunrun: Solar and Battery Storage as a Virtual Power Plant[55]

In February 2019, Sunrun won a bid to provide 20 MW of capacity to ISO New England by aggregating approximately 5,000 homes across a six-state region. Sunrun also has won contracts in California to provide 500 kW and 12.8 MW of capacity to two communities. Most recently, Hawaiian Electric Companies (HECO) contracted with Open Access Technology International, Inc. (OATI) to aggregate, forecast and control customer-owned behind-the-meter DERs to supply grid services to HECO on multiple islands. As part of this effort, OATI contracted with Sunrun to aggregate 1,000 of the company's solar-battery systems on Oahu by 2024 to provide 4.3 MW of capacity.

Similarly, in Herriman, Utah, Rocky Mountain Power, in conjunction with Sonnen and The Wasatch Group, is building a virtual power plant at an apartment complex through the combination of rooftop solar and distributed energy storage devices. This resource will be powered by 5.2 MW of rooftop solar combined with 12.6 MWh of electricity storage capacity. Reducing local air pollution was a key driver for this development.

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[54] https://www.whispervalleyaustin.com/, https://ecosmartsolution.com/.

[55] Julian Specter, "Sunrun Wins Another Capacity Contract for Aggregated Home Storage," Utility Dive (July 18, 2019). Available at https://www.greentechmedia.com/articles/read/east-bay-power-purchaser-signs-distributed-capacity-contract-with-sunrun#gs.97yn0a;

Julian Specter, "Another California City Drops Gas Peaker in Favor of Clean Portfolio," Utility Dive (July 30. 2019). Available at https://www.greentechmedia.com/articles/read/glendale-drops-gas-peaker-in-favor-of-clean-and-distributed-portfolio#gs.97w9jr;

Hawaiian Electric and Open Access Technology International Plan for Innovative Grid Services Wins PUC Approval. Available at https://www.hawaiianelectric.com/hawaiian-electric-and-open-access-technology-international-plan-for-innovative-grid-services-wins-puc-approval (8/29/19);

Jeff St. John, "Sunrun Lands Another Big Virtual Power Plant Deal, This Time in Hawaii," GTM: (September 4, 2019). Available at https://www.greentechmedia.com/articles/read/sunrun-lands-1000-home-solar-and-battery-grid-services-contract-in-hawaii#gs.97ulpa;

"Rocky Mountain Power to Operate Largest US Residential Battery Demand Response Project," Utility Dive (August 27, 2019). Available at https://www.utilitydive.com/news/rocky-mountain-power-prepares-to-operate-largest-us-residential-battery-dem/561553/.