Local Governments Can Achieve Texas-Sized Impacts from Distributed Energy Assets and Virtual Power Plants

Distributed energy resources and virtual power plants can **empower Texas communities** to lead the transition to a more resilient, affordable, and sustainable energy system.

While the saying may hold that "everything's bigger in Texas," the Lone Star State is looking to smaller, localized energy assets to bring significant benefits to communities and the grid. Known as distributed energy resources (DERs), these small-scale assets connect to the electric distribution grid and can generate, store, or shift the demand for electricity.

These assets, especially when combined to create virtual power plants (VPPs) — also known as aggregate distributed energy resources (ADERs) — are emerging as key tools that can be deployed quickly in support of a more reliable, resilient, and affordable electricity system.

Texas is actively exploring how these technologies can support its grid, and local governments statewide can play crucial roles in increasing the scale and speed of DER and VPP deployment. Through their roles in zoning, permitting, procurement, and program administration, municipalities and counties can maximize the adoption of these resources and the benefits they provide to communities and the broader grid.

What Are DERs and VPPs?

DERs are small-scale energy resources — typically between 1 kW and 10,000 kW — that are connected to the grid at the distribution level. The US Department of Energy Virtual Power Plant Liftoff report categorizes DERs into three main types: generation, storage, and demand-side resources.

1. Generation resources

produce electricity locally, thus reducing reliance on centralized power plants. Examples include:

- **Rooftop solar photovoltaic panels** that harness sunlight to generate electricity, thereby reducing emissions and, in certain circumstances, energy costs.
- **Combined heat and power (CHP) systems** that generate electricity and capture heat for use in heating or industrial processes. CHP systems usually offer high efficiency and cost savings.

2. Storage resources

can store energy during certain parts of the day (such as when it is cheap and abundant) and send that energy back to the grid during high-demand (or "peak") times. These assets can help maintain power during disruptions and unlock more efficient use of renewable energy resources. A common example:

- **Battery energy storage systems** (BESS), which can either stand alone or be combined with other generating DERs, such as wind and solar.

3. Demand-side resources

can optimize electricity use by shifting consumption from times of the day when energy demand is high to times when energy is more affordable and abundant. These small changes reduce strain on the grid, improve overall efficiency, and lower energy costs for users. Examples of demand-side resources include:

- **Smart thermostats** that reduce energy use by optimizing heating and cooling schedules.
- **Electric vehicle (EV) chargers** that enable flexible charging during off-peak hours. Some can even return energy to the grid.

Virtual power plants (VPPs) — also known as aggregate distributed energy resources (ADERs) in Texas — orchestrate multiple DERs to provide broader, grid-level benefits. VPPs can help utilities and grid operators leverage a portfolio of assets in a coordinated way to manage demand surges, mitigate price volatility, integrate renewable energy more effectively, and more.

During a heat wave, a VPP could remotely adjust the thermostat settings of thousands of homes to reduce peak load, preventing grid strain and costly outages.

What Are the Benefits of DERs and VPPs?

DERs offer a range of cost, resilience, and environmental benefits to communities.

Energy Costs

A key advantage of DERs is their ability to manage and, in many cases, reduce energy costs, depending on factors like utility rates and system configuration. Households, businesses, and municipal facilities equipped with rooftop solar, battery storage, or demand-response technologies can save on electricity bills by reducing the amount of electricity purchased from the grid and, where applicable, lowering demand charges by reducing peak energy usage. This is especially beneficial in Texas's deregulated energy market, where wholesale prices can vary, and significant price fluctuations may eventually be passed to consumers. DERs and VPPs might reduce costs not only for participants, but also for the broader community by potentially deferring the need for new large-scale generation, distribution, and transmission infrastructure.

Local Resilience

Individual DERs can support enhanced resilience to potential grid disturbances. Whether deployed on an individual home or a public property, DERs can — if islanded from the grid — generate energy or deploy stored energy from batteries to keep the lights on and other critical loads powered. In Texas, where extreme weather events have exposed vulnerabilities in recent years, DERs can provide backup power to critical facilities like hospitals and emergency services.

Grid Resilience

DERs, particularly when aggregated into VPPs, also expand supply and demand flexibility at the grid scale. This flexibility enables dynamic grid balancing and can enhance resilience for the entire grid during extreme weather events or at times of peak demand.

Economic Development

Significant deployment of DERs can create jobs that are usually place-based and difficult to offshore. This also opens the door for local and regional workforce training opportunities. A US Department of Energy (DOE) report indicates that clean energy jobs grew at twice the pace of overall US employment in 2023, making up more than half of all new jobs in the energy sector.

Environmental and Health Benefits

DERs such as solar panels and battery storage offer a unique opportunity to enhance resilience while maintaining low emissions and supporting better air quality. Fossil fuel-based DERs, such as diesel generators, can also provide resilience but will lead to greenhouse gas emissions and degraded air quality.

What Is Driving Interest in and Adoption of DERs and VPPs?

In addition to the benefits they present, growing interest in DERs and VPPs has been fueled by recent federal legislation, the rapid uptick in electricity demand, and the pressing need for grid reliability and resilience in the face of increasingly frequent extreme weather events.

Federal Legislation

Multiple federal incentives and programs are spurring unprecedented investments in clean energy technologies across homes, businesses, and transportation, specifically through the Inflation Reduction Act (IRA) and the Bipartisan Infrastructure Law (BIL).

These laws, especially the tax credits and rebates they have extended or created, are expected to accelerate the adoption of electric vehicles, energy-efficient appliances, and renewable energy installations. For more information on relevant credits and grant opportunities, see RMI and WRI's America's Federal Funding Opportunities and Resources for Decarbonization (AFFORD) database.

Growing Electricity Demand

A forecasted surge in electricity demand is also driving the need for new resources that can come online quickly to increase electricity supply, create more demand flexibility, and enhance grid reliability. The North American Electric Reliability Corporation (NERC) highlights that electricity demand and peak loads are growing at a pace unseen in three decades. This trend is particularly pronounced in Texas, where the rapid proliferation of energy-intensive industries, such as data centers and manufacturing, is amplifying energy needs.

The Electric Reliability Council of Texas (ERCOT), the state's grid operator, is already grappling with rising peak demand due to extreme weather events and sustained economic growth. However, it takes years to site, permit, and interconnect large-scale energy infrastructure — not to mention the high up-front costs. A variety of DERs — generation, energy storage, and demand-flexibility assets — could be deployed rapidly (in a matter of months) to support grid operators and utilities facing the critical task of ensuring a reliable and balanced electricity supply.

Building Resilience

Extreme weather events, like Winter Storm Uri in 2021 and Hurricane Beryl in 2024, are also pushing the Texas grid to its limits. Uri caused unplanned outages at large-scale generation facilities — mostly among gas-fired power plants — that necessitated rolling blackouts. Beryl caused extensive damage to power lines and led to millions losing power.

These strains on large-scale electrical infrastructure underscore the growing need for local, resilient power solutions. Unlike conventional, centralized generators, DERs are deployed at or near load (lessening the need for power lines to deliver power) and can be designed to power critical loads in the event of a grid outage. DERs and VPPs can also help dynamically balance supply and demand for the broader grid, enhancing reliability and ensuring a more resilient energy system.

Acknowledging these opportunities, the Public Utility Commission of Texas (PUCT) launched an ADER pilot project in 2022 to better understand how to integrate VPPs into the grid and maximize the real-time benefits they provide. This pilot has been hailed as a success, and the PUCT has expanded it to enable more resources to participate. This project and its expansion underscore the interest generated by VPPs and the opportunities they present to deliver a host of benefits to a variety of stakeholders.

Challenges Facing the Expanded VPP Participation

Despite the growing interest in and action to advance VPPs, there are still multiple barriers to their widespread deployment, such as:

Limited DER adoption

While DER penetration is increasing across the nation and in Texas, it is still relatively low in terms of the percentage of households that have adopted these technologies. Low penetration of DERs limits the ability to form or fully realize the benefits of a VPP. Increasing DER adoption will expand the number of households that could participate in a VPP and establish a more robust foundation for an aggregation that would be large enough for an aggregator to pursue.

Insufficient consumer awareness

A VPP is established when consumers enroll their devices and agree to the terms of participation. Yet today, awareness and understanding of VPPs is limited. Certain customers may not know that VPPs exist or understand how they function. Other customers may not have a clear understanding of how they will be compensated or how participation will affect their devices. These limitations will reduce participation in VPPs and potentially limit their deployment in certain geographies. Expanding awareness of VPPs and providing more education to consumers can help overcome this barrier.

Requirements for new utility software and capabilities

While VPPs can provide valuable grid services to utilities, they require utilities to make certain alterations. Utilities must adopt software to enhance control of the grid and, if applicable, manage the VPP assets. Further, utilities must update their planning processes and review incentive structures to understand how VPPs could best fit into their operations.

Local Governments Can Further DER Adoption and VPP Participation

Interest in DERs is driving up adoption rates across Texas. Distributed solar energy, for example, is booming: net generation from small-scale solar photovoltaics (PV) in Texas increased by over 158% between 2020 and 2023, according to the US Energy Information Administration. Similarly, EV adoption is growing statewide, and continued growth is expected. Local governments across the state are looking to build on this success by catalyzing and shaping further adoption. Below are several strategies that local governments can leverage in this endeavor, as well as local examples of these activities.

Increase Public Knowledge

- **Share information on the benefits of various DERs.**
  For instance, the City of El Paso's Chihuahuan Desert Climate Collaborative, created as part of the federally funded CPRG Priority Climate Action Plan, shares useful resources on energy efficiency, weatherization, and home energy assessments. Similarly, the City of Houston's partnership with the clean air and clean transportation nonprofit Evolve Houston provides information on electric vehicles.

- **Communicate existing incentives for DERs to the public.**
  Local governments can educate constituents about existing federal, state, and utility incentives. For instance, the North Central Texas Council of Governments provides information about EV incentives to industry, fleet owners, and the public.

- **Educate residents about DERs that can be easily integrated into VPPs.**
  Certain device types and brands are currently leading the market in development of VPPs, due to their compatibility with VPP platforms and aggregator requirements, as well as alignment with regulatory policies. Noting the technologies that are typically accepted by aggregators can ensure that installations can be incorporated into current and future VPPs, thus potentially unlocking additional revenue streams for device owners and lowering costs for consumers.

- **Communicate VPP benefits and programs to residents.**
  The processes by which VPPs provide value to the grid, and the mechanisms for compensating participants, can feel opaque to residents, which can result in reduced enrollment. As VPPs become more commonplace, local governments can become a trusted source of information. They can communicate both the impact of VPPs on an individual's energy usage, as well as the potential cost savings associated with enrollment.

Leverage Local Authority over Permitting, Planning, and Zoning

- **Update local zoning and land use codes to simplify installation of DERs.**
  Land use and zoning codes that explicitly allow (as a "by-right" use) the installation of accessory zero-emissions technologies (e.g., rooftop solar, home batteries, and

EV charging stations) can significantly clarify and simplify the process for installing these technologies. These changes can reduce installation timelines and lower costs. Local governments can consider adopting best practices to support DER installations, such as those outlined in the US DOE Energy Ready programs.

- **Update local plans to incorporate DERs and VPP considerations.** Governments can incorporate explicit, supportive DER and VPP language and metrics into their local plans. These changes can establish a foundation for local government staff to consider DERs more broadly and empower staff to act to increase their deployment. Such language also signals to potential adopters — such as residents and businesses — and installers that a community is serious about increasing the uptake of these technologies. Further, it helps to best align DER deployment with community priorities and can establish preferred co-benefits, such as cost stability and local jobs, associated with the adoption of these technologies.

- **Simplify permitting processes for small-scale distributed energy resources.** Streamlined permitting will decrease the "soft costs," or non-hardware costs, of installing DERs by reducing both the labor required to obtain these documents and installers' customer acquisition costs. Streamlining solar permitting is a foundational part of the SolSmart program, and simplified permitting processes in Texas communities (including Cedar Hill, Texas, a designated SolSmart Gold community) are already reducing the time needed for residents to install rooftop solar. Fully automated permitting approaches, such as Solar Automated Permit Processing (SolarAPP), have reduced PV system installation costs by around 2%–13%.

Launch or Expand Programs That Support Consumer Adoption

- **Provide incentives for DER adoption.** Local governments can create incentive offerings that reduce the cost of DERs for households and businesses. Ensure these incentives take into account VPP compatibility and whether covered DERs can participate in aggregations.

- **Conduct technology-specific campaigns to encourage DER adoption.** For example, the City of Farmers Branch partners with Texas Solar Switch to conduct a reverse auction, whereby residents sign up to participate and solar providers bid to install solar on a group of participating homes. The more people that sign up for the auction, the better the rates are. This partnership also offers Power Switch, where participants can choose to buy 100% renewable electricity without installing solar on their homes.

Engage Key Stakeholder Groups to Encourage DER Adoption and Supportive Policies

- **Engage with utilities, energy retailers, market operators, and regulators to support the development of VPPs.** Local governments can engage through formal avenues, such as participating

in Public Utility Commission of Texas (PUCT) and ERCOT stakeholder processes, or informal approaches like meeting with actors in the electricity sector to share experiences and goals related to VPPs. For example, a group of local governments in Texas submitted comments in the PUCT's Review of DERs docket in 2022, expressing support for ADERs. Their comments highlighted the potential of distributed energy to enhance grid reliability, promote renewable energy integration, and provide economic benefits to communities. The cities also asked for policies that facilitate DER aggregation, enabling municipalities to actively participate in energy markets and contribute to a more resilient and sustainable energy system.

- **Champion virtual power plants in the state legislature.**
  The state legislature provides the directives that the PUCT is required to implement. Local governments can highlight the value and local benefits of VPPs to state legislators from their district, emphasizing priorities such as the utilization of existing assets, cost savings, and contributions to grid resilience.

Leverage Local Government Operations

- **Commit to enrolling local government-owned DERs into existing or new virtual power plants.**
  Local governments, which often manage significant numbers of buildings and their associated DERs, can commit to enrolling their own assets into VPPs or can actively engage retailers to create VPP programs. This commitment of a dedicated base of DER assets might provide an initial foundation for the development of a VPP in the area by a utility, retail energy provider, or third party.

Local Resources for Local and System-Wide Benefits

Distributed energy resources and virtual power plants present an immense opportunity for both Texans and their grid. Texas can leverage the flexibility, scalability, and speed of deployment of these technologies to enhance local and grid-level resilience, reduce energy costs, and increase clean energy use. Local governments can play a critical role in turning this opportunity into reality. Through communications, stakeholder engagement, planning, and program development, local governments can catalyze DER adoption and spur participation in VPPs to bring vast benefits to their communities and the rest of the state.

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