Loan Programs Office

DOE Releases New Report on Pathways to Commercial Liftoff for Virtual Power Plants

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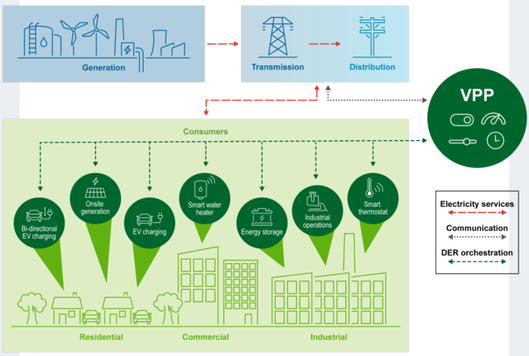
The U.S. Department of Energy (DOE) today announced the release of the **Pathways to Commercial Liftoff for Virtual Power Plants** (VPPs), underscoring the critical role that VPPs need to play in the Nation's affordable, reliable, and clean energy future.

The report was announced at RE+, the largest annual gathering of solar and clean energy professionals in North America.

With peak electricity demand rising and old coal and gas power plants retiring, the U.S. grid will need to add enough new capacity to serve over 200 gigawatts (GW) of peak demand by 2030. For the U.S. to follow a path toward 100% clean electricity by 2035, new capacity needs could be nearly double this amount. Deploying 80-160 GW of VPPs—tripling current scale—by 2030 could expand the U.S. grid's capacity to reliably support rapid electrification while redirecting grid spending from peaker plants to participants and reducing overall grid costs by $10 billion per year.

The report released today is the latest from the Pathway to Commercial Liftoff effort, a set of reports quarterbacked by DOE's **Office of Technology Transitions**. The reports provide the private sector, State governments, and energy industry partners a valuable, engagement-driven resource on how and when certain technologies can reach full-scale deployment. The new initiative underscores the critical role that DOE plays in enabling widespread commercial adoption of the clean energy technologies that are essential to meeting President Biden's ambitious goals of achieving 100% clean electricity by 2035 and a net-zero emissions economy by 2050.

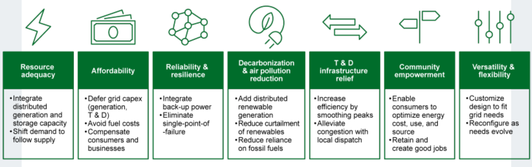
VPPs are aggregations of distributed energy resources (DERs) such as rooftop solar with customer-sited batteries, electric vehicles (EVs) and chargers, smart buildings and equipment and their controls, and flexible commercial and industrial (C&I) loads that can balance electricity demand and supply and provide utility-scale and utility-grade grid services like traditional power plants. VPPs enroll DER owners—including residential, commercial, and industrial electricity consumers—in a variety of participation models that offer financial rewards for contributing to efficient grid operations.



Over the next decade, the mix of renewable generation will be unprecedented, leading to more variable electricity supply and higher demand for transmission capacity. Transmission interconnection backlogs, which have stretched to an average of five years, pose potential resource adequacy challenges. Large-scale deployment of VPPs could help address demand increases and rising peaks at lower cost than conventional resources, reducing the energy costs for Americans —one in six of whom are already behind on electricity bills.

VPPs are not new and have been operating with commercially available technology for years. Most VPP capacity today is in demand response programs that are used when bulk power supply is limited. These programs turn off or decrease consumption from end uses such as smart thermostats, water heaters, and commercial and industrial equipment.

However, VPPs have the technical potential to perform a much wider array of functions. Example functions of VPPs on the market today include shifting the timing of EV charging to avoid overloading local distribution system equipment, supplying homes with energy from on-site solar-plus-storage systems during peak hours to reduce demand on the bulk power system, charging distributed batteries at opportune times to reduce utility-scale solar curtailment, dispatching energy from commercial EV batteries back to the grid, and contributing ancillary services to maintain power quality, all while minimizing impact to the DER owner.



The **Pathways to Commercial Liftoff: Virtual Power Plants** report addresses several key points:

1. **Expand DER adoption with equitable benefits:** Governments, nonprofit organizations, utilities, DER manufacturers, and VPP platforms can collaborate on holistic support for DER adoption and VPP deployment that prioritizes equitable benefits, including electricity bill savings, grid reliability and resilience, air quality improvements, and job opportunities.
2. **Simplify VPP enrollment:** Utilities, DER manufacturers, VPP platforms, consumer advocates, and regulators can develop a phased approach to streamline VPP participant enrollment. Measures include consumer education, automatic enrollment of DERs into VPPs at the point of purchase with opt-out options, and wider VPP-enablement of DER devices.
3. **Increase standardization in VPP operations:** Private- and public-sector stakeholders can improve coordination and resourcing for the development of guidelines, standards, and/or requirements that make VPPs more repeatable and shorten the design and pilot stages of individual VPP deployments.
4. **Integrate into utility planning and incentives:** Governments, utilities, and nonprofit organizations can increase resources and personnel support for utility regulators (e.g., public utility commissions, boards of cooperatives, and more) to revise or introduce new distribution system planning requirements, procurement processes, ratemaking, and customer programs that promote cost-effective DER adoption and VPP deployment while accounting for potential necessary grid upgrades.
5. **Integrate into wholesale markets:** In restructured markets, Independent System Operators and Regional Transmission Organizations may benefit from targeted support for the timely and inclusive integration of VPPs into system planning and marketplaces as outlined in FERC Order 2222.

In line with its living document philosophy, the DOE will continue to revise and update the Liftoff Reports as the technology and policy landscape evolves. Public input and stakeholder engagement continue to be encouraged through industry forums and can be submitted via email to **liftoff@hq.doe.gov**.

The **Pathways to Commercial Liftoff Reports** were developed through extensive stakeholder engagement and a combination of system-level modeling and project-level financial modeling. Additional reports will be published in the coming weeks and months. Find more information about and read the full reports **here**.

JIGAR SHAH
Director of the Loan Programs Office

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