ALLIANCE TO SAVE ENERGY
using less. doing more.

Active Efficiency COLLABORATIVE

ADVANCING VIRTUAL POWER PLANTS TO SCALE:

Policy, Market Trends, and Deployment Pathways

2025

VIRTUAL POWER PLANT ANNUAL REPORT

LETTER FROM THE CHAIR

Dear Colleagues,

It is an honor to share this year's Virtual Power Plant Annual Report on behalf of the Active Efficiency Collaborative.

Virtual Power Plants (VPPs) have the potential to become one of the most powerful tools to strengthen America's energy system. By digitally connecting distributed energy resources—rooftop solar, battery storage, electric vehicles, smart appliances, and more—VPPs provide real-time flexibility to balance supply and demand. This capability is no longer optional. With demand surging from electrification, AI factories (data centers), reshoring of manufacturing, demand-side management is essential to keeping the grid resilient, secure, and competitive.

As Chair of the Collaborative, I've seen firsthand how Active Efficiency—integrating efficiency with digital intelligence and flexibility—elevates demand-side resources into strategic assets. At scale, VPPs don't just cut costs; they enhance reliability, reduce peak demand, and strengthen national energy security. They allow us to orchestrate distributed resources as a unified system—enabling the U.S. to maintain leadership in an increasingly competitive global energy marketplace.

In my own work, I've witnessed how digital platforms transform industries by connecting data, people, and infrastructure to drive efficiency and resilience. The same applies here. With VPPs, we can create a digital layer of intelligence for the grid—one that allows us to predict, optimize, and secure energy flows. But this future must be built on trust. Interconnected grids, buildings, and devices create enormous opportunities, but also new risks. Cybersecurity, monitoring, and anomaly detection must remain central to how we scale demand flexibility.

This report reflects the Collaborative's work with utilities, technology leaders and innovators, researchers, and policymakers. It outlines the market reforms, regulatory modernization, and infrastructure investments needed to accelerate VPP adoption. It also highlights the progress already underway—from utility-led pilots to new business models proving that demand-side solutions deliver value at scale.

The message is clear: demand management is the new supply. By harnessing the intelligence and responsiveness of VPPs, we can meet rising demand, lower costs, and ensure the U.S. leads in building a more resilient, flexible, and secure energy future.

Thank you to all who contributed to this report and to the Collaborative's mission and work. Together, we are building the resilient, flexible, and secure energy system this moment demands.

Sincerely,

Bert Van Hoof

Chair, Active Efficiency Collaborative

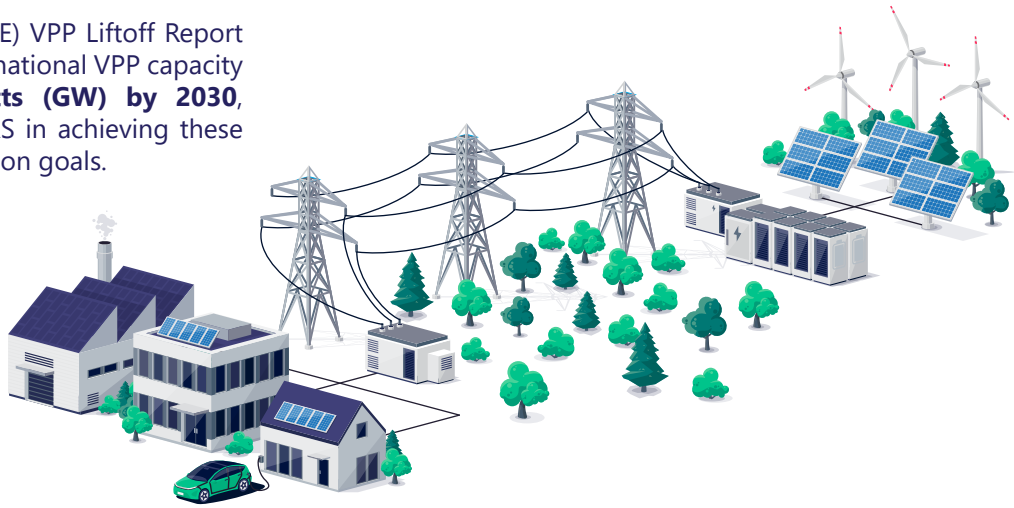
Chief Executive Officer, Willow

EXECUTIVE SUMMARY

Virtual Power Plants (VPPs) are emerging as a cornerstone of the United States' clean energy transformation. By digitally aggregating and coordinating distributed energy resources (DERs), such as rooftop solar panels, battery storage systems, electric vehicles, smart appliances, and flexible demand response, VPPs enable **real-time optimization of both energy supply and demand**. This enhances grid reliability and resilience, lowers costs for consumers, and reduces emissions.

The 2025 Department of Energy (DOE) VPP Liftoff Report lays out a strategic roadmap to scale national VPP capacity to between **80 and 160 gigawatts (GW) by 2030**, underscoring the pivotal role of DERS in achieving these decarbonization and grid modernization goals.

The VPP report is informed by extensive stakeholder engagement, including insights from the Active Efficiency Collaborative, and integrates **key policy, market, and technology perspectives**. It presents actionable strategies to expand VPP adoption, with an emphasis on customer participation, utility engagement, regulatory reform, & investment in digital infrastructure that ensures broader access across communities and regions.



ABOUT THE ACTIVE EFFICIENCY COLLABORATIVE

The Active Efficiency Collaborative (AEC), convened by the Alliance to Save Energy, is a coalition of energy leaders and experts working to advance the next generation of energy efficiency through **demand flexibility, digital solutions, & grid-interactive technologies**. In 2023, the AEC entered its most impactful year to date, aligning its work with major federal initiatives such as the Inflation Reduction Act (IRA) and the Infrastructure Investment and Jobs Act (IIJA), while also laying the groundwork for implementing the U.S. Department of Energy's VPP Liftoff Report.

The Collaborative brings together stakeholders from **utilities, technology companies, research institutions, and public agencies** to form a national platform for innovation, collaboration, and policy advancement. Its mission is to accelerate the adoption of advanced energy efficiency solutions while ensuring these technologies are accessible to a broad range of customers, communities, and regions.

The AEC's 2023 Roundtable Series played a central role in shaping the policy recommendations outlined in this report. These convenings **identified key challenges to demand flexibility and highlighted actionable opportunities** for VPP deployment. Grounded in real-world experience & input from diverse stakeholders, the roundtables provided a foundation for recommendations that reflect on-the-ground realities and support practical, scalable progress.

VISION

VPPs are rapidly becoming a cornerstone of the modern electric grid, enabling a **smarter, more flexible, and resilient energy system**. By integrating and coordinating distributed energy resources (DERs) such as rooftop solar, battery storage, smart thermostats, and demand response programs, VPPs allow utilities and grid operators to dynamically balance supply and demand, reduce peak load, and enhance reliability, while also lowering costs for consumers and supporting decarbonization goals.

The 2025 DOE Virtual Power Plant Liftoff Update outlines a national roadmap to scale VPP capacity to between 80 and 160 gigawatts (GW) by 2030. **The report emphasizes the importance of supportive policy frameworks, market modernization, and utility engagement to unlock this potential.** It draws on real-world case studies, industry-led pilots, and emerging regulatory models to highlight pathways for accelerating deployment. Key focus areas include clarifying valuation mechanisms for grid services, streamlining enrollment and interoperability, and identifying strategies to ensure broader participation across customer segments and geographies.

It's worth noting here that no plan for implementing VPPs on a large scale seems plausible without a massive contribution from Artificial Intelligence (AI). AI can optimize VPP operations with more accurate forecasting, real time controls and enhanced efficiencies, among other advantages. Certainly, as this work moves forward at the Alliance, AI will play a much larger role in the development of VPP programs.

FINDINGS

This report integrates insights from the 2024 VPP State Policy Snapshot, industry-led VPP pilot programs, and key regulatory developments, including FERC Order 2222 compliance and utility-led innovations from leaders such as PSE, SMUD, NYPA, MCE, Sunrun, and Sunnova*. These findings reflect both the growing technical capability and policy momentum needed to scale VPPs nationally.

The updated 2025 DOE VPP Liftoff Report outlines:

- Higher Peak Demand Projections: DOE now estimates that peak electricity demand will rise from approximately 800 GW in 2024 to 900 GW by 2030—a 12.5% increase over prior forecasts.
- Infrastructure Cost Challenges: With transmission investments rising 10.8% and distribution network investments increasing by 14.6% between 2022 and 2023, cost-effective non-wires alternatives (NWAs) like VPPs are gaining importance.
- Growing Need for Grid Resilience: In 2023 alone, the U.S. experienced 28 different billion-dollar weather disasters totaling $95 billion in damages. As extreme weather in the U.S. intensifies, VPPs are increasingly seen as a critical tool for improving resilience and protecting vulnerable communities.

RESULTS

- Statewide regulatory frameworks for VPP integration emerged in Colorado, Maryland, and Washington, setting a precedent for future policy.
- Utility-led VPP programs in the states of Arizona, North Carolina, and California expanded BYOT (Bring-Your-Own-Thermostat) programs to help incorporate batteries, EV chargers, and load flexibility solutions.
- Wholesale market participation breakthroughs: CAISO and ISO-NE have advanced FERC Order 2222 compliance, opening new revenue streams for DERs and VPP aggregators.

** Sunnova Energy filed for Chapter 11 bankruptcy in June 2025, with plans to sell its assets and wind down operations. It's contribution to VPPs however, is still relevant today.*

MAIN ASKS

Expand Federal Grants to Support Low-Income Distributed Energy Resource (DER) Adoption and VPP Aggregators

To ensure the benefits of energy innovation reach all Americans, targeted federal funding should support DER deployment in low-income communities and bolster VPP aggregators serving those areas. These grants will help overcome upfront cost barriers, enable broader participation in grid services, and build a more resilient and distributed energy infrastructure—key to energy reliability and independence.

Establish Uniform Voluntary Operational Standards for VPP Integration (e.g., OpenADR Compliance)

A standardized set of protocols, such as Open Automated Demand Response (OpenADR), will reduce integration costs, accelerate deployment, and enhance compatibility across technologies. Streamlining VPP operations around a national framework increases efficiency and lowers barriers to entry for new market participants—advancing private-sector investment and driving domestic energy innovation in support of energy dominance.

Require VPP Consideration in State Integrated Resource Plans (IRPs)

Requiring utilities to incorporate VPPs into long-term resource planning will solidify their role as a dependable, dispatchable grid asset. This approach ensures that utilities evaluate VPPs alongside traditional generation for reliability, capacity, and cost-effectiveness—strengthening grid resilience and aligning with national goals to modernize infrastructure without overreliance on foreign supply chains or costly new buildouts.

THE AEC VPP ROADMAP

INTEGRATING ACTIVE EFFICIENCY INTO THE VPP LANDSCAPE

The Active Efficiency Collaborative (AEC), the Alliance to Save Energy's initiative to advance demand-side solutions that strengthen grid reliability, improve system efficiency, and expand access to emerging energy technologies got its start in 2021. The AEC experienced a productive 2024, as it directly supported national efforts to scale Virtual Power Plants as tools to enhance domestic energy resilience and reduce dependence on centralized infrastructure.

In parallel with DOE's 2023 release of the inaugural VPP Liftoff Report, the AEC convened a six-part Roundtable Series bringing together utilities, technology providers, researchers, and state energy leaders to **inform Active Efficiency policy development and identify practical frameworks for demand flexibility**. These roundtables helped establish the foundational strategies for integrating VPPs into utility planning, market operations, and grid modernization efforts.

The insights gathered from these expert-led discussions directly informed the policy recommendations included in this report. By focusing on barriers to distributed energy resource (DER) adoption, streamlining enrollment and participation in VPP programs, and advancing national interoperability standards, **the AEC laid the groundwork for a reliable, scalable, and accessible VPP ecosystem**. These efforts contribute to a stronger, more self-reliant American energy grid aligned with the broader goals of energy independence & infrastructure modernization.

2023 AEC ROUNDTABLE HIGHLIGHTS

The AEC's 2023 Roundtable Series was a pivotal initiative, strategically timed to align with the DOE's VPP Liftoff Report and the growing national conversation on grid modernization.

These roundtable convenings provided a crucial platform for in-depth, expert discussions on the policy frameworks needed to support demand flexibility and VPP integration, shaping the trajectory of VPP development across the U.S.

THE SIX PART - ROUNDTABLE SERIES

1 EXISTING INVESTMENTS IN DEMAND FLEXIBILITY

Organization: U.S. Department of Energy, Building Technologies Office (BTO)

Summary: This session provided a national landscape overview of technologies enabling demand flexibility, including smart thermostats, connected HVAC systems, and grid-interactive efficient buildings (GEBs).

Outcome: Established a national baseline for adoption and deployment of active efficiency solutions, setting the stage for targeted policy interventions and frameworks to accelerate uptake.

2 WHAT'S HAPPENING IN THE STATES?

Organizations: Clean Energy States Alliance (CESA), Climate Policy Initiative (CPI), National Association of Regulatory Utility Commissioners (NARUC)

Summary: This rountable session highlighted state-level leadership in demand flexibility, including innovative regulatory approaches, pilot programs, and utility-led initiatives across the U.S.

Outcome: Mapped current efforts by public utility commissions and state energy offices, identifying trends, gaps, and promising models for replication and federal alignment.

3 ACCESSIBILITY IN ACTIVE EFFICIENCY

Organizations: Seattle City Light, Opower, Uplight

Summary: This discussion focused on improving access to demand-side solutions for low-income households and under-resourced communities by addressing barriers to participation.

Outcome: Advanced a framework for inclusive policy design, emphasizing community engagement, broad program eligibility, and alignment with national goals such as Justice40.

4 NEXT STEPS IN DEMAND FLEXIBILITY

Organization: Uplight

Summary: A deeper dive into practical deployment considerations, including customer recruitment, incentive structures, and grid-service monetization for flexible load assets.

Outcome: Identified near-term implementation priorities such as streamlined customer enrollment, program standardization, and improved data access, alongside persistent barriers like limited interoperability and uneven utility readiness.

5 ADVANCED TECHNOLOGIES FOR A FLEXIBLE GRID

Organizations: Google, U.S. Department of Energy, Franklin Energy, Climate Policy Initiative (CPI), Dallas Fort Worth International Airport.

Summary: Case studies highlighted the real-world deployment of integrated technologies, including AI-enabled building management systems and even large-scale demand response at transportation hubs.

Outcome: Demonstrated the value of cross-sector collaboration in enabling grid flexibility through digital infrastructure, advanced control systems, and scalable VPP models.

6 INTRODUCTION TO VPP LIFTOFF

Organization: U.S. Department of Energy, Loan Programs Office

Summary: Introduced the DOE's "Virtual Power Plant (VPP) Liftoff" initiative aimed at accelerating commercialization and federal policy support for widespread VPP deployment.

Outcome: This session marked the Collaborative's formal engagement in the federal VPP policy landscape, framing its ongoing work on market design, deployment challenges, and critical policy recommendations for DOE and Congress.

2024 VPP WORKSHOP SERIES: REGIONAL CASE STUDIES & DEPLOYMENT MODELS

The workshops convened utilities, technology providers, & regulators to share real-world lessons & deployment strategies. These sessions highlighted the breadth of approaches emerging across geographies, technologies, & customer segments.

MCE Community Choice Energy (March 2024)

- **Focus**: Access-first Virtual Power Plant (VPP) model emphasizing comprehensive DER deployment in underserved communities.
- **Technologies Used**: Residential solar PV, battery storage, EVs, heat pumps, smart thermostats.
- **Program Highlights**: Designed to provide local energy control, reduce customer bills, and build resilience. Integrates energy access with emissions reduction through the Healthy Homes Resilient Communities initiative.
- **Key Takeaway**: Community-based aggregation paired with local reinvestment delivers grid and societal benefits.
- **Policy Linkage**: Informs recs. for accessible grant programs & prioritization of community-driven VPPs.

Sunnova (July 2024)

- **Focus:** Residential solar + storage aggregation at national scale.
- **Scale:** Over 438,000 customers.
- **Flagship Programs:** Puerto Rico BEDR (with LUMA), ISO-NE capacity markets, California DEBA/DSGS.
- **Key Takeaway:** Interoperable policy frameworks are essential to scale impact.
- **Policy Linkage:** Underscores importance of OpenADR standardization.

Sunrun (July 2024)

- **Impact:** 75+ MW of aggregated capacity.
- **Programs:** PG&E ELRP, ConnectedSolutions in New England, LUMA BEDR, California's DSGS/DEBA.
- **Innovation Highlight:** Open-access VPPs enabling flexibility in tech adoption.
- **Key Takeaway:** Plug-and-play VPPs increase participation and value.
- **Policy Linkage:** Supports policies reducing proprietary integration barriers.

Onsemble (August 2024)

- **Focus:** Grid-interactive electric water heaters (GEWHs) as thermal storage.
- **Pilot:** Rheem + PG&E deployment.
- **Features:** Remote control, peak shaving, multi-value stacking.
- **Key Takeaway:** Thermal storage is scalable and low-cost.
- **Policy Linkage:** Recommends DR performance protocols and tech-neutral flexibility incentives.

Puget Sound Energy (December 2024)

- **Program Suite:** Flex Smart, Flex Rewards, Flex EV, Business DR, Flex Batteries.
- **Engagement:** 500,000+ customers.
- **Goal:** 100 MW of dispatchable demand reduction by 2025.
- **Key Takeaway:** Comprehensive portfolios combining behavioral and automated DR optimize value.
- **Policy Linkage:** Informs IRP alignment and market platform integration guidance.

SMUD (February 2025)

- **Programs:** Smart thermostats, commercial DR, EV charging.
- **Challenges:** Vendor variability, DER opt-outs, market value assignment.
- **Approach:** Bottom-up Distributed Energy Resource Management Systems development & local workforce investment.
- **Key Takeaway:** Distribution-level integration and workforce readiness are foundational.
- **Policy Linkage:** Supports local job training programs and DER data standardization.

CONTEXT AND PURPOSE OF THE 2025 UPDATE

The 2025 update builds upon the 2023 DOE VPP Liftoff Report, incorporating real-world case studies, state-level policy developments, industry insights, and best practices. The report's purpose is to accelerate VPP adoption across the U.S. and offer stakeholders practical policy and programmatic levers.

DOE aims to support the deployment of 80–160 GW of VPP capacity by the year 2030. This will **cover 10–20% of peak electricity demand to enhance grid efficiency, affordability, and resilience**. However, grid pressures continue to intensify due to:

RISING PEAK DEMAND

Projected to increase from ~800 GW in 2024 to ~900 GW in 2030, fueled by electrification, data centers, and industrial load growth.

RESILIENCE DISRUPTIONS

The U.S. experienced 28 resilience disasters exceeding over $1 billion in damage in 2023, underscoring the need for flexible, distributed solutions like VPPs.

COST PRESSURES

Transmission and distribution infrastructure spending rose sharply between 2022–2023. Non-wires alternatives such as VPPs offer lower-cost, scalable solutions.

KEY POLICY AND MARKET DEVELOPMENTS IN 2024

STATE-LEVEL VPP POLICY EXPANSION

INSIGHTS FROM THE 2024 STATE POLICY SNAPSHOT

The 2024 Virtual Power Plant (VPP) State Policy Snapshot, developed by the NC Clean Energy Technology Center (NCCETC) and the Smart Electric Power Alliance (SEPA), tracks 105 VPP-related policy actions across 38 states and Washington, D.C., showcasing how state-level leadership is driving market development.

KEY POLICY TRENDS IN 2024

Utilities Driving VPP Adoption

- 68 of 105 policy actions were initiated or led by utilities.
- Bring-Your-Own-Thermostat (BYOT) programs evolved to incorporate battery storage, EV charging, and comprehensive DER bundles.
- Notable expansion efforts emerged in Arizona, Virginia, North Carolina, New Jersey, and Washington.

Statewide VPP Frameworks

- Maryland DRIVE Act (2024): Requires utilities to establish VPP pilots and offer clear compensation to aggregators.
- Colorado SB 218 (2024): Mandates tariff structure development and aggregator integration rules.

State Investigations and Long-Term Planning

- New Jersey: Exploring how DERs and VPPs can participate in wholesale markets under FERC Order 2222.
- New York: Launched the "Grid of the Future" study to evaluate large-scale VPP integration into IRPs and utility planning.

Net Metering and VPP Reconciliation

- Kentucky & Virginia: Revisited net metering rules to prevent disincentives for customers enrolled in VPPs.
- Hawaii and North Carolina: Integrated VPP considerations into successor net metering tariffs.

NOTABLE 2024 STATE POLICY ACTIONS

COLORADO

SB 218

Requires Xcel Energy to propose VPP program structures by February 2025.

MARYLAND

DRIVE ACT

Compels development of VPP compensation rules by January 2025.

WASHINGTON

HB 1589

Sets a mandate for PSE to reduce peak demand 10% through VPPs by 2027.

MINNESOTA

Xcel targeting 400 MW–1 GW of DER capacity via formal VPP procurement.

NORTH CAROLINA

Launch of PowerPair program, offering $500/kWh battery storage incentives to promote VPP aggregation.

2025 VPP POLICY OUTLOOK

Deployment is expected to expand significantly in at least eleven states where the regulatory frameworks are evolving. States include:

- California
- Colorado
- Maryland
- New York
- North Carolina
- Texas

IMPLICATIONS

To maximize the impact of these state-led initiatives, there must be tighter alignment with federal policy. Harmonized rules across jurisdictions will ensure VPPs can operate seamlessly in both retail & wholesale markets.

Regulatory certainty, paired with cross-jurisdictional interoperability, will drive DER aggregator growth, improve energy dominance, and support emission reduction goals.

BEST PRACTICES FOR SCALING VPPS

Building on the insights from the AEC Roundtable Series—especially discussions on access, enrollment barriers, standardization, and utility planning—this section distills key implementation strategies that emerged across the Collaborative's stakeholder network. These strategies informed the policy recommendations below and reflect tested models already in use across VPP programs nationally.

EXPANDING DER ADOPTION WITH ACCESSIBLE BENEFITS

Challenges: DER adoption remains low across the U.S., especially in underserved communities. Rooftop solar is deployed in only 3.5–3.8% of homes, battery storage in less than 1%, and smart thermostats in 12.9–13.8%. High upfront costs and financing challenges continue to limit participation.

Best Practices

- MCE's Healthy Homes, Resilient Communities (HHRC) program expands low-income DER access through state funding.
- Sunnova's DER Access Strategy provides affordable battery & solar offerings in underserved markets.
- NYPA's electrification initiatives prioritize disadvantaged communities.
- PSE's Community DER partnerships with CBOs facilitate local adoption.
- SMUD's Workforce Development Program trains local DER technicians.

Policy Recommendation: Establish federal grants for low-income DER adoption and transparent VPP compensation structures.

Rationale: Addresses the financial barriers that limit DER access and enables underserved households to benefit from grid services.

SIMPLIFYING VPP ENROLLMENT

Challenges: Low consumer awareness and complex onboarding deter participation in VPP programs.

Best Practices

- Sunnova's Aggregator Model simplifies participation by allowing third-party VPP access.
- NYPA's Community Education Initiative improves VPP awareness.
- PSE's Flex Enrollment Portal provides a user-friendly platform.
- SMUD's pre-enrollment of 30,000 thermostats streamlines DR integration.

Policy Recommendation: DOE should launch a national VPP awareness campaign, standardize enrollment, and implement low-income tax incentives.

Rationale: Simplified onboarding and targeted education can increase enrollment, especially among hard-to-reach populations.

INCREASING STANDARDIZATION IN VPP OPERATIONS

Challenges: A lack of interoperability and inconsistent service contracts hinder market growth.

Best Practices

- MCE uses OpenADR protocols for cross-platform DER coordination.
- Sunnova's standardized data exchange ensures VPP energy dominance.
- PSE's DERMS optimizes DER integration and dispatch.
- SMUD's Multi-Vendor Battery Program broadens technology inclusion.

Policy Recommendation: Require OpenADR compliance and establish a federal VPP standardization task force.

Rationale: Enhances compatibility and streamlines scaling across markets.

INTEGRATING VPPS INTO UTILITY PLANNING & INCENTIVES

Challenges: Many utilities do not incorporate VPPs in Integrated Resource Plans (IRPs), reducing opportunities for grid value recognition.

Best Practices

- NYPA & Con Edison's Non-Wires Alternatives (NWA) Initiative offsets costly infrastructure upgrades.
- MCE's Resilience Hubs prioritize VPPs in emergency preparedness.
- PSE's IRP sets a 524 MW DER target.

Policy Recommendation: Mandate VPP inclusion in IRPs and expand federal incentives for utility-VPP partnerships.

Rationale: Recognizes VPPs as strategic assets in utility planning.

INTEGRATING VPPS INTO WHOLESALE MARKETS

Challenges: Regulatory uncertainty and inconsistent market rules complicate DER aggregation and compensation.

Best Practices

- Sunnova expands into FERC 2222-compliant wholesale participation.
- NYPA's Reserve Capacity Program leverages aggregated DERs.
- PSE integrates demand response into CAISO's EIM.

Policy Recommendation: Increase FERC 2222 implementation funding, create a national market task force, and develop standardized participation and data protocols.

Rationale: Facilitates DER market access and enhances energy dominance across RTOs/ISOs.

CONCLUSION: SCALING VPP DEPLOYMENT FOR A RESILIENT GRID

The policy recommendations and findings outlined in this report are deeply informed by the 2023 AEC Roundtable Series and 2024 VPP workshops. From equity-focused DER program design to utility-enablement pathways, **the Active Efficiency Collaborative served as a foundational forum for surfacing implementation challenges and identifying replicable solutions.**

Virtual Power Plants (VPPs) represent a transformative opportunity to enhance grid energy dominance, reduce peak demand, improve resilience, and accelerate the transition to a clean energy economy. As the 2025 DOE Virtual Power Plant Liftoff Update outlined, significant progress has been made through state policy, utility initiatives, and wholesale market reform. Still, critical barriers remain, requiring coordinated action.

KEY TAKEAWAYS FOR SCALING VPPS NATIONWIDE:

STATE POLICY LEADERSHIP DRIVING VPP EXPANSION

Colorado, Maryland, and others are leading with legislation mandating VPP pilots, setting tariff structures, and integrating VPPs into IRPs.

CUSTOMER ENGAGEMENT IS ESSENTIAL

Programs like SMUD's pre-enrollment and APS's Cool Rewards show that automated, low-friction engagement increases participation.

UTILITIES MUST EVOLVE THEIR ROLE

From centralized providers to DER orchestrators—utilities must fully integrate VPPs into system planning.

ECONOMIC BARRIERS MUST BE ADDRESSED

Non-wires alternatives like VPPs offer cost savings, but equitable access to DERs requires grant programs, inclusive

FEDERAL LEADERSHIP & STANDARDIZATION ARE CRITICAL

Regulatory uncertainty hampers wholesale integration. Federal standards, including OpenADR compliance and interconnection streamlining, will unlock scale.

THE PATH FORWARD: BUILDING A VPP-ENABLED GRID BY 2030

To meet DOE's goal of 80–160 GW of VPP capacity by 2030, coordinated action is needed across policy, infrastructure, and consumer engagement.

IMMEDIATE PRIORITIES (2024-2025)

Establish a National VPP Task Force for federal-state coordination.

- **Rationale**: A centralized body can align efforts across jurisdictions and ensure consistent implementation of best practices.

Expand tax credits, grants, and incentives for DER deployment.

- **Rationale**: Financial support can unlock market access for low- and moderate-income communities & accelerate adoption of grid-beneficial technologies.

Standardize interconnection and enrollment procedures.

- **Rationale**: Uniform processes lower barriers to participation, reduce delays, and promote scaling across markets.

Require utilities to include VPPs in IRPs.

- **Rationale**: This ensures that demand-side flexibility is factored into long-term utility planning, enhancing system reliability and cost efficiency.

MID-TERM GOALS (2026-2028)

Scale utility/aggregator partnerships for demand flexibility.

- **Rationale**: Strengthening public-private collaboration will accelerate integration of DERs and increase grid responsiveness.

Digitize enrollment with opt-out or pre-enrollment models.

- **Rationale**: Seamless customer engagement mechanisms are essential to increase participation at scale.

Expand wholesale participation through FERC-aligned structures.

- **Rationale**: Regulatory alignment across markets enables efficient DER aggregation and improves grid resource valuation.

LONG-TERM VISION (2028-2030)

Achieve 10–20% peak demand served by VPPs.

- **Rationale**: This target represents a significant share of flexible capacity, reducing strain on traditional infrastructure and enhancing resilience.

Build an interoperable, bi-directional, VPP-ready grid.

- **Rationale**: Grid flexibility and data integration are critical to supporting high DER penetration and enabling two-way energy flows.

Leverage AI, forecasting, and DERMS for full system optimization.

- **Rationale**: Advanced analytics and automation will unlock maximum grid value from VPPs and enable real-time demand shaping.

WORKS CITED

Arizona Public Service. (2024). Cool Rewards program: Thermostat demand response enrollment data.

Brattle Group. (2023, April). Real reliability: The value of virtual power plants. https://www.brattle.com/wp-content/uploads/2023/04/Real-Reliability-The-Value-of-Virtual-Power-Full-Report.pdf

California Independent System Operator. (2024). FERC Order 2222 implementation plan.

Colorado General Assembly. (2024, May). SB24-218: The Modernize Energy Distribution Act.

Department of Energy. (2025, February). Pathways to commercial liftoff: Virtual power plants (VPPs) – 2025 update. https://liftoff.energy.gov/vpp/

Energy Information Administration. (2024). Annual energy outlook 2024.

Environmental Protection Agency. (2023). Distributed energy resources and virtual power plants: Grid benefits and policy pathways.

Federal Energy Regulatory Commission. (2020). FERC Order No. 2222: A new era for distributed energy resource aggregation.

Hawaii Public Utilities Commission. (2024). Hawaii BYOD (Bring Your Own Device) energy storage program revisions.

Kraken Mercury Consortium. (2024). Developing standards for VPP interoperability.

Minnesota Public Utilities Commission. (2025, October). Xcel Energy distributed capacity procurement (DCP) plan.

NC Clean Energy Technology Center & Smart Electric Power Alliance. (2024). 2024 Virtual power plant (VPP) report – State policy snapshot.

New Jersey Board of Public Utilities. (2024). Grid of the future study: DER and VPP participation in wholesale markets.

New York State Energy Research and Development Authority. (2024). Value of distributed energy resources (VDER) and virtual power plants: Compensation frameworks and market participation.

Onsemble Energy. (2024). VPP market participation and forecasting tools: Case study.

Pacific Gas & Electric. (2024). VPP pilot program for grid resilience and demand response.

Puget Sound Energy. (2024, December). Flex programs: Virtual power plant (VPP) enrollment and demand response strategies.

Sacramento Municipal Utility District. (2025). Load flexibility portfolio and virtual power plant initiatives.

San Diego Community Power. (2024). Solar battery savings program for low-income households.

Sunnova Energy International. (2024). VPP market participation and DER standardization strategies.

Texas Electric Reliability Council. (2025). Phase 3 ADER (Aggregated Distributed Energy Resources) expansion plan.

U.S. Department of Energy. (2023). Virtual power plants – Unlocking grid flexibility and decarbonization.

Washington State Legislature. (2024). HB 1589: Demand response and virtual power plant expansion act.

ALLIANCE TO SAVE ENERGY
using less. doing more.

Active Efficiency COLLABORATIVE

THANK YOU TO OUR ACTIVE EFFICIENCY COLLABORATIVE MEMBERS

AGA American Gas Association

SMUD

conEdison

Seattle City Light

United States Environmental Protection Agency

Southern California Edison
An EDISON INTERNATIONAL Company

EEI Edison Electric Institute

Snohomish County PUD Public Utility District No. 1

NASEO National Association of State Energy Officials

uplight

Southern Company

Berkeley Lab

legrand

PSE Puget Sound Energy

EnerSys

New York Power Authority

U.S. Department of Energy

California Energy Commission

NARUC National Association of Regulatory Utility Commissioners

NRDC Natural Resources Defense Council

Edison International

City of Seattle

Pacific Northwest National Laboratory

willow

MEEA Midwest Energy Efficiency Alliance

NIST National Institute of Standards and Technology U.S. Department of Commerce

Carrier

SEEA Southeast Energy Efficiency Alliance