Policy Principles for Enabling Virtual Power Plants (VPPs)

NECPUC Retail DR Working Group Presentation

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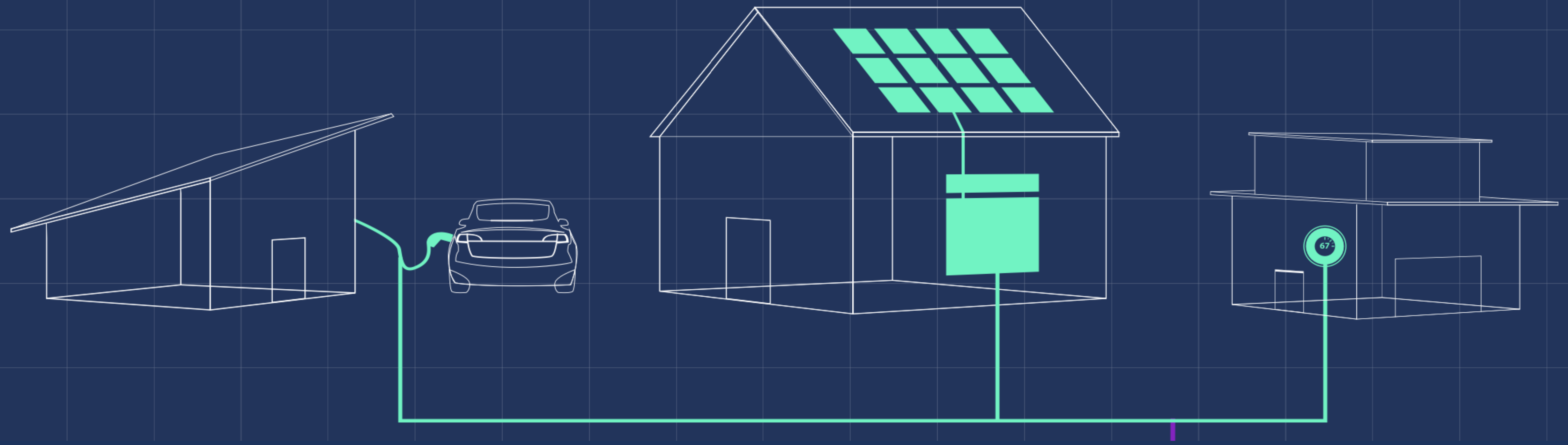

New England's Winter Reliability Risk

NERC's 2023-2024 Winter Reliability Assessment categorizes New England's risk as ***Elevated***, citing limited natural gas infrastructure, especially when cold temperatures may cause peak demand for *both* electricity generation and consumer space heating needs.

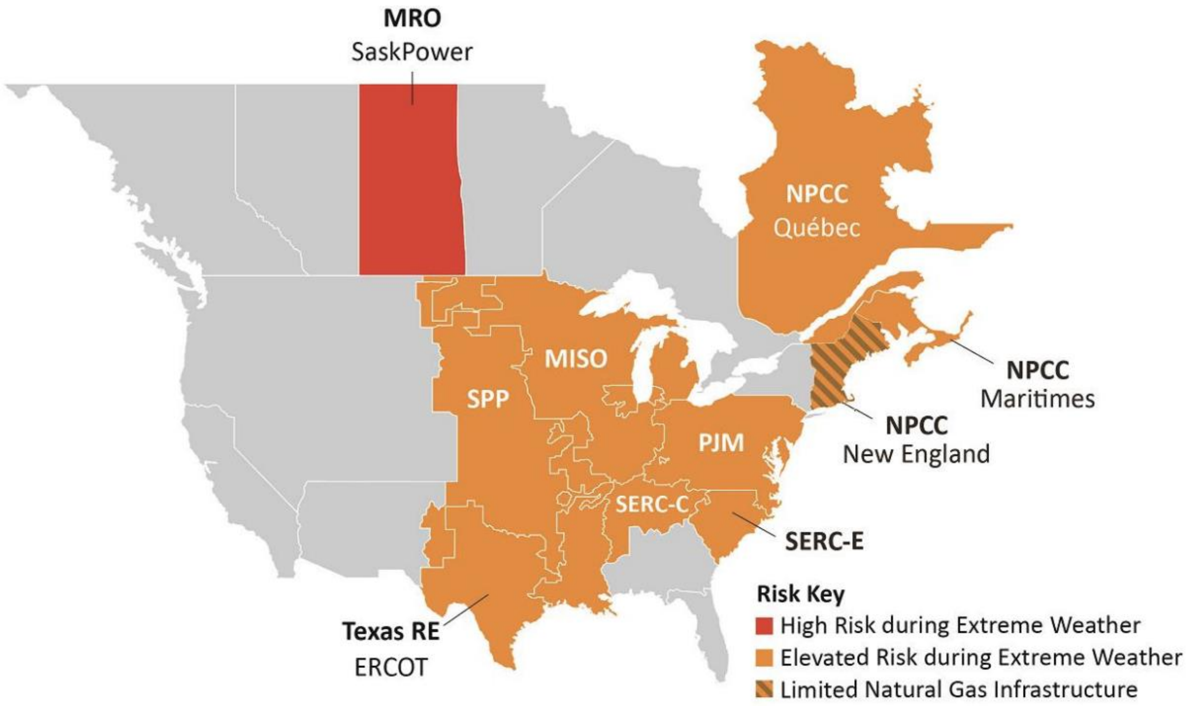

Figure 1: Winter Reliability Risk Area Summary

Seasonal Risk Assessment Summary	
High	Potential for insufficient operating reserves in normal peak conditions
Elevated	Potential for insufficient operating reserves in above-normal conditions
Low	Sufficient operating reserves expected

Source: NERC 2023-2024 WRA, Nov 2023.

New loads are coming online—which can be burdens to the grid, *or* key tools, depending on the prices and programs set up to leverage them.

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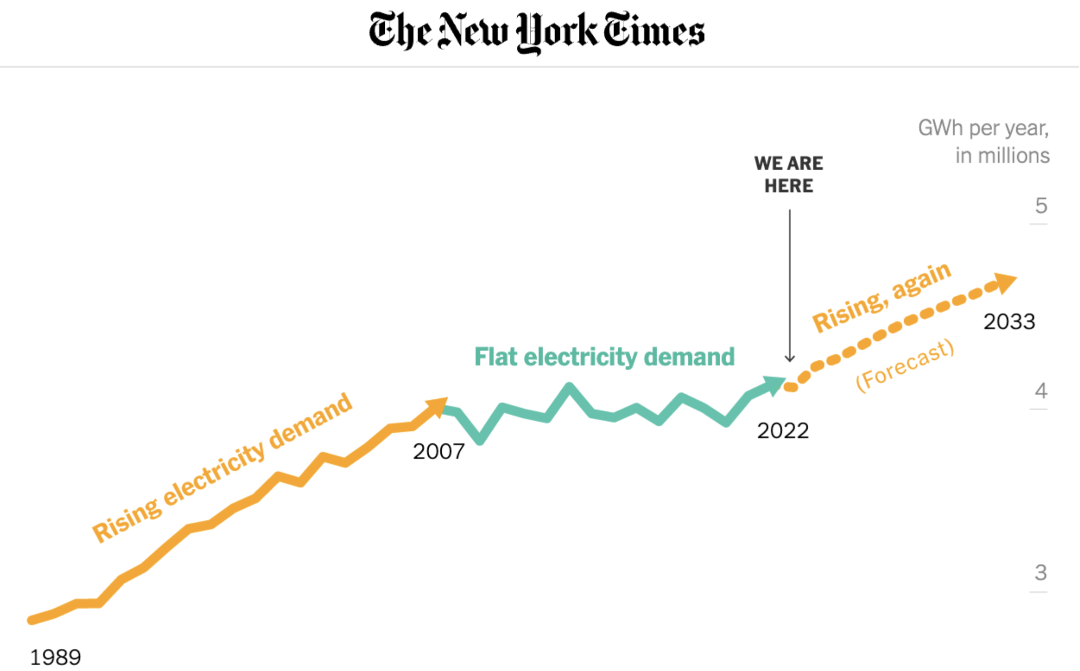
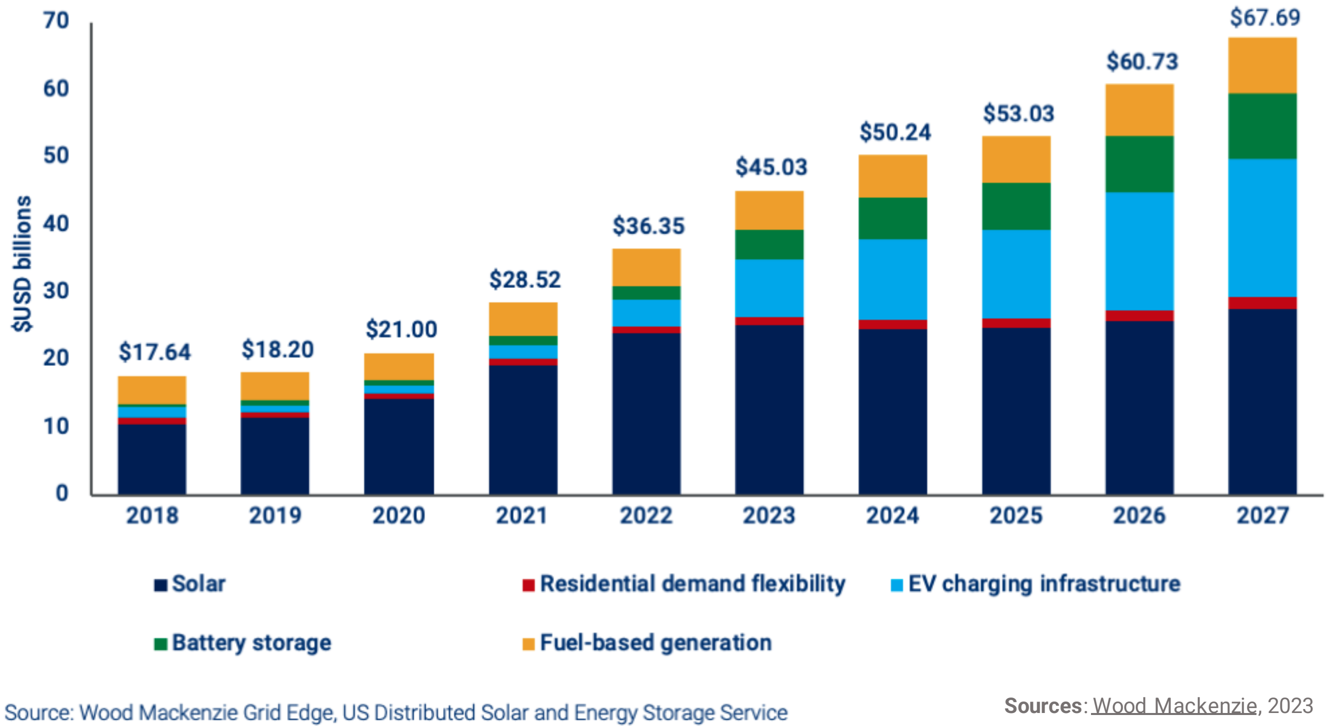
Grid planners nearly doubled the 5-year load growth forecast from 2.6% to 4.7%.



Sources: New York Times, 2024; Grid Strategies, 2023

US peak demand will grow by 38 GW through 2028—and will likely be even higher in next year's estimate.

Between 2022 and 2027, the market for DERs—the building blocks of VPPs—will double, representing 262 GW of capacity.



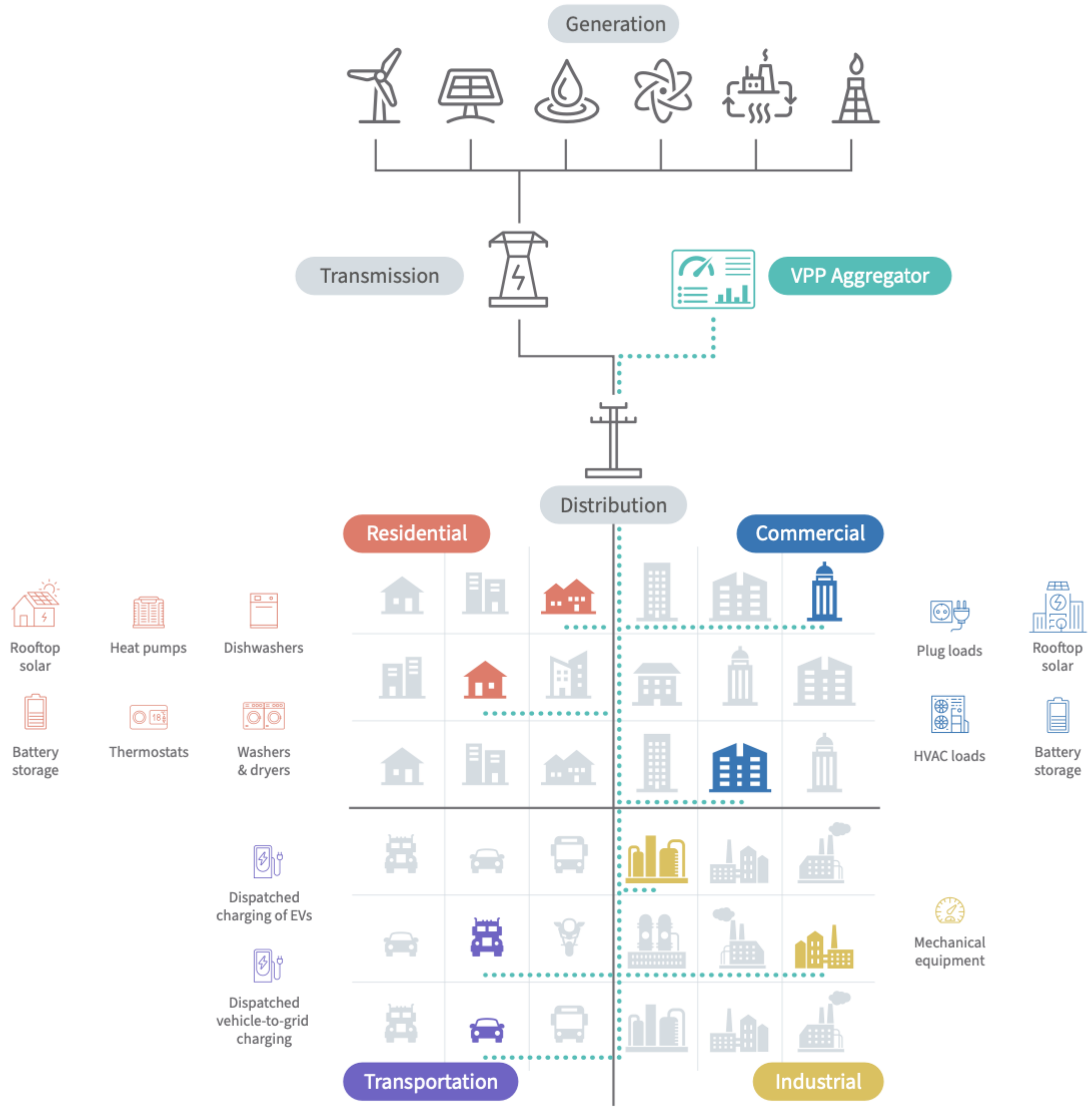
Sources: Wood Mackenzie, 2023

This nearly matches the expected 272 GW of utility-scale resources to be installed over the same period of time.

What is a Virtual Power Plant?

A virtual power plant (VPP) is an aggregation of grid-integrated, distributed energy resources* (DERs) that can balance electrical loads & provide utility-scale & utility-grade grid services.

* **Distributed energy resources (DERs)** include equipment located on or near the site of end-use that can provide electricity demand flexibility, electricity generation, storage, or other energy services at a small scale (sub-utility scale) and are typically connected to the lower-voltage distribution grid.



Sources: Definitions: Adapted from the DOE *Pathways to Commercial Liftoff: Virtual Power Plants*, 2023
Infographic: RMI *Virtual Power Plants, Real Benefits*, 2023

VPPs: Part of the Regulator and Policymaker Toolkit

VPPs can be part of the toolkit to achieve affordability, reliability, safety, and decarbonization objectives for the grid and its customers.

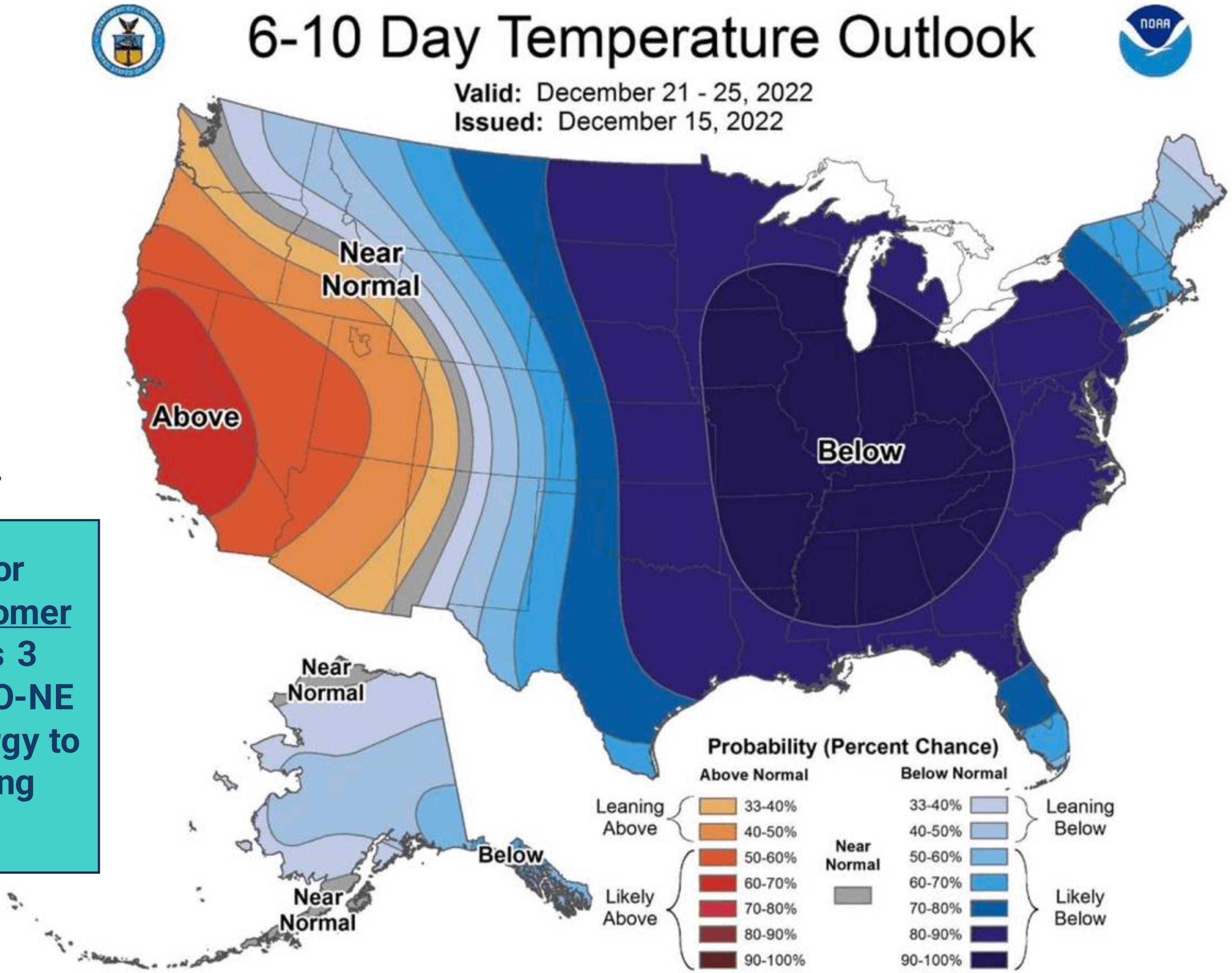
These policy principles serve as a guide for the core set of conditions to enable VPPs to fairly compete in the energy industry, deliver grid services, provide energy and non-energy benefits to customers, and support the above objectives.

For more: VPP Policy Principles

Winter Storm Elliott, 2022

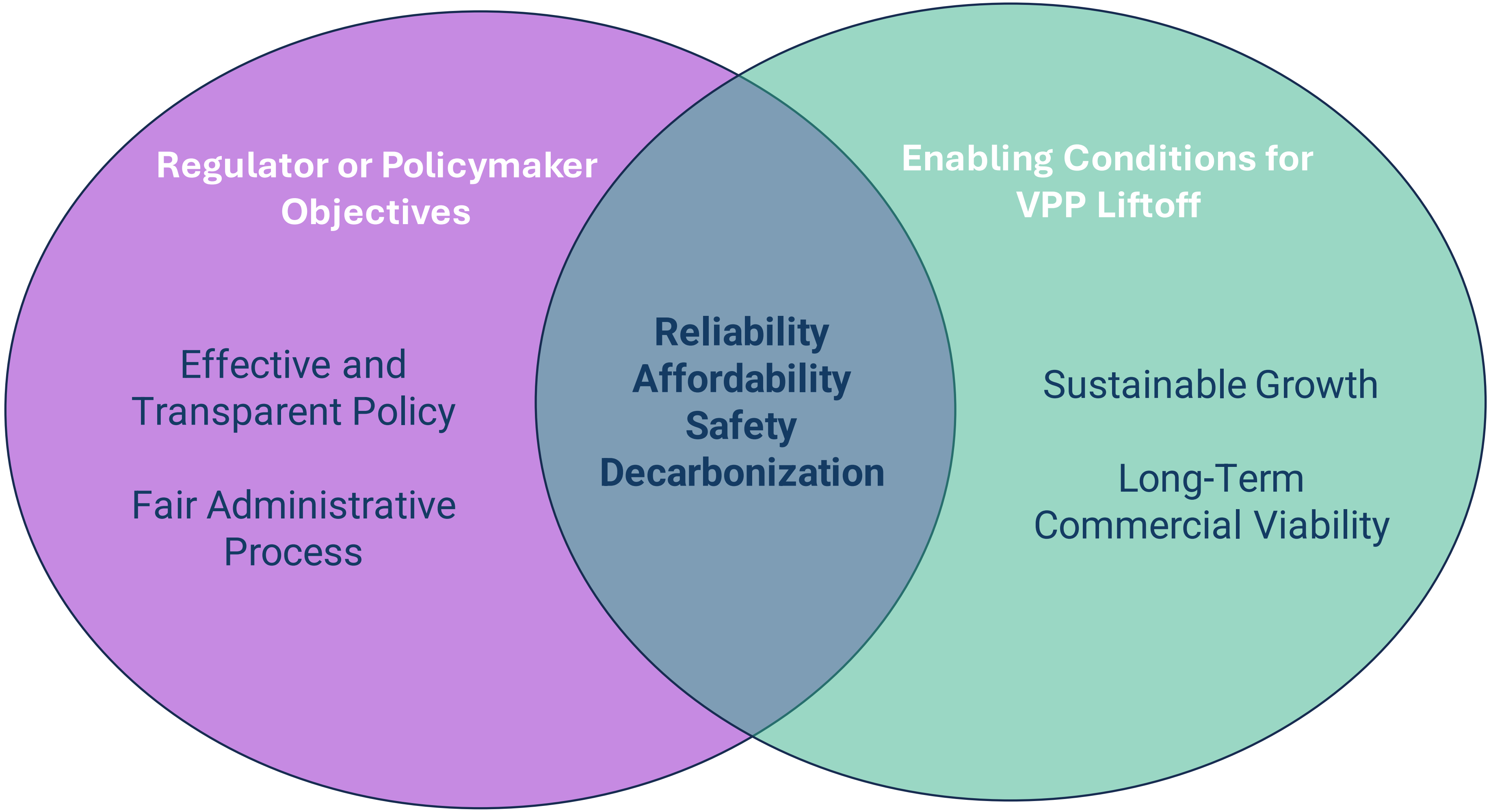
VPP winter reliability example:

DR and DER aggregator CPower dispatched customer DERs 197 times across 3 programs in PJM and ISO-NE to deliver 50 GWh of energy to prevent blackouts during Winter Storm Elliott.



Source: NOAA, 2022

How to Leverage These Principles



Today:

1. Regulatory or policy circumstance or perspective
2. Common VPP challenges related to that circumstance
3. How a principle can respond to these challenges and suggest a path forward
4. An example of where this has been done well

Policy Principles to Enable VPPs

Category	Principle
DER Asset Base	1. Advance policies to expand beneficial DER adoption by diverse end-users.
	2. Enable inclusion of all DER technologies in VPPs.
VPP Design	3. Utilize best practices in program design.
	4. Use open communication protocols and standards.
	5. Enable VPP participation in wholesale and retail markets.
	6. Regularly update grid service needs to reflect the evolving grid.
	7. Support comprehensive utility planning and investment decisions.
Equitable Compensation	8. Fairly compensate VPPs for services delivered.
	9. Enable value stacking to maximize benefits.
	10. Support policies that value VPP contributions to resilience, reliability, and sustainability.
	11. Uphold equitable penalties and liabilities.
Customer Experience	12. Maintain customer choice in DER operational control.
	13. Uphold customer data ownership and simplify enrollment.
	14. Protect and educate customers.
	15. Support customer participation in structuring VPP offerings through procedural equity.
Utility and System Operator Roles	16. Encourage participation of competitive hardware and service providers.
	17. Use open-source software and make grid data available.

Policy Brief:

Source: VPP Policy Principles, VP3, 2024

Deployment

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Regulatory or Policy Circumstance Examples

If you are ruling on the effective development of non-wires programs to address distribution system congestion

Related Challenges that VPPs Face

VPPs need a sufficient DER asset base to provide grid services

VPP Policy Principle That Supports a Solution

P1: Advance policies to expand beneficial DER adoption by diverse end-users.

e.g. tax credits and rebates, utility up-front financing, utility on-bill financing, DER carve-outs in energy portfolio standards

Examples of Where This Has Been Done Well

- Green Mountain Power's Powerwall Lease and Bring-Your-Own-Device programs saw long waitlists and recently-lifted enrollment caps
- Rocky Mountain Power's Wattsmart Battery Program with sonnen has a simple upfront incentive and annual bill credits

VPP Design

Regulatory or Policy Circumstance Examples

If you are outlining the high-level specifications for a VPP program

If you've opened a proceeding investigating VPP program design

Related Challenges that VPPs Face

Specifications can preclude VPPs (minimum aggregation sizes, real-time telemetry requirements)

Designing bespoke VPP programs across the US can lead to high implementation costs

VPP Policy Principle That Supports a Solution

P3: Utilize best practices in program design.

e.g. leverage best practices from established, successful, and jurisdictionally relevant examples to avoid common pitfalls; utilities and third parties share lessons learned

Examples of Where This Has Been Done Well

- ConnectedSolutions originated in Massachusetts but has led to the adoption of customer battery funding programs in all six New England states
- Stay tuned next month for the upcoming VP3 ***Virtual Power Plant Flipbook*** for more case studies on successful VPP program design

Equitable Compensation

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Regulatory or Policy Circumstance Examples

If you are investigating the value of or compensation for DERs

If you are investigating the cost-efficacy of demand-side programs

Related Challenges that VPPs Face

VPPs aren't valued or compensated for the full suite of benefits they can provide (including non-energy benefits)

Program funding can be temporary or subject to budget cuts

VPP Policy Principle That Supports a Solution

P9: Enable value stacking to maximize benefits.

e.g. stacking wholesale market and retail utility grid services, clear eligibility criteria, double-counting prevention rules

Examples of Where This Has Been Done Well

- ConnectedSolutions customers in MA can participate in both the National Grid program and ISO New England forward capacity market.
- The batteries in GMP's BYOD and ESS programs are responsive to real-time loading signals from the Vermont and New England systems. In addition, the programs reduce GMP's capacity obligation in the ISO-NE forward-capacity auction three years ahead by reducing GMP's load during the peak hour. Lastly, GMP started a new pilot using a portion of these batteries in the ISO-NE frequency regulation market.

Customer Experience

Regulatory or Policy Circumstance Examples

If you are ruling on clickthrough authorization processes between utilities and third-party VPP providers

Related Challenges that VPPs Face

Customer enrollment has attrition due to complexity

Customers might not sign up to VPP programs

VPP Policy Principle That Supports a Solution

P13: Uphold customer data ownership and simplify enrollment.

e.g. simple, secure, quick, transparent, reliable customer enrollment and disenrollment processes; efficient timeline for utility planning and contracting processes to integrate third parties; enrollment at the device's point of sale

Examples of Where This Has Been Done Well

- Xcel's AC Rewards Program tripled smart thermostat enrollment from May to August 2020 through onboarding a new DRMS and implementing a user-friendly online enrollment process
- Texas has a third party, Smart Meter Texas, that maintains all customer data with easy third-party access
- In CA's DSGS Option 3, customers authorize aggregators to use their device for participation in the program. Then, sub-metered interval data is shared directly from the battery inverter to the CA Energy Commission.

Utility and System Operator Roles

Regulatory or Policy Circumstance Examples

If you are ruling on the ability of third-party aggregators to enact contracts with utilities

Related Challenges that VPPs Face

Contracts between utilities and third-party aggregators vary greatly by jurisdiction

VPP Policy Principle That Supports a Solution

P16: Encourage participation of competitive hardware and service providers.

e.g. providing services such as customer enrollment and support, device management and dispatch, single settlement point for the administrator, de-risking underperformance across a fleet, program administration

Examples of Where This Has Been Done Well

- Last October, Missouri lifted its ban preventing third parties from bidding demand response into wholesale markets
- Ontario's IESO supports third-party DER participation in wholesale markets and is currently exploring expanding third-party smart meter data access

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For more: VPP Policy Principles

VIRTUAL POWER PLANT PARTNERSHIP

Thank you!

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VP3 Resources

- VP3 Website
- *VPP Policy Principles* paper, RMI, 2024
- Principles Webinar Recording, April 9, 2024
- *Virtual Power Plants, Real Benefits* report, RMI, 2023
- ***Virtual Power Plant Flipbook***, coming soon, 2024

Sources from VPP Policy Principles Paper

- *The Demand Response Baseline*, EnerNOC, Inc., 2009
- *Design Principles for (Local) Markets for Electricity System Services*, Smart Energy Europe, 2019
- *Flex Assure Code of Conduct*, Flex Assure, 2021
- *The Future of our Grids: a Smart, Efficient, and Flexible Network of Electrified Consumers*, Smart Energy Europe, 2023
- Jennifer Downing et al., *Pathways to Commercial Liftoff: Virtual Power Plants*, Department of Energy, 2023
- Lynn P. Costantini et al., *NARUC Grid Data Sharing Playbook*, National Association of Regulatory Utility Commissioners, 2023
- *A Market-Based Approach to Local Flexibility: Design Principles*, Europex – Association of European Energy Exchanges, 2020
- Michael Murray, Laura Kier, and Bob King, P.E., *Energy Data: Unlocking Innovation with Smart Policy*, Mission:data and AEMA, 2017
- *Regulators' Financial Toolbox: Virtual Power Plants*, National Association of Regulatory Utility Commissioners, 2023
- *Policy Principles*, Flex Coalition, 2023

Additional Resources

- *Reality Check: Keeping the Lights on in Extreme Winter Weather*, RMI, 2023
- *Wasted Wind and Tenable Transmission during Winter Storm Elliott*, RMI, 2023
- *Real Reliability: The Value of Virtual Power*, Brattle, 2023
- *Virtual Power Plants and Energy Justice*, NREL, 2023
- *Guidelines for Selecting a Communications Protocol for Vehicle-Grid Integration*, SEPA, 2020
- NARUC-NASEO DER Integration and Compensation resources and activities
- NASEO GEB working group
- NASEO GEB resources page
- ASHRAE Task Force for Building Decarbonization
- NAESB-DOE standard distribution services contract press release and working group calendar (*non-member registration and agendas available there*)
- NASEO-NARUC Microgrids State Working Group
- ESIG DER Task Forces
- DOE Operational Coordination work, including paper on standard distribution services contract, 2023
- DOE Connected Communities
- Active Efficiency Collaborative