
Energy Storage

House Energy and Digital Infrastructure | March 28, 2025

Green Mountain Power: Who We Are

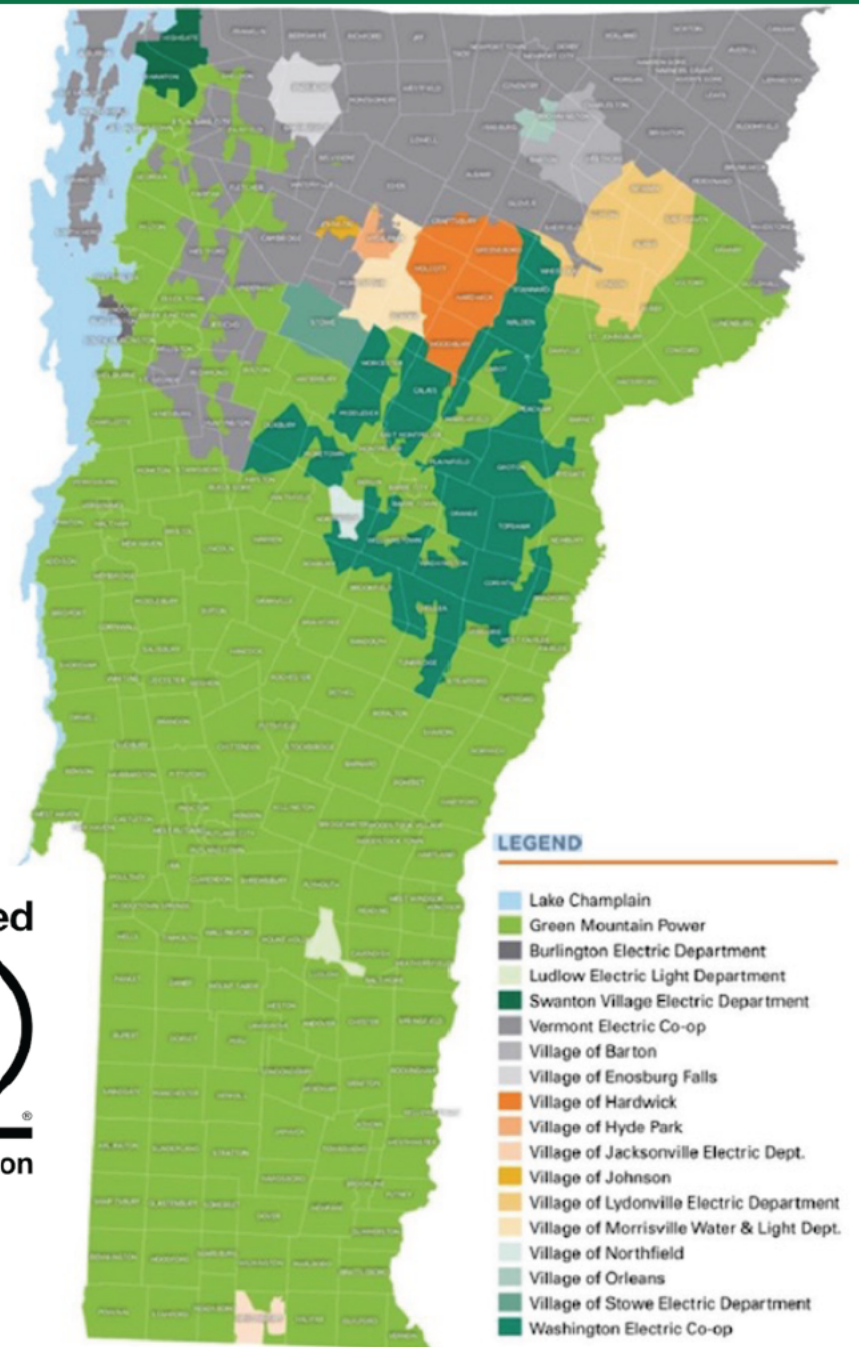
We serve more than 275,000 customers across Vermont

- ▶ 85% residential
- ▶ 15% commercial
- ▶ 77% of Vermont
- ▶ 510 Employees
- ▶ 285 are IBEW Local 300 members
- ▶ Storms bringing higher precipitation amounts in all seasons, higher wind speeds.
- ▶ Mostly rural testimony
- ▶ 12,500 miles of distribution lines
- ▶ 1,000 miles of sub-transmission lines
- ▶ 2024 system peak 662 MW

Certified



Corporation



Energy Resources

- ▶ Residential & utility-scale batteries, microgrids
 - ▶ 4,500 customers with more than 8,000 residential batteries
 - ▶ Virtual Power Plant (VPP)
 - ▶ 70 MW stored energy (all types together)
 - ▶ 7 MW of grid-scale battery storage at solar sites
 - ▶ Largest power source in Vermont
- ▶ Fleet of renewable generation resources
 - ▶ 41 hydroelectric generators with 117MW in nameplate capacity
 - ▶ Wind resources: Kingdom Community Wind and Searsburg
 - ▶ Combination of owned (38MW) and PPA solar across the system
 - ▶ Panton microgrid, pairing energy storage with solar to keep 51 customers and essential town building connected if the larger grid is damaged
 - ▶ Resilient all electric neighborhood in South Burlington, 155 homes



Energy Storage Portfolio



- ▶ Residential Energy Storage Programs
 - ▶ Lease program (ESS)
 - ▶ Bring Your Own Device (BYOD)
 - ▶ Grafton Resiliency Zone Pilot
 - ▶ Energy Storage Assistance Program (ESAP)
 - ▶ ARPA-funded program in partnership with Department of Public Service
- ▶ Grid-Scale Solutions
 - ▶ PPAs
 - ▶ Panton Solar + Storage microgrid
- ▶ Mobile Energy Storage
 - ▶ DOE Grant with NOMAD

Virtual Power Plant (VPP)

- ▶ VPPs are RPPs
 - ▶ Stored energy from diverse sources
 - ▶ Aggregated and sent to the grid
- ▶ Multiple benefits for customers
 - ▶ Reduces costs
 - ▶ Provides resiliency

VPPs can be dispatched at multiple time scales and frequencies



Ancillary
Services



Energy



Capacity



Resilience

VPPs can be dispatched to provide location-specific benefits



Transmission



Distribution










Behind-the-meter

Source: 2024 Rocky Mountain Institute <https://rmi.org/insight/virtual-power-plant-flipbook/>

Why Are Utilities Advancing VPPs?

VPPs are generating diverse benefits for utilities and customers.

Primary Drivers	 Resource Adequacy	 Reliability and Resilience	 Transmission and Distribution Infrastructure Relief	 Affordability for Ratepayers and the Utility	 Decarbonization	 Customer Empowerment	 Versatility and Flexibility
Utility VPP Example	<p>Pacific Gas and Electric (PG&E) PG&E's and Sunrun's Peak Power Rewards solar and battery storage program delivered a consistent average of 27 MW of power over two hours for 90 days during the 2023 summer.²</p> <p><i>"Resource adequacy refers to the ability of the electric grid to satisfy the end-user power demand at any given time; it is an assessment of whether the current or projected resource mix is sufficient to meet capacity and energy needs for a particular grid."</i> <i>DOE Pathways to Commercial Liftoff Report</i></p>	<p>California's Emergency Load Reduction Program (ELRP) and Demand Side Grid Support (DSGS) California's ELRP and DSGS emergency programs leveraged DERs for nine consecutive days to avoid rolling blackouts during a historic September 2022 heat wave.³</p>	<p>National Grid Massachusetts National Grid's ConnectedSolutions VPP has grown to include multiple DER types and allows value stacking with other programs as well as wholesale market participation. Based on the success of ConnectedSolutions, National Grid is looking beyond peak reduction, and considering how VPPs can provide non-wires alternatives to address local capacity constraints.⁴</p>	<p>Green Mountain Power (GMP) GMP's Energy Storage System lease program gives customers access to a home battery system for a fraction of the cost, affording more customers home resiliency in exchange for sharing stored energy with GMP during peak energy usage. By sharing energy and exporting back to the grid, the batteries reduce system costs for all GMP customers, benefiting both program participants and non-participants.⁵</p>	<p>Sacramento Municipal Utility District (SMUD) SMUD's solar & storage VPP was largely motivated by its Carbon Zero 2030 plan.⁶</p> <p>Puget Sound Energy (PSE) PSE's VPP portfolio has been primarily driven by Washington State policy that requires PSE to have 100% clean electricity by 2045, with 10% of historical peak load sourced through demand flexibility by 2027.⁷</p>	<p>Arizona Public Service (APS) APS has grown its Cool Rewards thermostat program from 42 MW in 2020 to 145 MW in 2023 by listening to and prioritizing customer needs.⁸</p> <p><i>"VPPs empower consumers — all consumers — to play a more active role in shaping the way energy is used and consumed in society and within their homes and businesses."</i> <i>Virtual Power Plants, Real Benefits</i></p>	<p>Hawaiian Electric (HECO) HECO's solar-powered battery VPP with Swell Energy, known as <i>Swell Energy Home Battery Rewards</i>, provides multiple grid services, specifically capacity and ancillary services.⁹</p>

VPPs are a flexible and versatile solution that help utilities navigate the grid transformation being driven by fossil plant retirement, renewables build-out, load growth, and extreme weather.

Source: 2024 Rocky Mountain Institute <https://rmi.org/insight/virtual-power-plant-flipbook/>

Mobile Storage

- ▶ NOMAD
 - Battery on wheels
 - Made by Waterbury company
- ▶ Backup power to avoid outages
 - Neighborhood
 - Manufacturing facility
- ▶ DOE grant to do more
 - Projects for rural communities



Resilient Neighborhood

- ▶ Vermont's first all-electric fully resilient neighborhood
- ▶ Worked with O'Brien Brothers
 - ▶ 155 homes in South Burlington
 - ▶ 100% carbon free
 - ▶ Fully electric homes
 - Heat pump systems for heating and cooling
 - Heat recovery unit and 80 gallon heat pump hot water heater
 - All electric appliances
 - Level 2 car charger
 - Span Drive Smart Panel
 - Energy storage & Solar
- ▶ Grid resource and benefits for all customers



What's Next: V2X

- ▶ Vehicles are batteries
 - ▶ Can power homes or the grid
 - ▶ Quickly evolving technology
- ▶ GMP partners with South Burlington School District
 - ▶ Electric buses share energy to reduce peaks
 - ▶ Collaboration featured in New York Times

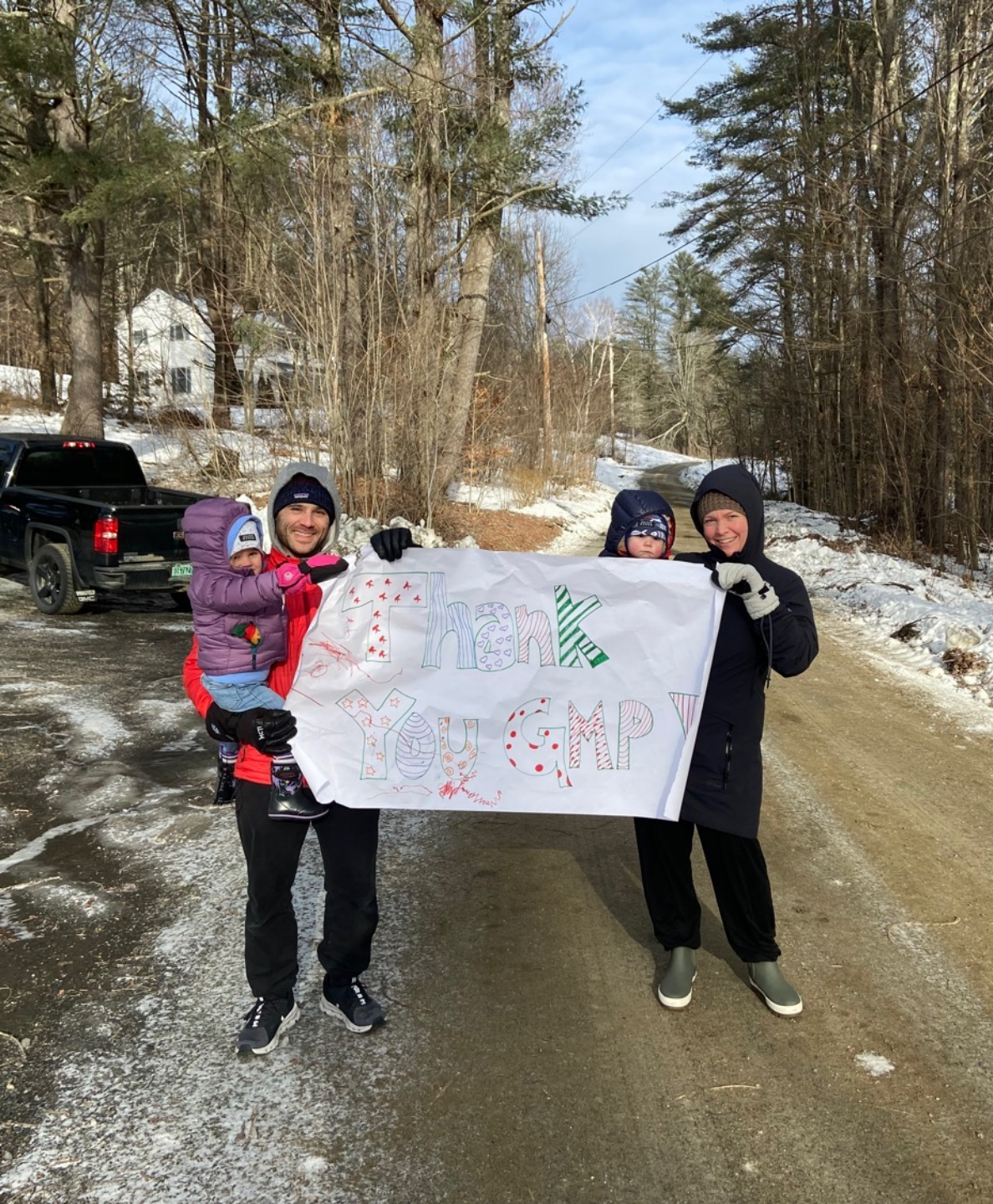


School buses in Vermont are part of an experiment to test the idea that electric vehicles could be vital in the transition to clean energy. Oliver Parini for The New York Times

How Your Child's School Bus Might Prevent Blackouts

When not driving around, electric buses and other vehicles could help utilities by storing their solar and wind energy and releasing it to meet surges in demand.





Questions?

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