Cutting Carbon and Costs with Flexible Load Management

GREEN MOUNTAIN POWER

Better Buildings by Design Conference
February 6, 2020

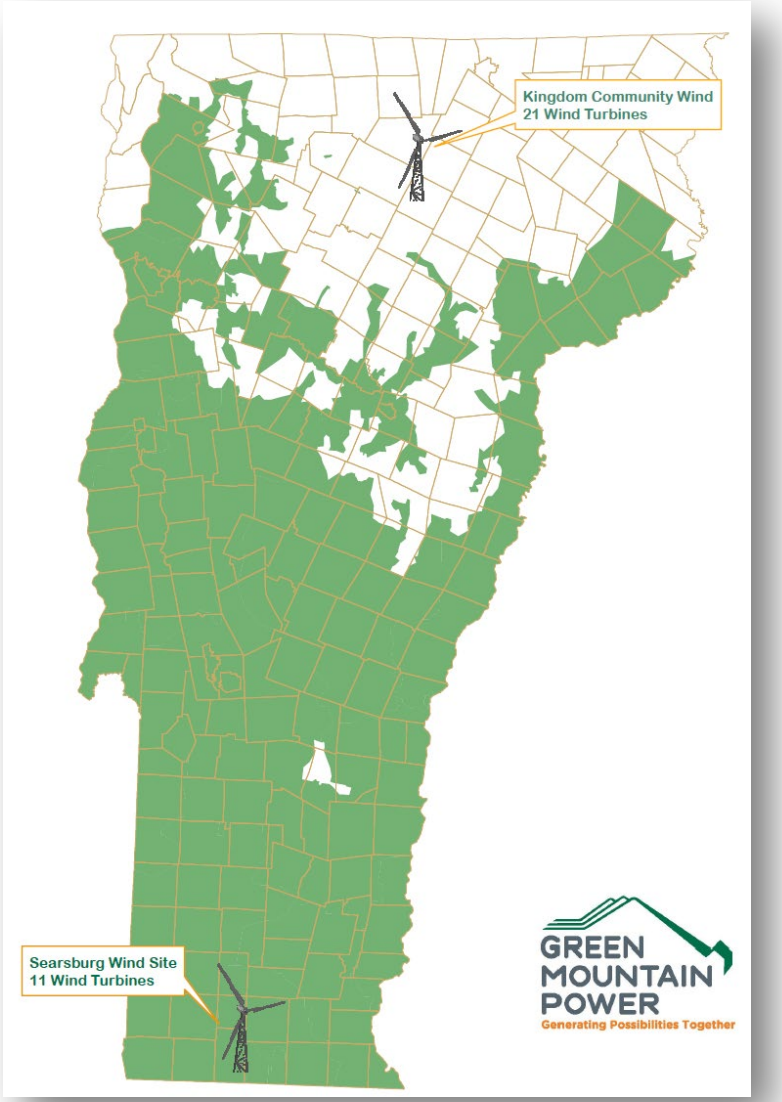
Graham Turk
Innovation Champion

QUICK LOOK AT GMP

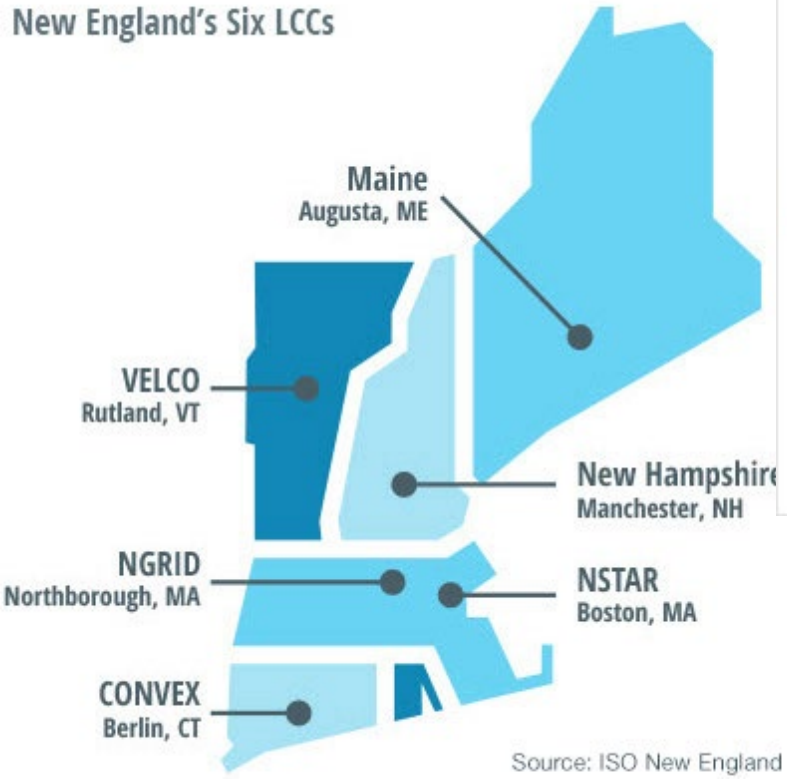
- ✓ We serve 263,080 customers in 202 towns in 7,500 square miles of service territory

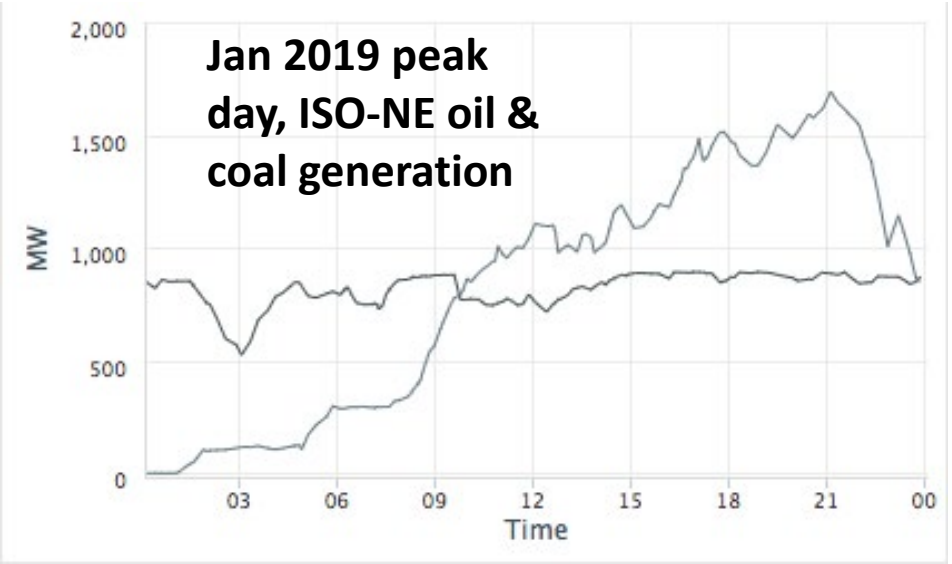
- ✓ We operate:
  - 48 hydro plants
  - 12 solar projects
  - 2 wind farms
  - 1 joint-owned biomass plant

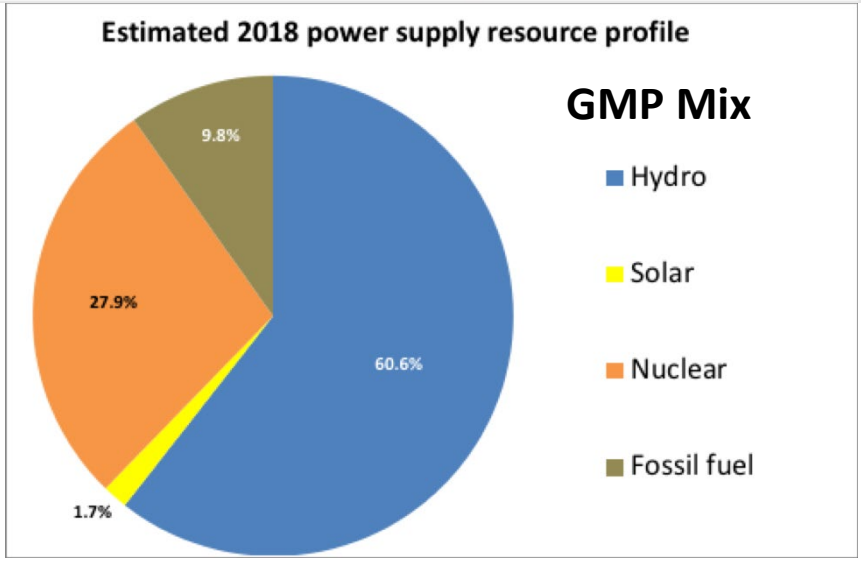
- ✓ We maintain:
  - 976 miles of transmission lines
  - 11,273 miles of distribution lines
  - 185 substations

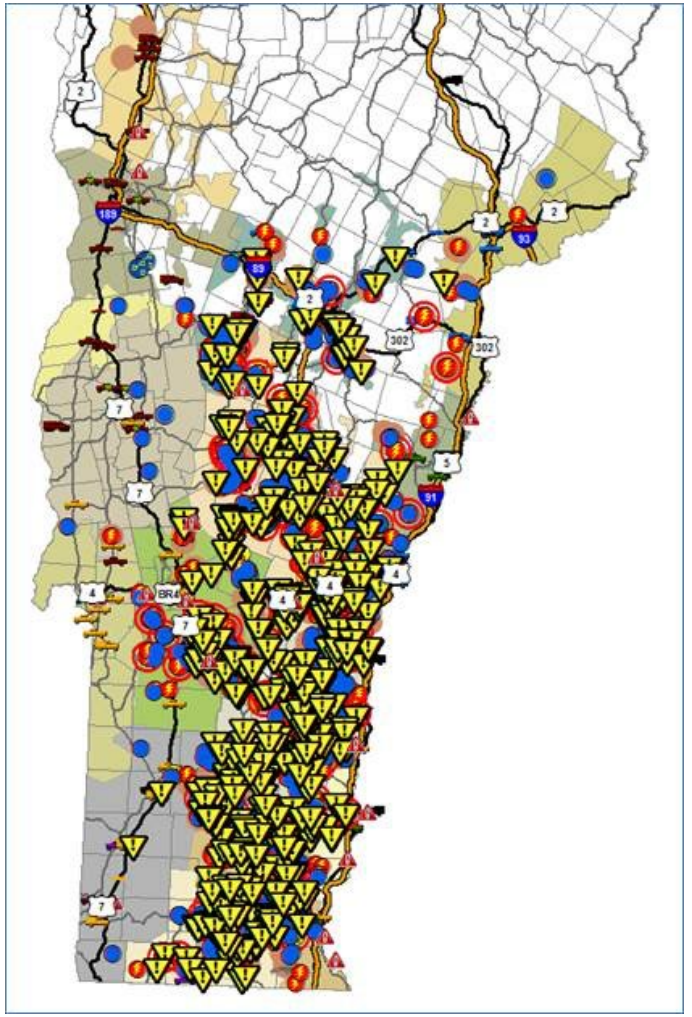


COSTS, CARBON, RELIABILITY









✓ GMP portfolio is 60% renewable, 90% carbon-free

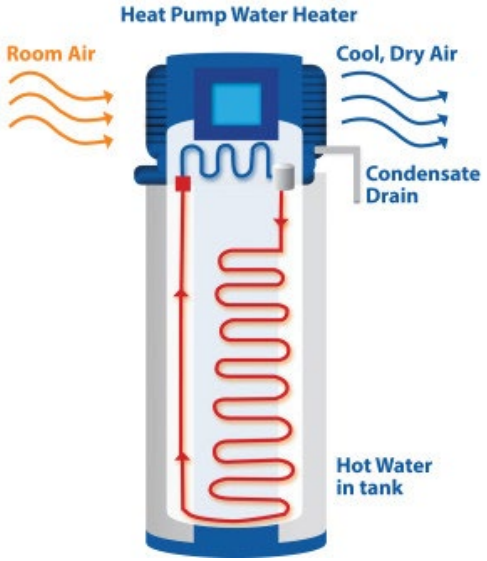
FLEXIBLE LOAD MANAGEMENT PILOT

Goal: Demonstrate distributed, flexible load management for controllable assets that can ride through peak curtailments

A win-win for participants and all GMP customers

Types of Flexible Loads

- Ice storage
- Building envelopes
- Refrigeration
- Industrial processes
- Air/water heating & cooling



Efficiency Vermont

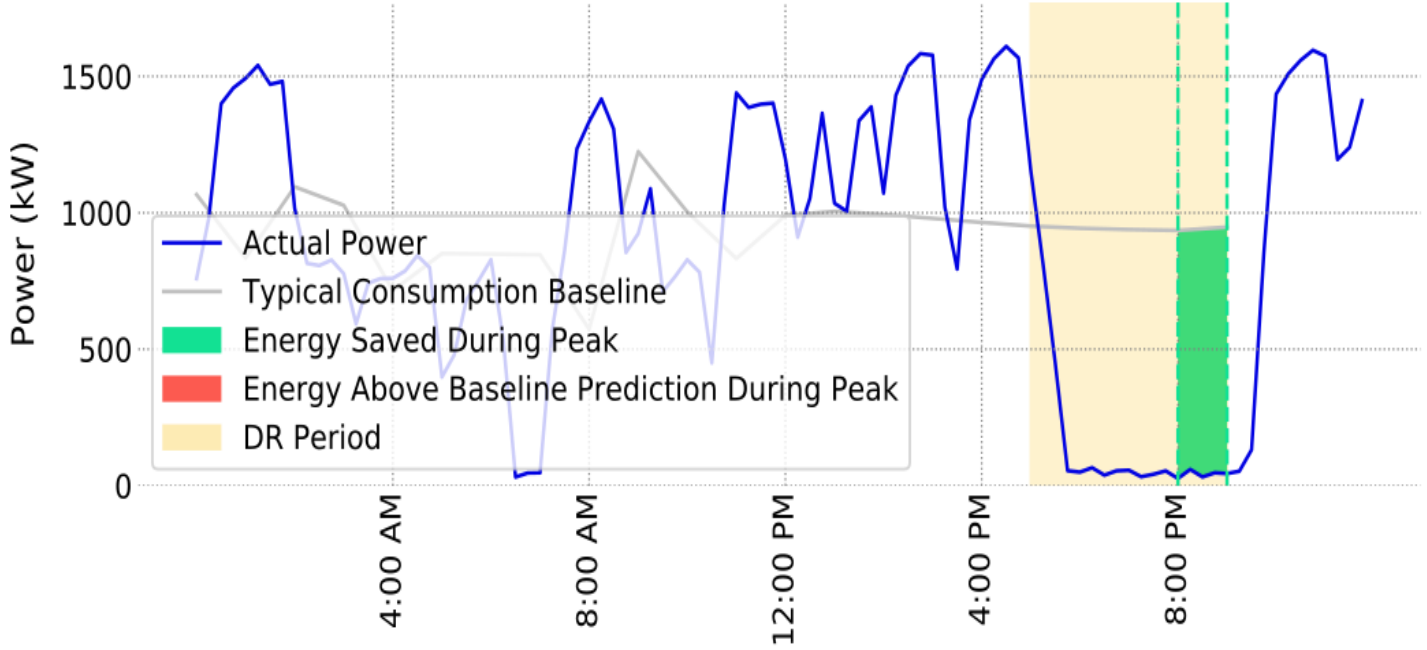
do

FLM PILOT STRUCTURE

- Customers - Identify behind-the-meter DR assets to opt into Pilot
- EVT - Establishes eM&V Methodology and installs any required equipment
- Dynamic Organics - Establishes Dashboard For Customer and GMP
- GMP - Calls multiple monthly events; we send notices to customers via e-mail and text, and coordinate with DO to update the Dashboard
- Customers - Choose when and how to respond by reducing load and get paid for their actual impact on peak

FLEXIBLE LOAD MANAGEMENT PILOT

Predicted Average During RNS Peak:	947 kW
Actual Maximum During RNS Peak:	59 kW
Observed Reduction During RNS Peak:	888 kW
Reward Rate:	$6.60 per kW
RNS Reward:	$5,860.65



June 2019 Peak Event

Date: Thursday June 27, 2019
DR Requested: 5:00 PM - 9:00 PM
Peak Type(s): RNS
RNS Peak Hour: 8:00 PM - 9:00 PM

LARGEST STORMS IN GMP HISTORY

"Jumbo" Storms (affecting >100,000 customers)	Events	Customers Affected	Customers out at Peak
Hurricane Irene – Aug 28th thru Sept 3rd, 2011	1,604	140,655	57,000
Heavy Wet Snow event - Dec 9th thru Dec 17th, 2014	3,130	147,832	39,000
Halloween Gradient Wind Event - Oct 29th thru Nov 4th, 2017	2,688	124,825	81,000
Heavy Wet Snow and Wind Event - Nov 26th to Dec 3rd, 2018	2,686	114,213	52,000
High Winds & Flooding Event - Oct 31st to Nov 4th, 2019	1,709	113,964	56,000

WHY STORAGE IS IMPORTANT

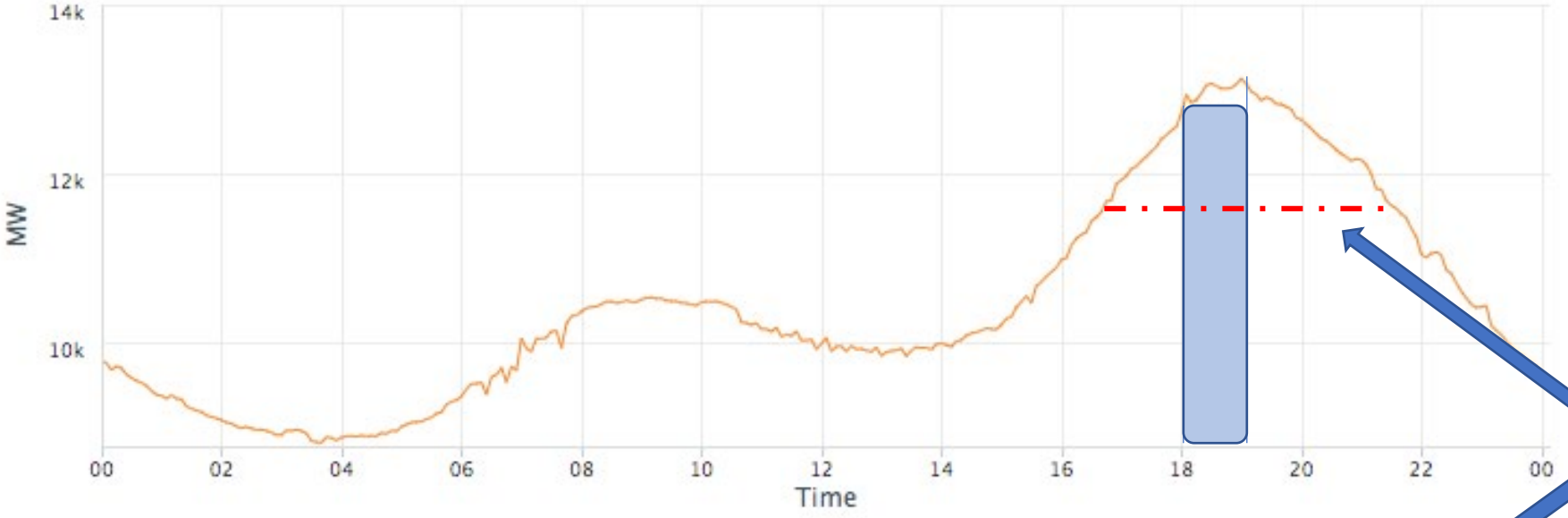
- **Resiliency**: stay up and running during storms, which have become more frequent and more severe due to climate change
- **Affordability**: cost-effective, seamless backup power, plus peak shaving drives down costs for all customers
- **Grid flexibility:** provides GMP new tools to manage a new grid that has significantly more distributed solar
- **Carbon reduction:** batteries charge off low-emission supply and displace dirty peaks

Total CO2 Reduction

Over 1.5 million pounds of CO2 reduced so far = 144 passenger vehicles off the road for 1 year

EPA Greenhouse Gas Equivalencies Calculator

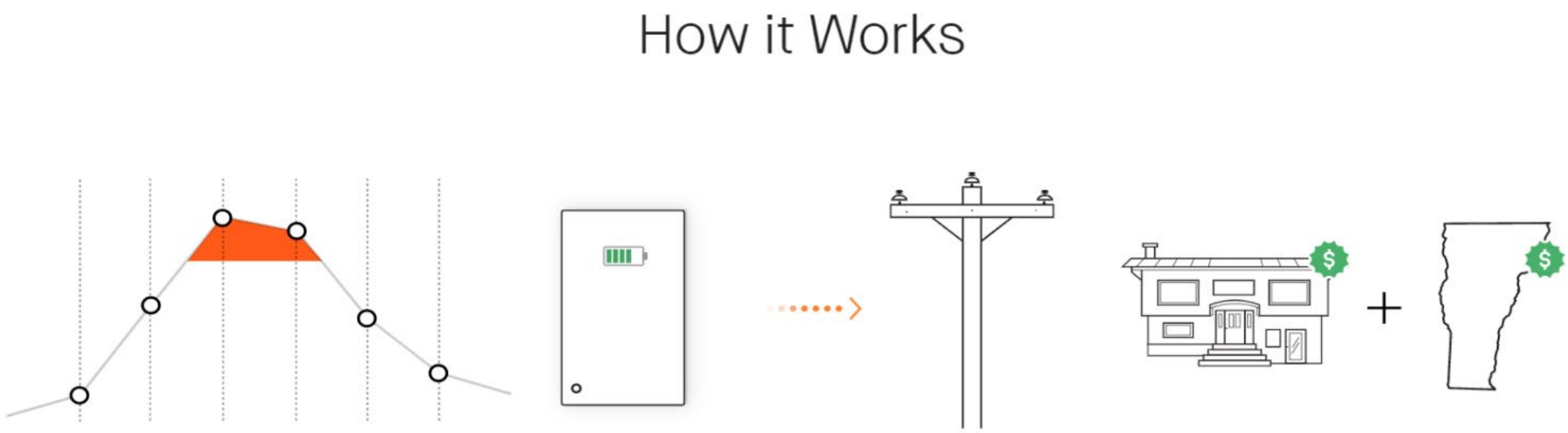
PEAK SHAVING 101: GENERATE SAVINGS FOR ALL CUSTOMERS



- GMP power supply costs driven by single hour of highest demand each month
- Batteries clip or lower the peaks by discharging
- 3-5 events per month based on GMP forecasts

GMP ENERGY STORAGE PILOT

Battery storage at home for $15/month



10 MW = 7,500 homes off the grid during a peak

BATTERIES IN ACTION

HOW ARE WE DOING?

Tesla batteries save $500K for Green Mountain Power through hot-weather peak shaving

2018 article in Utility Dive, savings for single peak event

July 30th Peak

9.25MW curtailed

2019 Greentech Media article after Halloween wind storm

Batteries vs. Blackouts: 1,100 Homes Powered Through Vermont Outage With Storage

Utility Green Mountain Power's pilot programs paid off with clean, distributed backup power amid a statewide outage.

CUSTOMER STORIES

"The batteries pumped our water, ran our lights, appliances, TV, and computers, and even powered our electric snowblower, just as seamlessly as if we were connected to the grid"

- Gerry Hawkes, Woodstock: GMP customer who used storage and solar to stay powered during a 4-day outage

GREEN MOUNTAIN POWER
Generating Possibilities Together

Think Big, Start Small and Scale Fast

Questions?

graham.turk@greenmountainpower.com