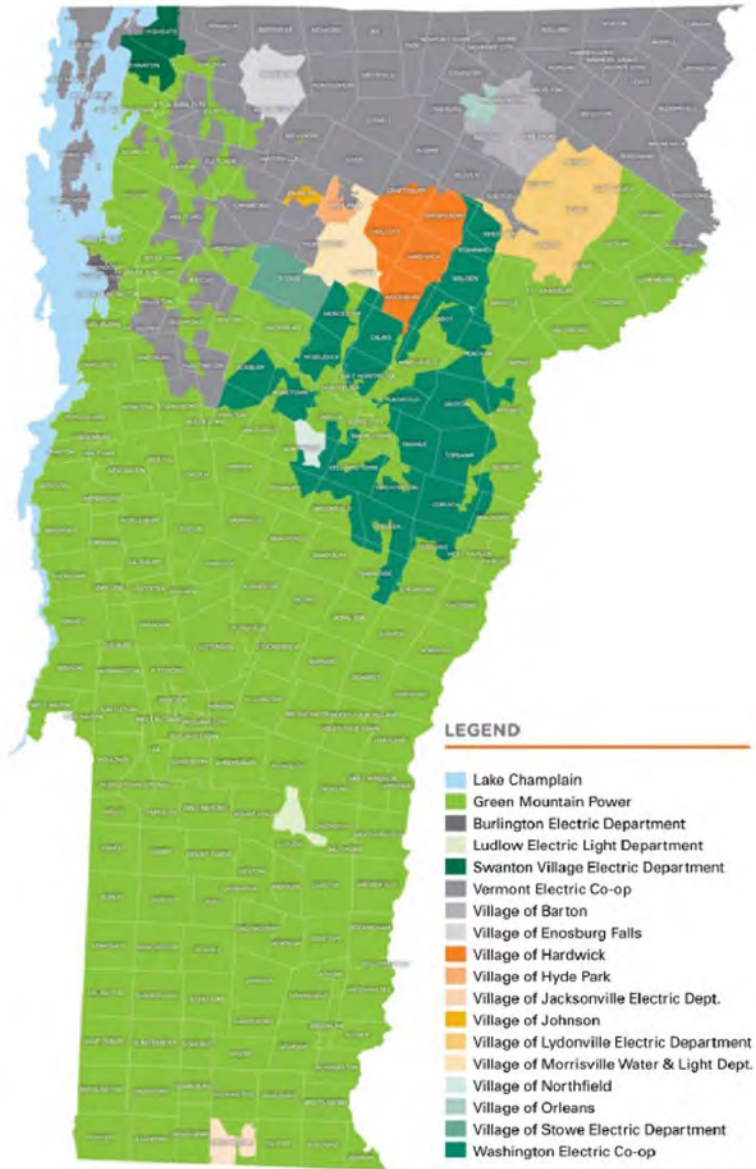


Green Mountain Power

Resiliency Work to Keep Vermont Connected



GMP: Who We Are



- ▶ GMP serves over 272,000 customers in 202 towns, covering 77% of Vermont
 - ▶ 85% residential customers, 15% businesses
 - ▶ Mostly rural and suburban territory with approximately 12,500 miles of distribution lines and 1,011 miles of sub-transmission
 - ▶ 15 district offices with teams across Vermont
 - ▶ About 510 employees, 285 are members of the IBEW Local 300
 - ▶ Our annual energy mix is 100% carbon free and 78% renewable
 - ▶ GMP will be 100% renewable by 2030

Storms are Getting Worse & We are Ready

- ▶ Overall Trend:
 - ▶ Vermont is getting more severe, damaging water-heavy water
 - ▶ Unprecedented series of storms this winter
 - ▶ 3 of the top ten worst storms in GMP history, just this winter
 - ▶ All top ten storms in the last decade



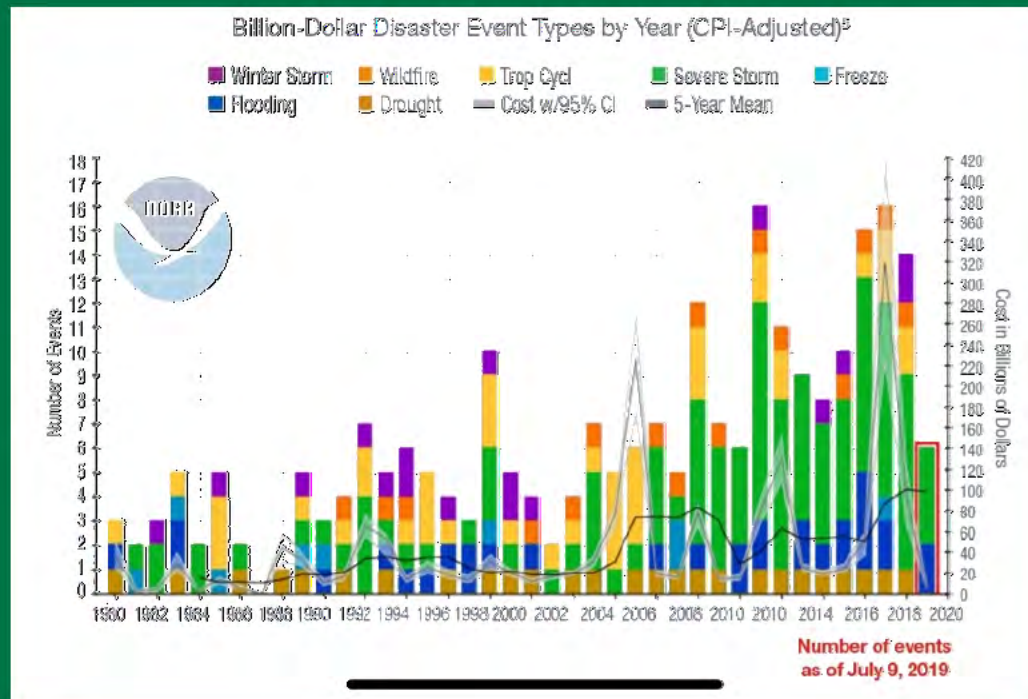
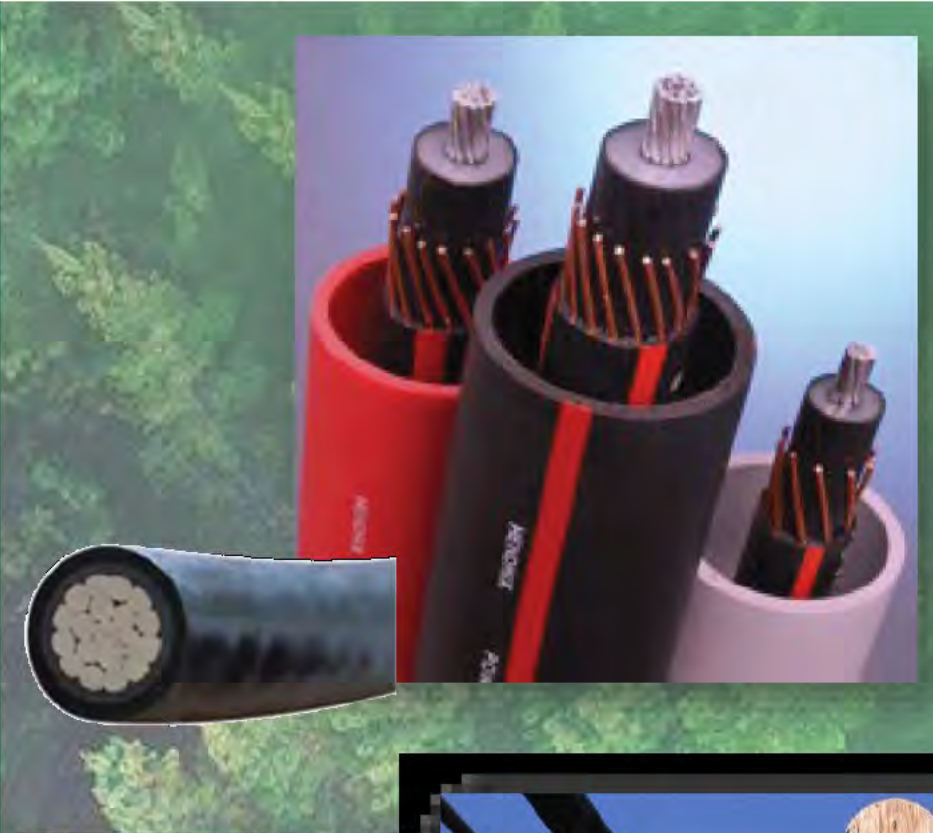
Storm Resilient: Overview

- ▶ 2020, state approved GMP's Climate Plan to launch targeted grid strengthening projects
- ▶ Expanding energy storage/batteries to keep customers powered up
- ▶ Microgrids & Resiliency Zones to keep communities powered up
- ▶ Extensive planning and resources in place prior to storms
- ▶ Partnering with Communities



GMP's Proactive Climate Plan: Grid

- ▶ Upgrading infrastructure with Storm Hardened construction to better withstand today's changing climate.
- ▶ Undergrounding rural overhead lines, reducing the threat for outages while reducing maintenance costs.
- ▶ Using new and proven technologies such as self-healing distribution lines and battery storage to keep customers powered up.



GMP's Proactive Climate Plan: Energy Storage

- ▶ GMP has deployed 40 MW of residential and utility scale batteries throughout Vermont
- ▶ Enough to power 20,000 homes for days
- ▶ Batteries strengthen the greater grid, add resiliency, and helps lower costs for all GMP customers
- ▶ Circuit, Town-level Storage, can isolate to microgrid if larger grid is damaged
- ▶ GMP deploying customized Resiliency Zones in partnership with communities to keep them powered up
- ▶ Home Storage can last for days if managed, and longer if paired with solar
- ▶ Batteries also reduce energy use at peak times on the grid, reducing costs for all customers



Brattleboro District Climate Resilient Projects

- ▶ Route 30, Jamaica to Dummerston, through Townsend and Newfane and parts of Dover and Brookline
- ▶ Route 100-Wardsboro-Main backbone from Route 30 along Rt. 100 into Wardsboro.
- ▶ West Hill Rd from Townsend Dam-Main feed into rural parts of Dover and Wardsboro, VH4A.
 - ▶ State permitting can add years to this work
- ▶ Resiliency Zone in Brattleboro
- ▶ Resiliency Zone in Grafton

Partnering with Communities on Resiliency



- ▶ Extensive Outreach before, during, and after storms
 - ▶ Including regional and local updates to local officials
- ▶ Communities with their own plans/staffing for severe weather are more resilient
 - ▶ Identifying points of contact is key



Storm Prep & Planning

- ▶ Green Mountain Power monitors 4 forecasters and multiple weather models days in advance of any storm.
 - ▶ Forecasters-
 - ▶ VT Utility Forecaster Roger Hill
 - ▶ Disaster Tech-Northern VT University born weather prediction
 - ▶ National Weather Service-Burlington(12 VT Counties)
 - ▶ National Weather Service-Albany(2 VT Counties)
 - ▶ Weather Models-
 - ▶ GFS-Global Forecast System
 - ▶ Euro-European Forecast Model
 - ▶ NAM-North American Model
 - ▶ Outage Prediction-
 - ▶ Internal GMP present weather vs prior weather prediction
 - ▶ Disaster Tech-Prediction based on total precipitation and how much is frozen.
 - ▶ Customer Outreach: Proactively alert customers/communities
 - ▶ Text alerts, emails, social media, web site, press releases, robo-calls, critical care customer outreach
- ▶ Secure and pre-position GMP team, and extra crews brought in to help, as needed

GMP Nor'easter Response

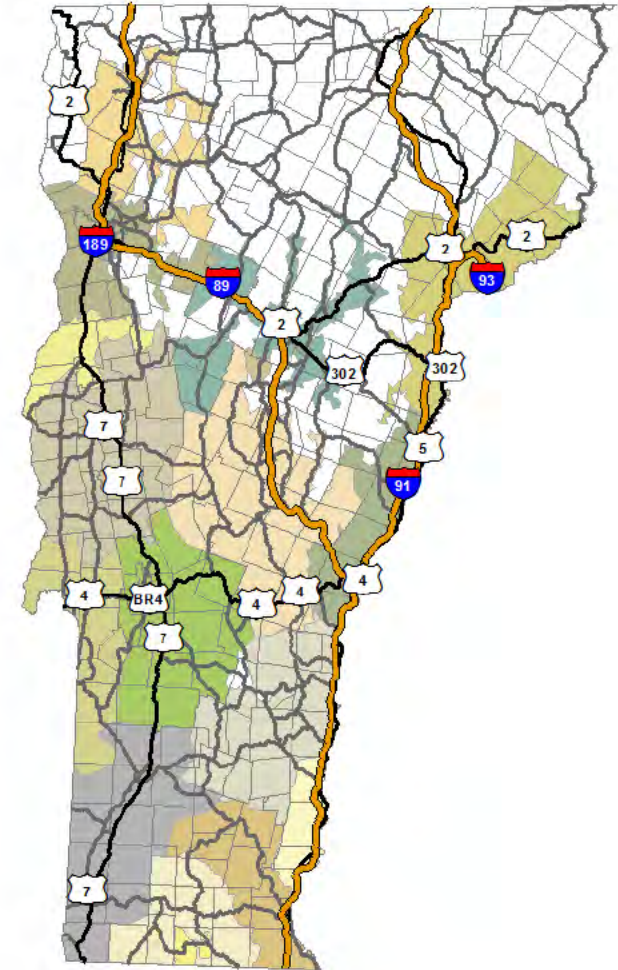


- ▶ T&D / Line Workers
 - ▶ 650 field workers
- ▶ Tree Crews
 - ▶ 250 field workers
 - ▶ Quadrupling our internal field force
 - ▶ Crews from: NH, MA, ME, NY, Quebec, New Brunswick, KY, PA.
- ▶ Everyone at GMP works during a storm with cross trained functions to serve customers.
 - ▶ In addition to: Call Center, Relay Techs, Power Production, Designers, Engineers, Meter Service, Control Center Operators.

Storm Restoration

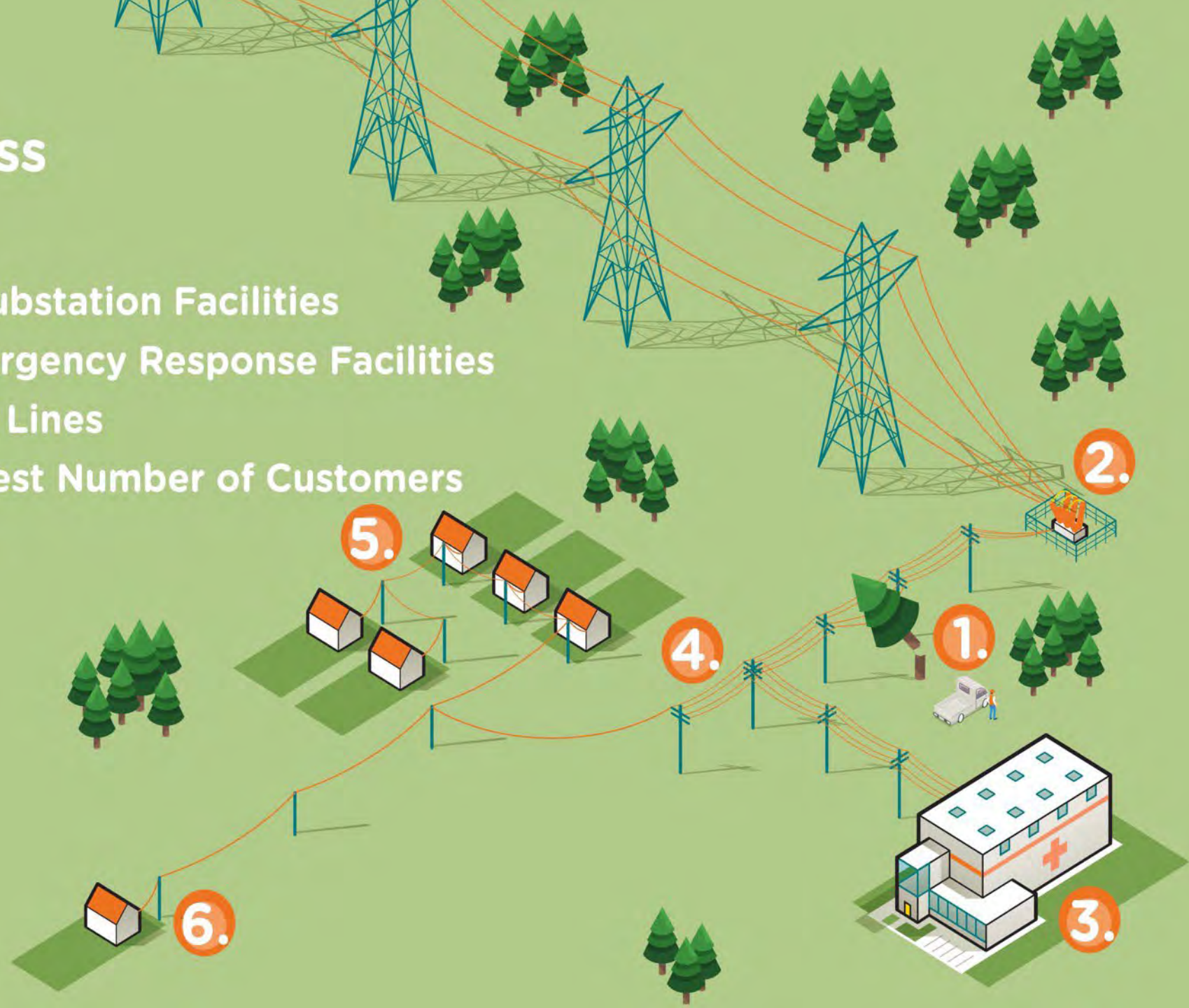
- ▶ Distribute Resources to the hardest hit areas.
- ▶ Communicate often with customers as information becomes available. High level restoration times once damaging weather stops, when the last customers in a geographic area will be back on.
- ▶ Have districts run storm response in their area for efficiency

- GMP's 15 operating districts



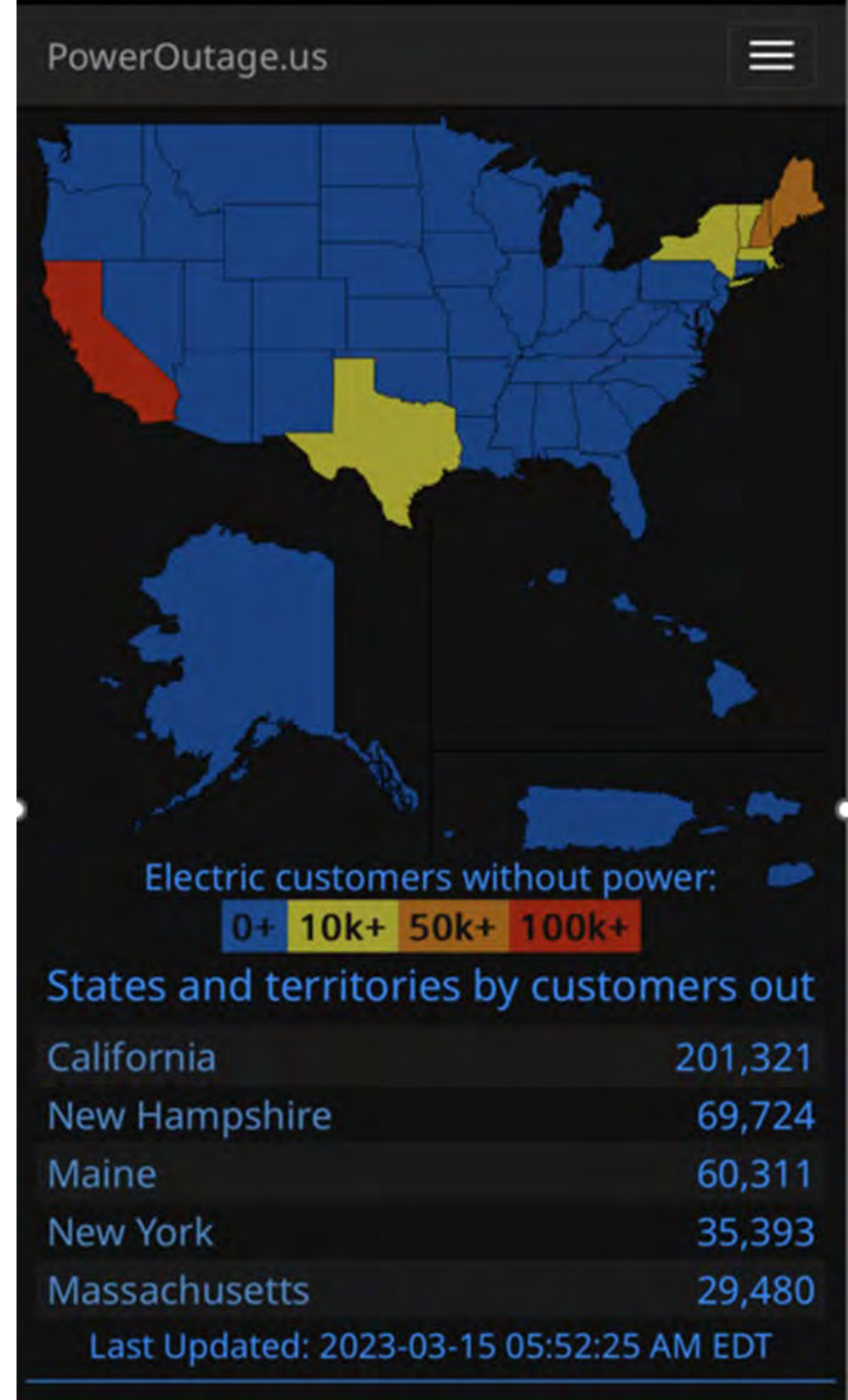
GMP Power Restoration Process

1. Clear Hazards
2. Repair Transmission & Substation Facilities
3. Restore Hospitals & Emergency Response Facilities
4. Repair Main Distribution Lines
5. Restore Areas with Largest Number of Customers
6. Restore Isolated Events



March Nor'easter Caused Widespread Damage

- ▶ Nor'easter brought cement-like snow, hitting southern Vermont especially hard, weighing down and tearing down lines and uprooting trees.
- ▶ The forecast shifted, expanding the areas of the state affected by the storm, and extending the time the severe weather sat over Vermont, causing more damage.
- ▶ Crews faced challenging conditions
 - ▶ Even as they restored power to thousands of customers during the first 24 hours, much of their time was assisting local communities in clearing roads to make them safe for first responders.
- ▶ Crews restored power to more than 102,000 customers





QUESTIONS?

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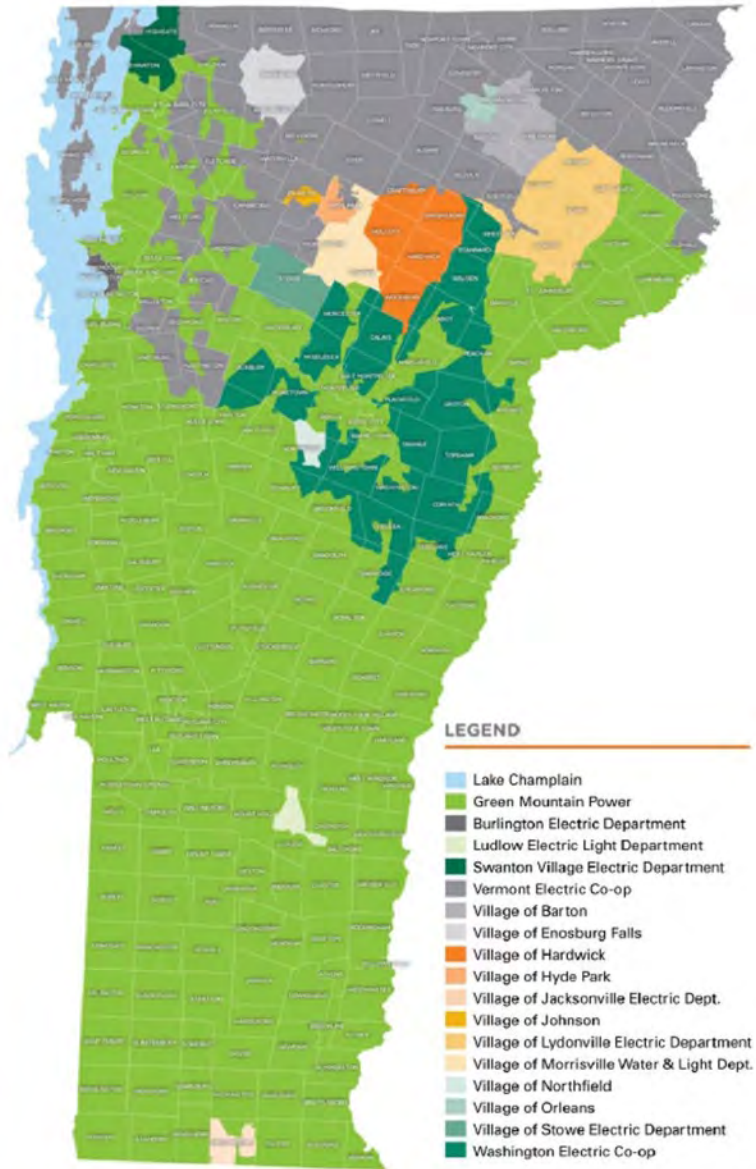
Green Mountain Power

Resiliency Work to Keep Vermont Connected

GMP.DPS.Q121(b) -
TRORPC Meeting
12/6/23



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 - ▶ About 510 employees, 285 are members of the IBEW Local 300
 - ▶ Our annual energy mix is 100% carbon free and 80% renewable
 - ▶ GMP will be 100% renewable by 2030

Storms are Getting Worse & We are Ready

- ▶ Overall Trend:
 - ▶ With the warming climate, Vermont is getting more severe, damaging, moisture laden storms.
 - ▶ Unprecedented series of storms this past winter
 - ▶ Since Dec. 16th, 2022, 6 major storms after 4 years without a major storm, 3 of which were in the top 10 in GMP history.
 - ▶ All top ten storms in the last decade





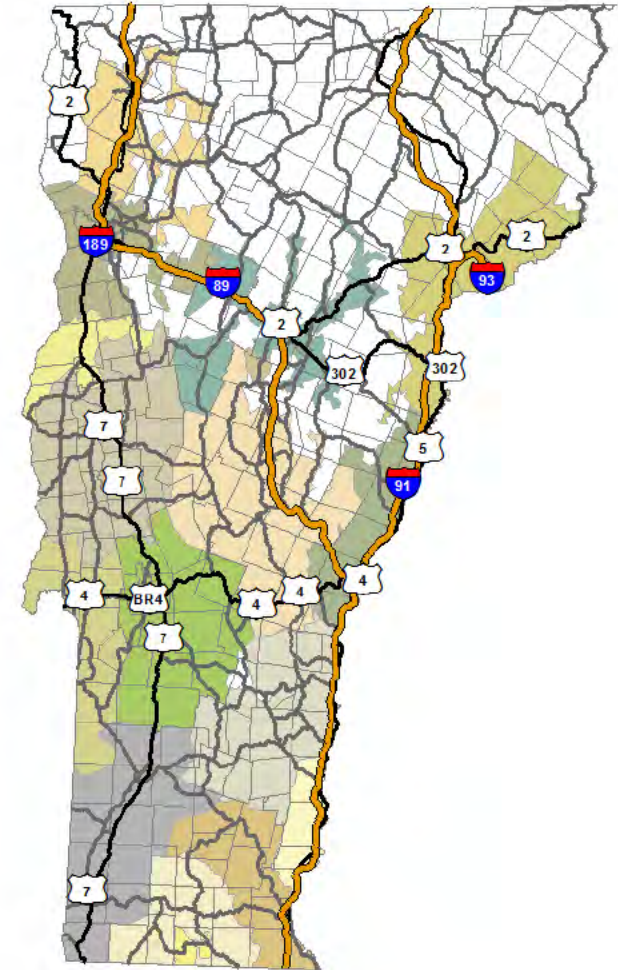
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 - ▶ **Weather Models-**
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 - ▶ High Resolution Rapid Refresh
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 - ▶ **Customer Outreach: Proactively alert customers/communities**
 - ▶ Text alerts, emails, social media, web site, press releases, robo-calls, critical care customer outreach
- ▶ **Secure and pre-position GMP team, and extra crews brought it to help, as needed**

Storm Restoration

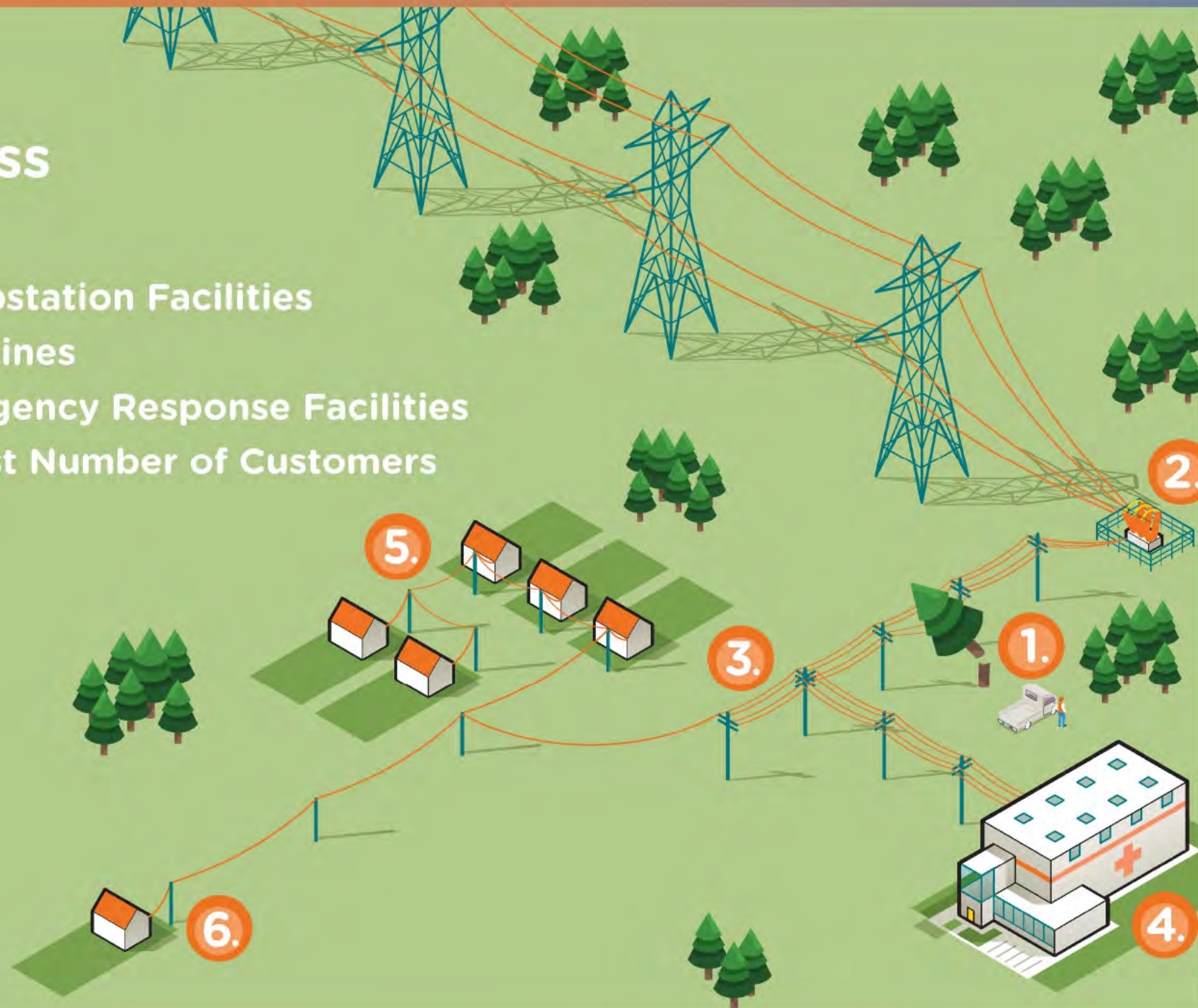
- ▶ **Distribute Resources to the hardest hit areas.**
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- **GMP's 15 operating districts**



GMP Power Restoration Process

1. Clear Hazards
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5. Restore Areas with Largest Number of Customers
6. Restore Isolated Events



Partnering with Communities on Storm Support



- ▶ **Extensive Outreach before, during, and after storms**
 - ▶ Including regional and local updates to local officials
 - ▶ Portable Jackery Batteries for Critical Care Customers
- ▶ **Communities with their own plans/staffing for severe weather are more resilient**
 - ▶ Identifying points of contact is key

Helping Vermonters Stay Informed and Safe



- ▶ **Town/RPC Meetings**
 - ▶ Coordinating communication
- ▶ **VEM Meetings/Coordination**
 - ▶ Cares list
- ▶ **Lifted the Cap on Energy Storage, support CC customers**
- ▶ **Custom/Frequent messaging**

Storm Resilience

- ▶ 2020, state approved GMP's Climate Plan to launch targeted grid strengthening projects
- ▶ 2023, GMP committed to Zero Outages by 2030
- ▶ Expanding energy storage/batteries to keep customers powered up
- ▶ Microgrids & Resiliency Zones to keep communities powered up
- ▶ Extensive planning and resources in place prior to storms
- ▶ Partnering with Communities



The New York Times

Vermont Utility Plans to End Outages by Giving Customers Batteries

Green Mountain Power is asking state regulators to let it buy batteries it will install at customers' homes, saying doing so will be cheaper than putting up more power lines.

Share full article



A Tesla battery in a basement in Williston, Vt. Green Mountain Power proposed buying and installing batteries like it for customers. Caleb Kenna for The New York Times

2030 Zero Outages Initiative

VERMONT'S INDEPENDENT VOICE

SEVEN DAYS

NEWS | OPINION & NEWS

Green Mountain Power Aims to Eliminate Outages by 2030

By KEVIN MCCALLUM



Green Mountain Power vows new plan will end outages

Updated: Oct. 10, 2023 at 1:41 PM EDT



Deep Dive Opinion Library Events Press Releases

Green Mountain Power proposes energy storage for all Vermonters

The utility has proposed spending \$280M to harden the grid and provide customers with storage, after spending \$45 million restoring its system following major storms last winter.



Green Mountain Power launches 'zero outages initiative' with home batteries

The Atlanta
Journal-Constitution

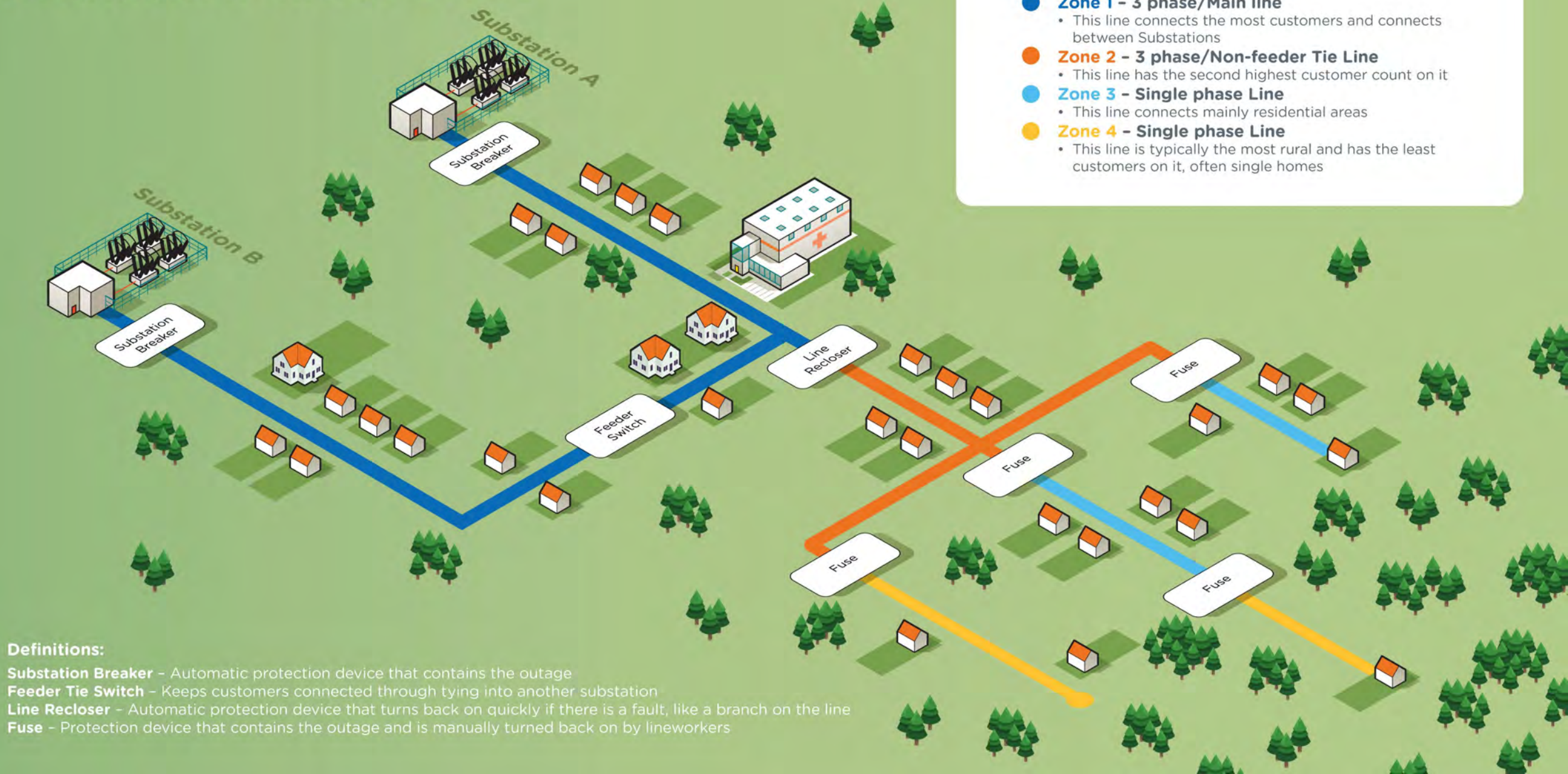
Georgia Power should follow lead set by Vermont utility

While Georgia Power seems to be lost, "Georgia Power ... seeks ideas for new electricity sources" (News, Oct. 10), a Vermont utility knows how to get it done, "Vermont utility plans battery backups" (News, Oct. 10).

GMP Zero Outages: Distribution Circuit Zones

Circuit Zone Key

- **Zone 1 - 3 phase/Main line**
 - This line connects the most customers and connects between Substations
- **Zone 2 - 3 phase/Non-feeder Tie Line**
 - This line has the second highest customer count on it
- **Zone 3 - Single phase Line**
 - This line connects mainly residential areas
- **Zone 4 - Single phase Line**
 - This line is typically the most rural and has the least customers on it, often single homes



Definitions:

Substation Breaker - Automatic protection device that contains the outage

Feeder Tie Switch - Keeps customers connected through tying into another substation

Line Recloser - Automatic protection device that turns back on quickly if there is a fault, like a branch on the line

Fuse - Protection device that contains the outage and is manually turned back on by lineworkers

Zone 1: Out of the Substation

- ▶ Zone 1
 - ▶ Mainline Feeder
 - ▶ Three Phase
 - ▶ Sub to Feeder Ties
- ▶ Resiliency Technologies
 - ▶ Reconductoring with spacer cable
 - ▶ Some “conditional undergrounding” where it make sense.



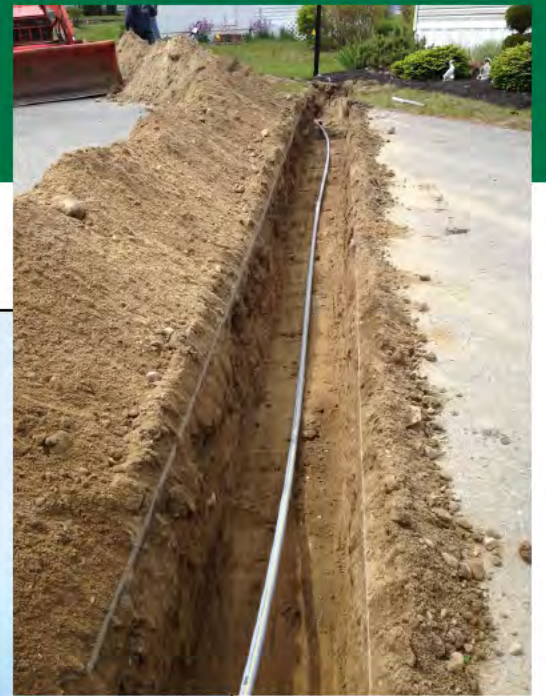
Zone 2: Three Phase

- ▶ Zone 2
 - ▶ All three phase beyond Zone 1
- ▶ Resiliency Technologies
 - ▶ Reconductoring with spacer cable
 - ▶ More undergrounding as compared to Zone 1



Zone 3: Single Phase

- ▶ Zone 3
 - ▶ Single phase
 - ▶ “Higher” customer density
- ▶ Resiliency Technology
 - ▶ Focusing as much as possible on undergrounding
 - ▶ Where not possible (significant ledge) 165 mil tree wire.



Zone 4: Last Mile of Single Phase

- ▶ Zone 4
 - ▶ Single Phase
 - ▶ “Lower” customer density
- ▶ Resiliency Technology
 - ▶ Installing batteries
- ▶ Philosophy
 - ▶ Less expensive to install batteries and let the customer ride out an outage.
 - ▶ In the future, considering hardening the lines (underground or covered wire).
 - ▶ In the meantime, focus will be placed hardening that mainline / three phase



GMP's Zero Outages in Practice: Energy Storage

- ▶ GMP has deployed more than 50 MW of residential and utility scale batteries throughout Vermont
- ▶ Enough to power 25,000 homes for days
- ▶ Batteries strengthen the greater grid, add resiliency, and helps lower costs for all GMP customers
- ▶ Circuit, Town-level Storage, can isolate to microgrid if larger grid is damaged
- ▶ GMP deploying customized Resiliency Zones in partnership with communities to keep them powered up
- ▶ Home Storage can last for days if managed, and longer if paired with solar
- ▶ Batteries also reduce energy use at peak times on the grid, reducing costs for all customers



Stop the spread • Avoid close contact with others • Cover your mouth and nose with a cloth face cover when around others • Wash your hands often • Cover coughs and sneezes • Clean and disinfect often • Monitor your health daily

GMP pioneers with Panton microgrid



Solar panels cover more than 30 acres in Panton, as seen on March 16.

Solar project will be first of its kind in US

Dan D'Ambrosio
Burlington Free Press
USA TODAY NETWORK

PANTON - Most of the pieces for a pioneering "microgrid" that will act as a giant solar-powered backup battery during electrical outages are in place on the wide-open fields of Panton outside of Vergennes.

The solar-powered microgrid will be the first of its kind in the country, according to Josh Castonguay, chief innovation and engineering executive for Green Mountain Power. So are the 677 solar panels (plus 3,500 rows and 74,239 chips), according to the town website in this small Vermont village beside themselves with excitement.

"Actually, no, they're not," said Howard Hall, chairman of the Panton Selectboard. "It's nothing really exciting for most of the people here."

Green Mountain Power first approached the town in 2015 about building the solar field in a farmer's leased field on Panton Road. Hall said that in a town where the purchase of a woodburner is the subject for debate, the \$40,000 yearly in tax revenue the solar installation produces was a welcome boost.

"We have come close to our town," he said. "It's not a collection of things."



Josh Castonguay, Green Mountain Power's chief innovation and engineering executive, explains how the Panton microgrid will work, as seen on March 16. PHOTOS BY DAN D'AMBROSIO/USA TODAY NETWORK

"With microgrids powered by clean energy and paired with batteries to store and deploy that power when it's needed,

SoBu hot air balloon event causes traffic jam Saturday

April Barton
Burlington Free Press
USA TODAY NETWORK

A hot air balloon event Saturday night was so popular it caused a traffic jam in South Burlington. Hundreds of cars lined up for the Light the Night event. Maybe it was the warm temperatures or the drivable event which allowed visitors to stay COVID-safe remaining in their cars that caused people to come out in droves.

South Burlington police put out an advisory that night saying "traffic is significantly backed up on Kimball Ave, Community Dr, Gregory Dr and Kennedy Rd due to a hot air balloon parade of some sort."

While the police may have not known all the details of the event, South Burlington Recreation & Parks were there to assist as motorists drove through Technology Park. Event organizers and partners of the nonprofit Light the Night handed out QR codes for people to electronically donate to the Vermont Foodbank and collected food donations.

The event was free, but donations were encouraged. It began at 7:30 p.m. and lasted a couple of hours. Traffic was able to get back to normal at that point.

Traffic jams caused by an event, not something experienced for about a year while many stayed in isolation during the COVID-19 pandemic, could be the first signs of a return to normal.

Contact April Barton at abarton@freepressmedia.com or 802-660-8154. Follow her on Twitter @aprilbarton.



A hot air balloon glow entitled "Light the Night" brought out hundreds of cars in South Burlington on Saturday to support the Vermont Foodbank. FREE PRESS/APRIL BARTON

USA TODAY

Promising candidate

Atlassian and its research partner Oxford University released the first picture Monday of the large clinical trial they have run in the U.S. for their COVID-19 vaccine. Finding that it is safe and prevents 75% of asymptomatic disease. It also implies

What's a Resiliency Zone?

- Community hub that stays connected, even when severe weather hits
- We partner with communities on targeted resiliency projects
- Selected using outage and CDC community vulnerability data
- Some are battery-only
- Currently underway: Brattleboro, Grafton, Rochester
- 3 new communities selected each year



Panton Vermont Microgrid

Distribution circuit can disconnect from greater grid

- About 50 customers in center of town, includes Town Hall
- Stays powered up if larger grid is damaged
- 4.9 MW solar array
- Tesla Powerpack batteries
- 2 years of engineering work, first in the country
- PBS Nova feature

Resilient Neighborhood Pilot - O'Brien Farms

- ▶ Partnership with O'Brien Brothers for 155 fully electric homes.
- ▶ Electric heating/cooling, battery backup, Span panels, solar, EV charging.

Resilient Neighborhood

1. Storm damages grid
2. Home batteries switch on seamlessly to power your home
3. Solar can recharge your batteries
4. You can use the Span panel to control which electric loads you power
5. The neighborhood microgrid battery provides more backup power as needed



- ▶ Community includes large community battery storage and public DC fast charging.
- ▶ Neighborhood will be a flexible load and generation resource for the grid, reducing costs for all customers.



QUESTIONS?

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