RESILIENTPOWER
A project of CleanEnergyGroup

An Introduction to Virtual Power Plants

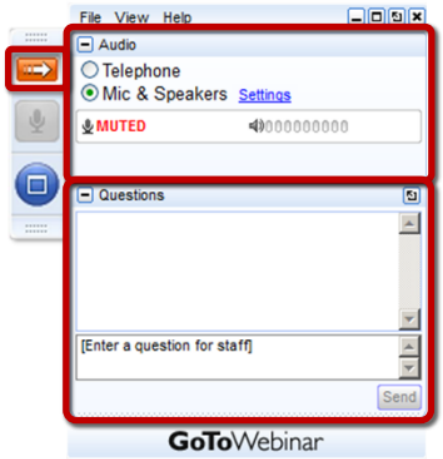
September 28, 2020

CleanEnergyGroup
Innovation in Finance, Technology & Policy

Utilities across the country are beginning to tap into hundreds, sometimes thousands, of devices in homes and businesses to create virtual power plants (VPP). These VPPs can deliver many of the same services as traditional power plants but they're power by distributed resources, including water heaters, smart thermostats, and, increasingly, solar and battery storage.

This webinar covered the basics of what a virtual power plant is and how it can create value for both utilities and customers, with examples from real-world programs. Presenters included the software company Virtual Peaker and Portland General Electric Company (PGE). PGE recently launched a new VPP pilot program that will incentivize the installation of more than 500 residential battery storage systems, representing up to four megawatts of energy.

WEBINAR LOGISTICS



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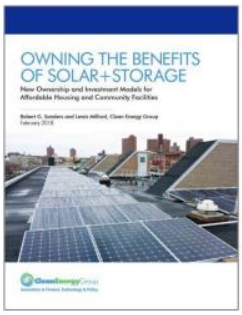
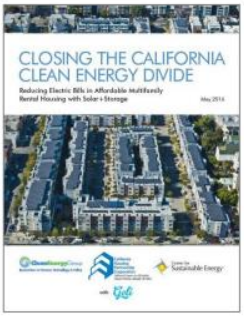
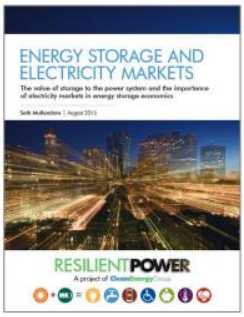
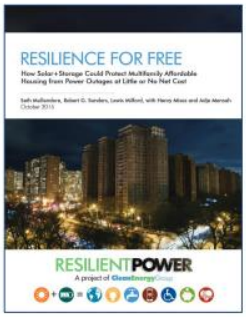
THE RESILIENT POWER PROJECT

- Increase public/private investment in clean, resilient power systems (solar+storage)
- Protect low-income and vulnerable communities, with a focus on affordable housing and critical public facilities
- Engage city, state and federal policy makers to develop supportive policies and programs
- Visit www.resilient-power.org for more information and resources









SUPPORTING 150+ PROJECTS ACROSS THE COUNTRY

WEBINAR SPEAKERS

Shadea Mitchell
Head of Client Success, Virtual Peaker

Audrey Burkhardt
Senior Product Development Specialist, Portland General Electric

Seth Mullendore
Vice President and Project Director, Clean Energy Group (moderator)

Virtual Peaker

Portland General Electric

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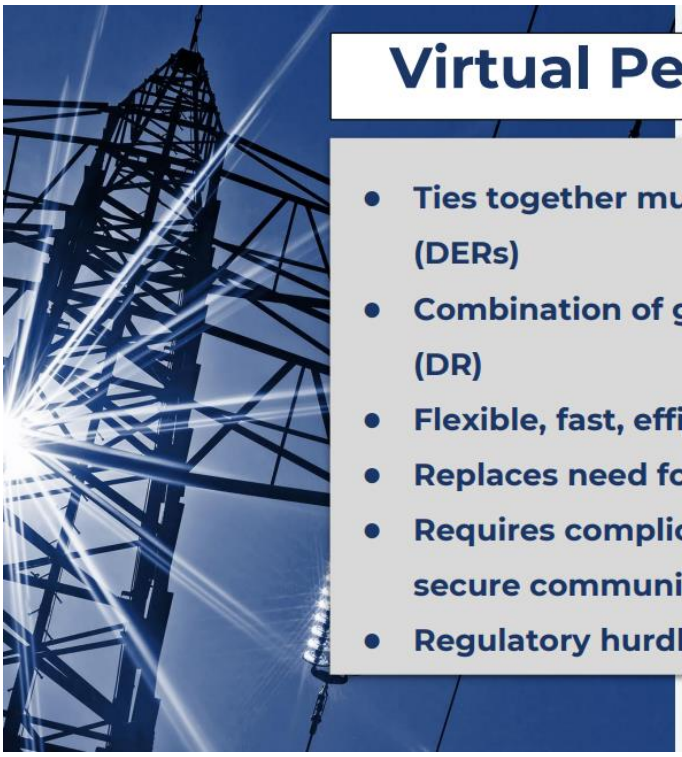


Virtual Peaker Plants (VPPs)

- Ties together multiple distributed energy resources (DERs)
- Combination of generation and demand response (DR)
- Flexible, fast, efficient
- Replaces need for fossil-fuel generation
- Requires complicated optimization, control, and secure communications.
- Regulatory hurdles and limitations

The Evolution of Demand-Side Management

DIRECT LOAD CONTROL

One-way communication
High cost
Load shed only
Zero touch with customer

BASIC DR

Two-way communication
Manage events in aggregate
Limited device flexibility
Low-touch with customer

REAL-TIME CONTROL

Device optimized
Manage events at household level
Infinite device types
High-touch with customer
AI and Machine Learning

PGE Smart Battery Pilot

Audrey Burkhardt
Senior Product Developer

PGE at a Glance

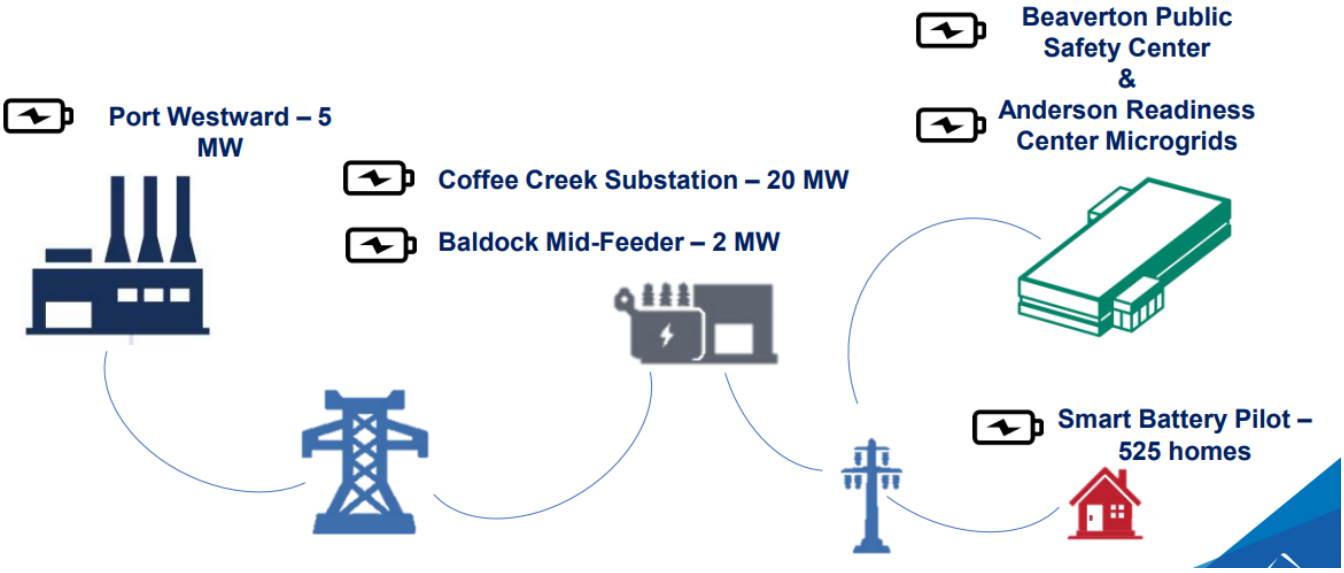
Quick Facts:

- Vertically integrated company including generation, transmission and distribution. Serving 4,000 mi²
- PGE customers:
  - Residential 773,514
  - Commercial 110,028
  - Industrial 200
- Serves 46% of Oregonians, 51 incorporated cities
- Total number of employees ~3,000

Diverse generation mix

Hydro, Coal, Natural Gas, Wind, Solar

Proposed Projects



Residential Pilot

Objectives

Small scale research study intended to optimize learnings of dispersed battery storage

Grid

- Study and model value to the grid for future use in IRP
- Primary use cases:
  - autonomous volt/var support
  - autonomous frequency response
  - contingency reserve, bulk generation capacity
  - customer power reliability
- Locational benefits studied through Testbed density

Program

- Determine the optimal design for a future scalable, cost-effective program
- Incentive levels, optimal dispatch strategies, integration with power operations, communications & controls technologies

Customer

- Conduct interviews and surveys to understand customer resiliency needs, hurdles to adopting storage
- Balance expectations of battery performance with PGE management of battery operations

Smart Battery Pilot Design

Virtual Power Plant of 525 residential batteries for grid services

2 - 4 MW / 6 - 8 MWh

$40 or $20 per month for interconnected devices

Additional rebate in Testbed to drive density for locational benefits

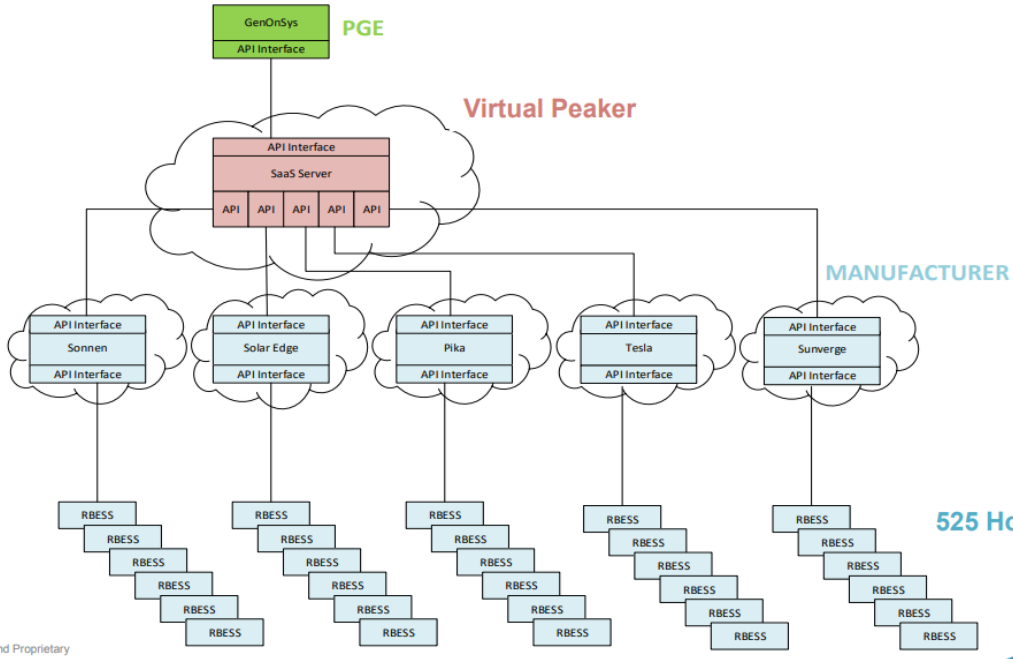
$3,000 → $2,000 → $1,000

Solar Within Reach for Income Qualified

$5,000 for installing storage in conjunction with Solar Within Reach

Qualified devices are Tesla, Generac/Pika, SolarEdge, Sonnen, Sunverge

Architecture



Virtual Peaker

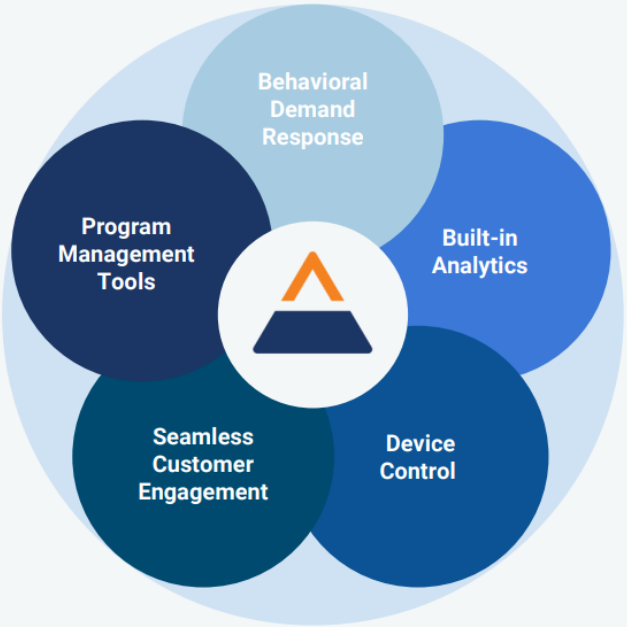
Founded: 2014

Located: Louisville, KY

Business Model: SaaS

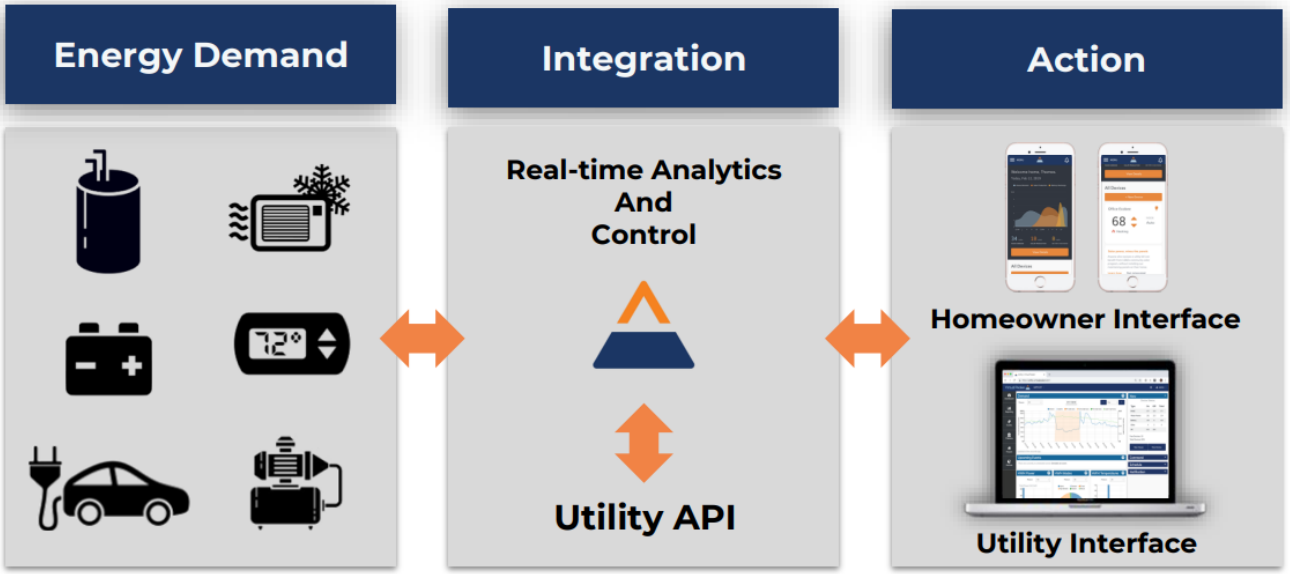
- Serves as the software engine behind residential DER, DR, and VPP programs across the US

Virtual Peaker: An adaptable SaaS solution

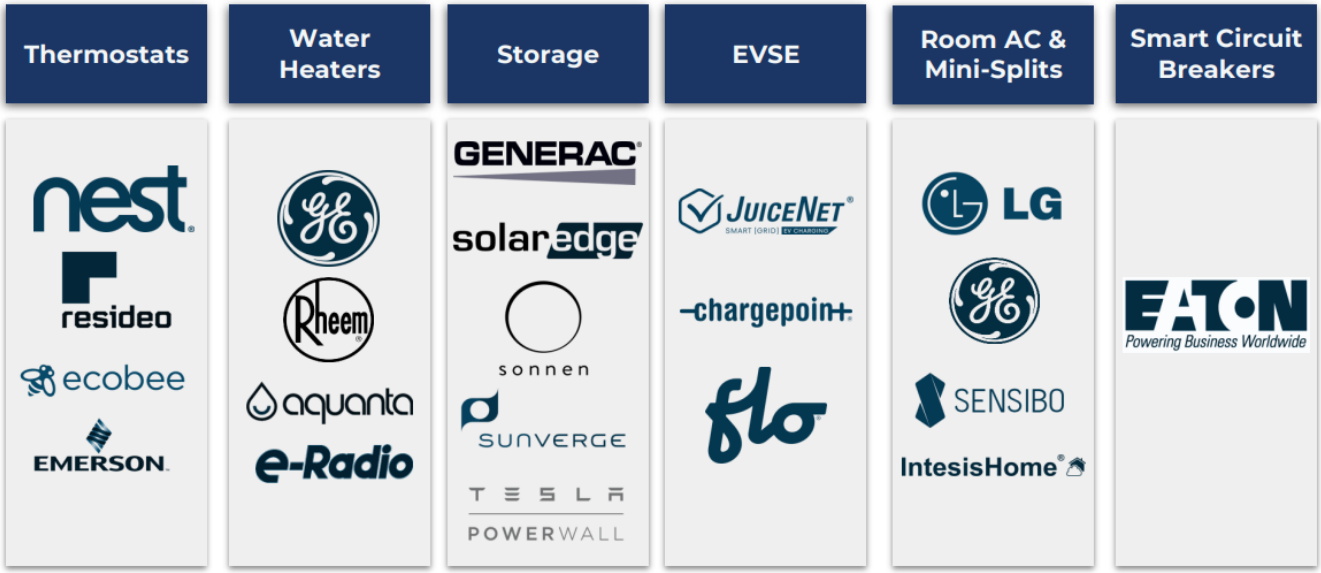


- Tie together multiple programs needs
- Manage both front and back end requirements
- Deploy in weeks, not months
- Right-size contract for any utility

How We Do It



The Broadest Manufacturer Support



Robustly integrate with a new device in ~2 weeks

Virtual Peaker

Shadea Mitchell

Head of Client Success

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Thank you for attending our webinar

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Upcoming Webinars

Nantucket Island Energy Storage: Batteries for Reducing Peak and Deferring Infrastructure Investment
Friday, October 9, 2-3pm ET

Financing Resilient Power in Underserved Communities: Moving Forward with Distributed Solar+Storage Projects
Tuesday, October 20, 2-3:30pm ET

Read more and register at: www.cleanegroup.org/webinars