An Introduction to Virtual Power Plants

September 28, 2020
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

- Boulder: Nonprofit transportation center serving elderly and disabled residents
- Puerto Rico: Supporting the installation of solar+storage at multiple community medical clinics
- Boston: Multiple housing properties representing 1,000+ units of senior and affordable housing
- New Mexico: Added resilience for remote wildfire operations command center
- DC: First solar+storage resilience center at affordable housing in DC
- Puerto Rico: Supporting the installation of solar+storage at multiple community medical clinics

Map showing project locations across the United States with various icons representing different project types.
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)
Introduction to Virtual Power Plants

Clean Energy Group - 9/28/2020
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

- Port Westward – 5 MW
- Coffee Creek Substation – 20 MW
- Baldock Mid-Feeder – 2 MW
- Beaverton Public Safety Center & Anderson Readiness Center Microgrids
- Smart Battery Pilot – 525 homes
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

<table>
<thead>
<tr>
<th>Feature</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Virtual Power Plant</td>
<td>525 residential batteries for grid services</td>
</tr>
<tr>
<td></td>
<td>2 - 4 MW / 6 - 8 MWh</td>
</tr>
<tr>
<td>Monthly Payment</td>
<td>$40 or $20 per month for interconnected devices</td>
</tr>
<tr>
<td>Rebate in Testbed</td>
<td>Additional rebate to drive density for locational benefits</td>
</tr>
<tr>
<td></td>
<td>$3,000 → $2,000 → $1,000</td>
</tr>
<tr>
<td>Solar Within Reach</td>
<td>For Income Qualified</td>
</tr>
<tr>
<td></td>
<td>$5,000 for installing storage in conjunction with Solar Within Reach</td>
</tr>
<tr>
<td>Qualified Devices</td>
<td>Tesla, Generac/Pika, SolarEdge, Sonnen, Sunverge</td>
</tr>
</tbody>
</table>
Architecture

Virtual Peaker

MANUFACTURER

525 Homes
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

Energy Demand

Integration

Action

Real-time Analytics And Control

Utility API

Homeowner Interface

Utility Interface
The Broadest Manufacturer Support

Thermostats
- nest
- residio
- ecobee
- EMERSON

Water Heaters
- GE
- Rheem
- Aquanta
- e-Radio

Storage
- GENERAC
- Solaredge
- sonnen
- Sunverge
- TESLA Powerwall

EVSE
- JuiceNet
- ChargePoint
- GE
- Sensibo
- Intesishome

Room AC & Mini-Splits
- LG

Smart Circuit Breakers
- Eaton

Robustly integrate with a new device in ~2 weeks
Shadea Mitchell
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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

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