Northwest **Power** and **Conservation** Council

December 3, 2024

MEMORANDUM

TO: **Council Members**

FROM: **Joe Walderman, Resource Analyst**

SUBJECT: **Virtual Power Plant Discussion**

BACKGROUND:

Presenters: Franco Albi, Director Regional Integration, PGE; Shawn Grant, Manager Customer Distribution Engineering, PacifiCorp

Summary: Utilities are taking advantage of distributed energy resources and enhanced communication capabilities and software to use demand side resources in new ways through virtual power plants (VPPs). A VPP is a network of decentralized energy resources that are aggregated to provide utility-scale and utility-grade grid services like a traditional power plant. Franco Albi and Shawn Grant will speak to their utilities' progress on creating and growing a VPP and how they work to maintain a reliable and adequate electric system for their customers.

Relevance: The Council's ninth power plan will provide recommendations for new resources to ensure an adequate, efficient, economical, and reliable power supply given the anticipated load growth. Developing this strategy will require consideration of the availability of long-term firm transmission to support power delivery. In addition to generating resources, the plan will consider a suite of distributed energy resources. The VPP offers a partial solution to the need for new resources while avoiding the transmission constraints. Virtual power plants also reflect developments in how utilities are using demand response and distributed energy resources, important components in the Power Plan.

Workplan: A.3.2. Coordinate with regional utilities on integrated resource planning and other activities to share plan findings and leverage utility insights and advancements.

Mor Info: https://portlandgeneral.com/news/2020-07-01-pge-program-will-transform-hundreds-of-homes-into-a-virtual-power

https://cleantechnica.com/2022/09/14/virtual-power-plant-model-to-expand-in-utah-idaho-with-video/

Virtual Power Plant (VPP)

Franco Albi, Director, Regional Integration
Portland General Electric
December 11, 2024

Portland General Electric at a glance

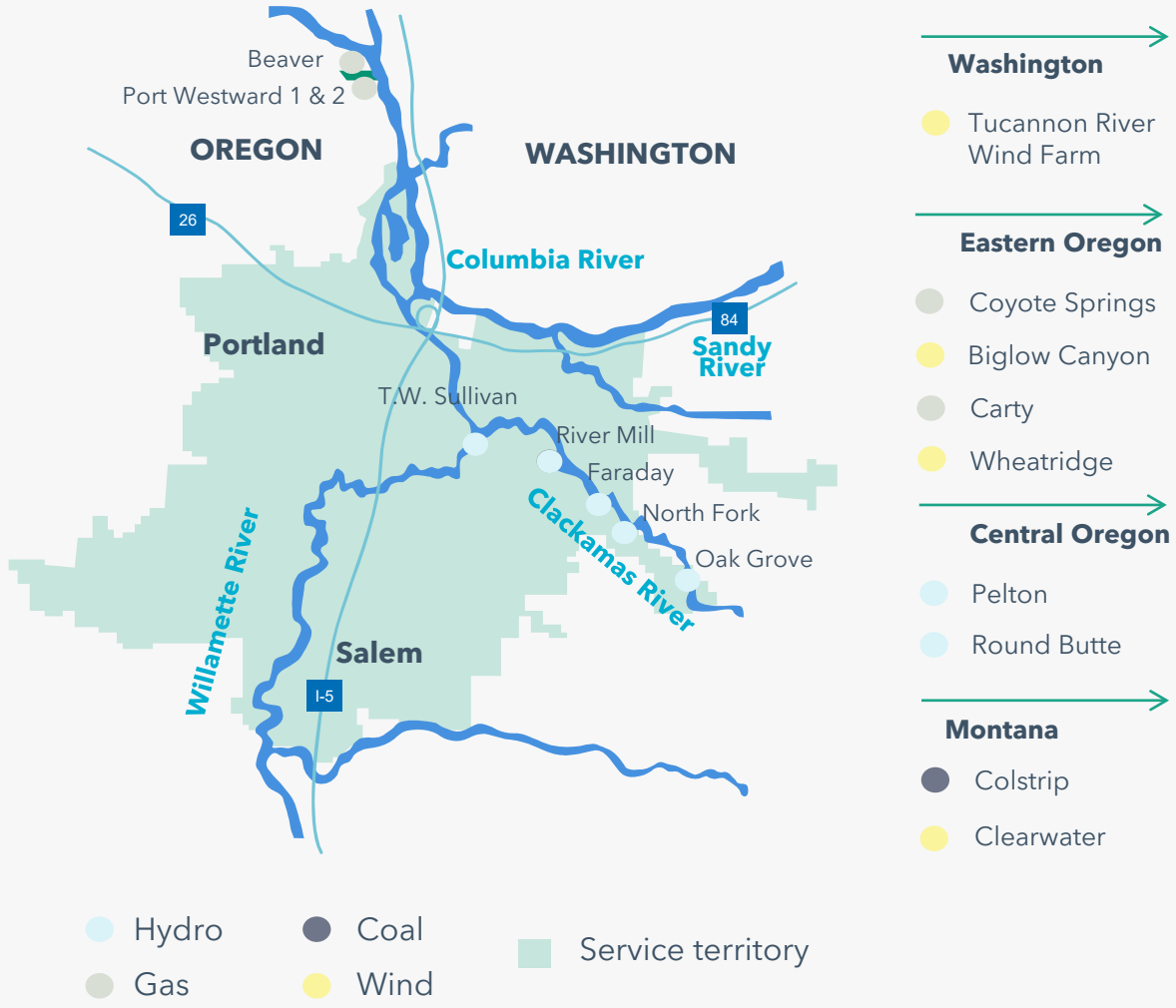
Serving all customers in our territory

- Vertically integrated electric utility encompassing generation, transmission and distribution
- Approximately 926,000 retail customers within a service area of approximately 1.9 million residents
- Roughly half of Oregon's population lives within PGE service area, encompassing 51 incorporated cities entirely within the State of Oregon
- Roughly two-thirds of Oregon's commercial and industrial activity occurs in PGE service area

Leading the way to a clean energy future for Oregon

- Our goal of serving PGE customers with 100% clean energy by 2040 aligns with state policy. The targets to reduce baseline greenhouse gas emissions from power served to Oregon retail customers are:
  - 80% reduction in greenhouse gas emissions by 2030
  - 90% reduction in greenhouse gas emissions by 2035
  - 100% reduction in greenhouse gas emissions by 2040

3,300+ MWs of Generation

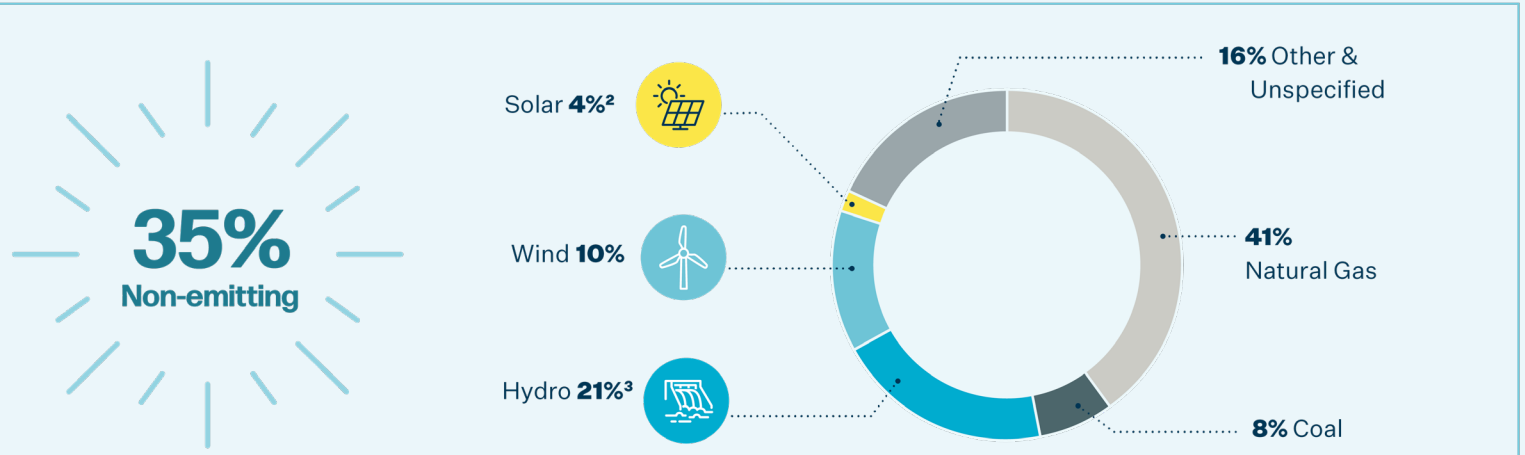


Clean energy journey

PGE continues to make significant progress toward decarbonization.*

GHG Emissions from Power Served to Oregon Customers	GHG Intensity for Power Served to Oregon Customers
2023 emissions for power served to Oregon customers	
6.56 millions metric tons of CO_2e	0.32 metric tons of CO_2e per MWh
GHG emissions from power served to Oregon customers[1]	GHG intensity for power served to Oregon customers[1]

Resource Mix for Power Served to Oregon Customers



1. March 2024, https://portlandgeneral.com/about/who-we-are/sustainability

Emissions goals

80% by 2030

90% by 2035

100% by 2040

* Baseline = 8.1 MMTCO2e as established by Oregon DEQ based on average of 2010-2012 PGE reported emissions.

Based on energy served to retail customers within the State of Oregon, as required by Oregon DEQ.

Some or all the renewable energy attributes associated with PGE's Basic Service Mix may be sold, claimed, or not acquired.

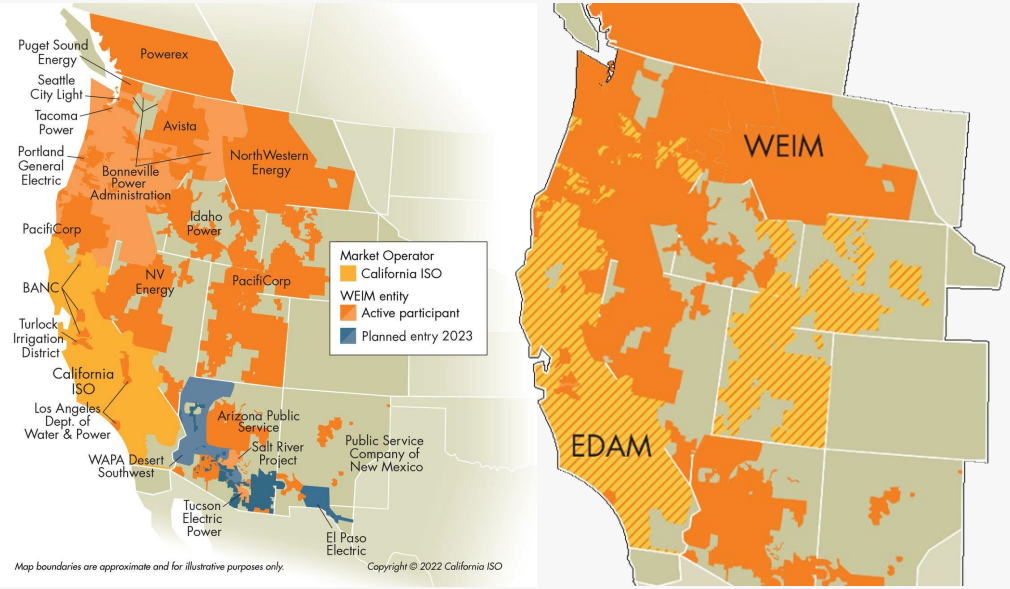
All 2023 emissions data is subject to change as internal review procedures are performed.

Certain emissions information is subject to review and approval by the Oregon DEQ and Environmental Protection Agency.

Regional resource adequacy

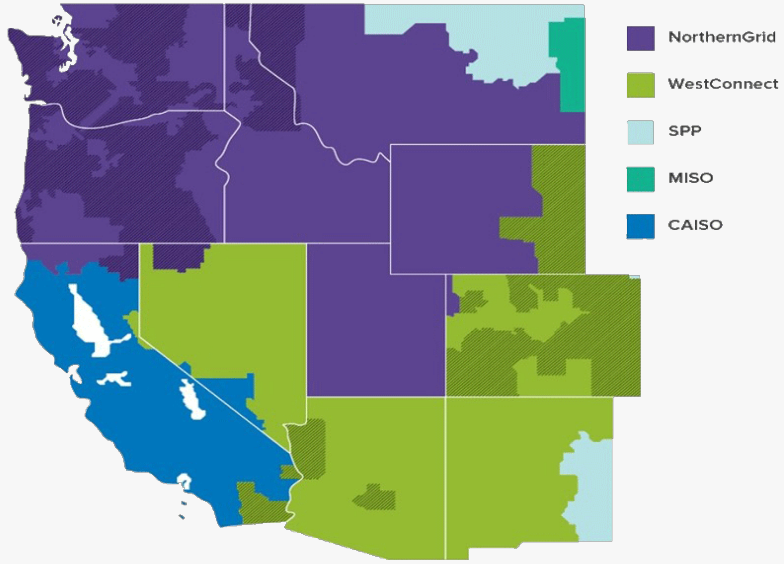
Complex market dynamics and challenges in connecting clean energy resources to customers increases the importance of virtual power plants

Western Market Evolution



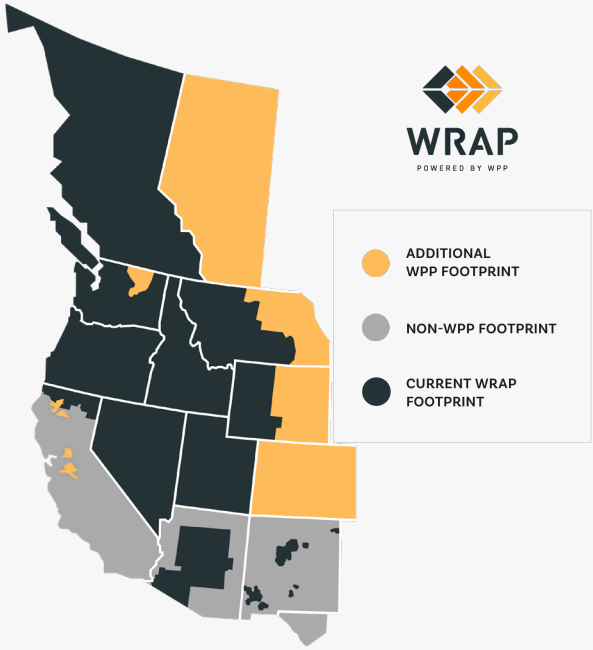
Building on the proven success and tangible benefits of the real-time Western Energy Imbalance Market (WEIM), the EDAM can increase regional coordination, support states' policy goals, and meet demand cost-effectively.

Transmission Planning



Transmission and distribution constraints remain a key barrier to the energy transition, as evidenced by steadily increasing curtailment and congestion costs across most market operators.

Western Resource Adequacy Program



The first regional reliability planning and compliance program in the West is a region-wide approach for assessing and addressing resource adequacy.

Flexibility for a reliable, affordable, clean energy future

Increasing customer choice and control requires a bidirectional, automation-enhanced grid

Traditional Generation Plants

- Wind
- Solar
- Hydro
- Nuclear
- Battery Storage

Regional Transmission Grid

Integrated Operations Center

- Grid Operations
- Power Operations
- VPP Operations

Two-way Distribution Grid

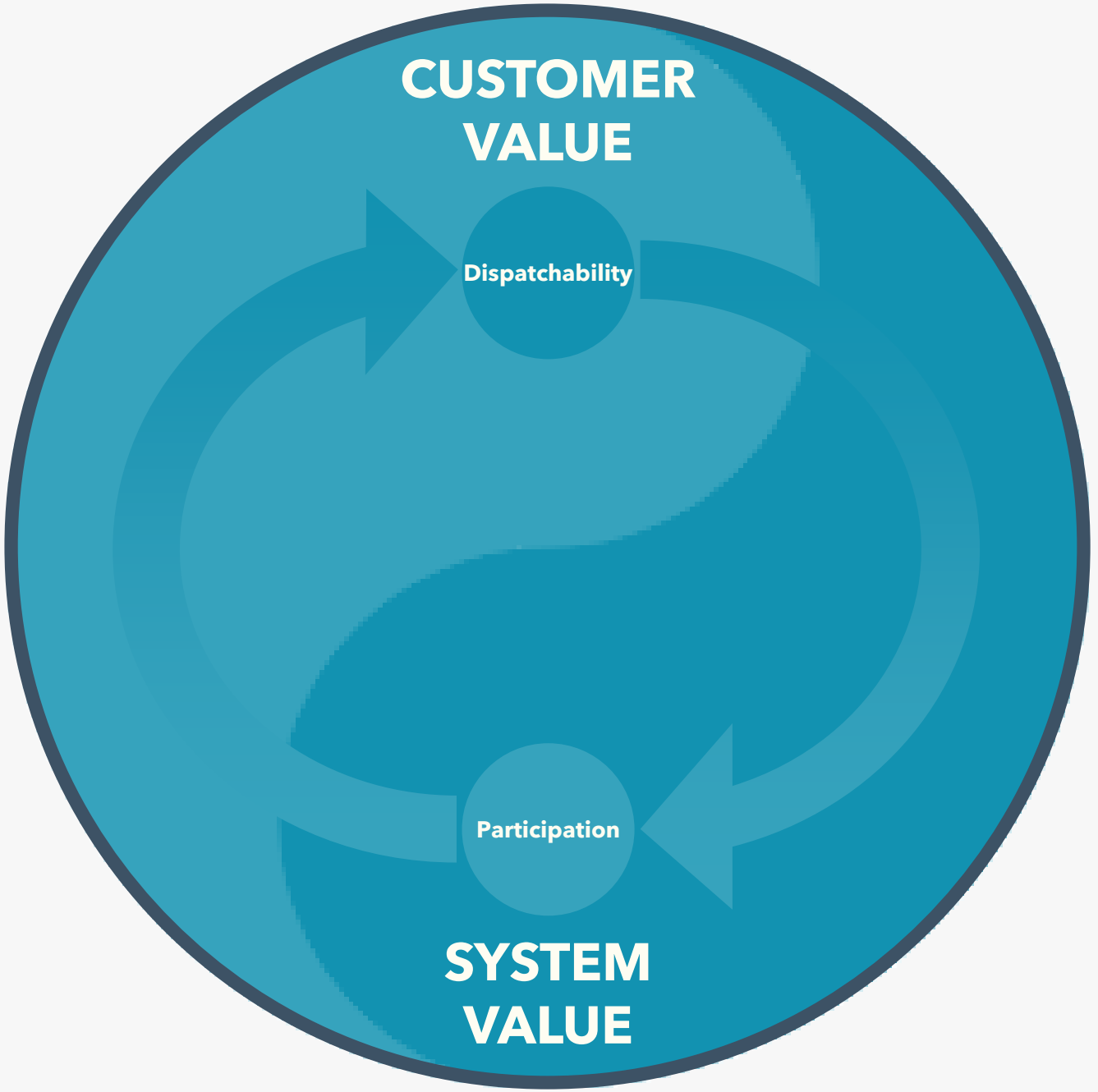
Virtual Power Plant

- Transportation
- Heating Systems
- Industrial Processes
- Solar
- Battery Storage
- Smart Devices

Customer

Orchestration

System



Fundamental Shifts

Thinking and operating differently to provide reliable power while accelerating the clean energy transformation and keeping costs as low as possible

1 Use every MW

MWs come in many shapes and sizes. Curtailment of clean generation is a last resort.

2 Flow the other way

Generation exists throughout the system. Flowing from generation to load, regardless of source and sink location must be standard operating procedure.

3 Flex the flow

Active participation means customers can choose when and how to consume or produce energy and PGE orchestrates the flow to maximize system utilization.

WE MUST SHIFT

As an **experienced guide,** PGE supports customers as they navigate change and uncertainty by **building connected solutions** together so that everyone can participate in the **grid of the future**.

FROM	TO
Energy Customer	***Energy Partner***
One-Way Flow	***Omni-Flow***
Centralized Control	***Centralized Coordination***
Peak Demand	***Optimized Utilization***
Generation to match Load	***Flexible Generation, Load, and System***
VPP is Cool	***VPP is Core***

Decarbonize

Electrify

Perform

Virtual Power Plant

PGE enables customers to shift their power usage from peak times while providing reliable and affordable energy

Virtual Power Plant

The orchestration of
Distributed Energy Resources and Flexible Load,
through technology platforms,
to provide grid and power operations services.

Flexible Load | **Distributed Thermal** | **Distributed Solar** | **Distributed Storage** | **Utility Storage**

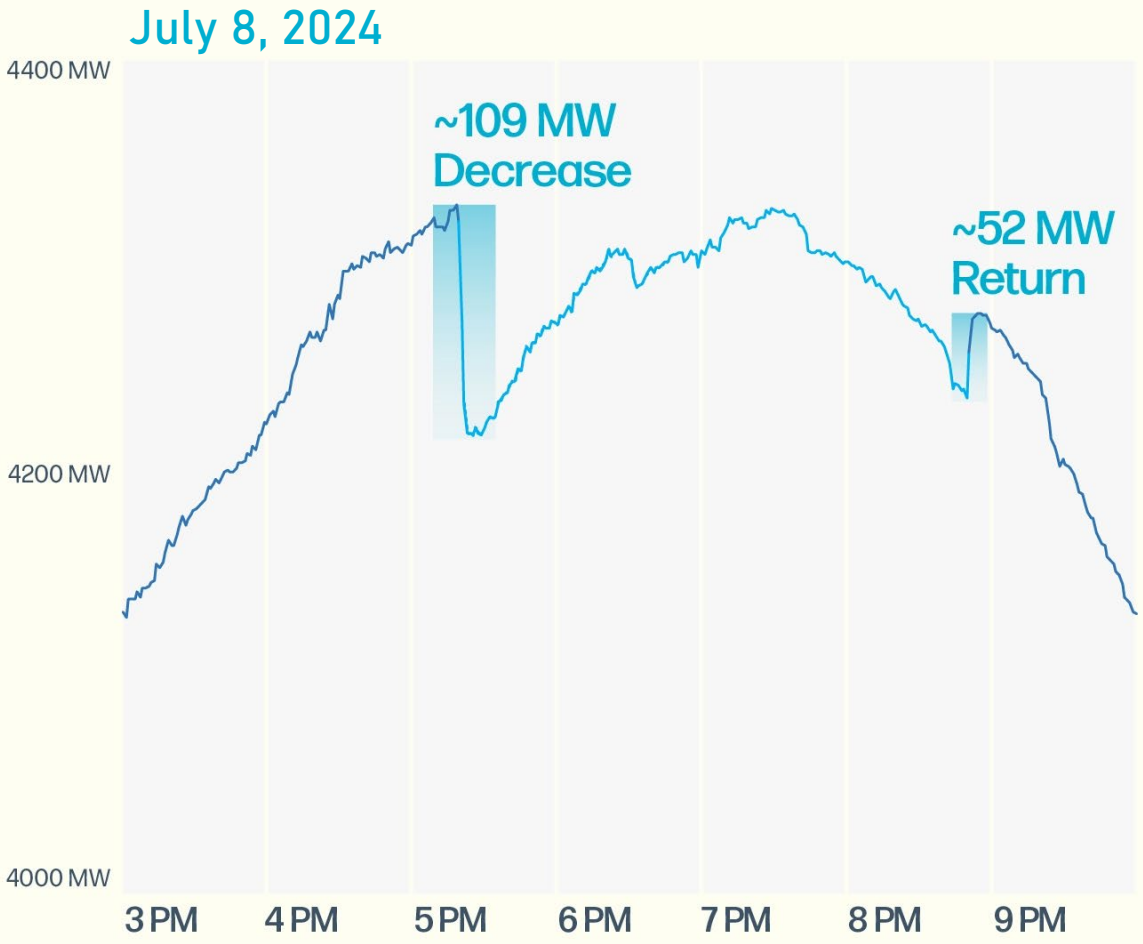
Technology Platforms

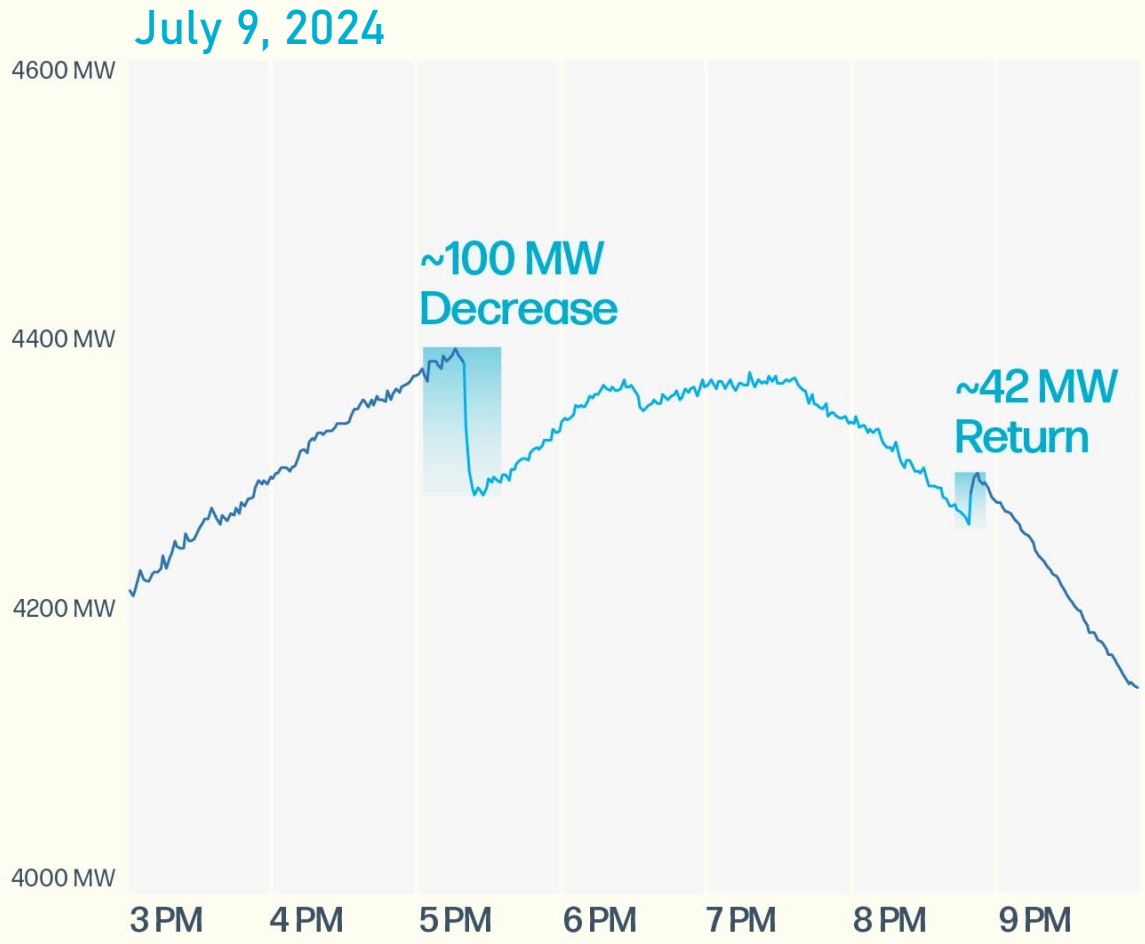
Policy and Regulation

To achieve a 25% peak usage offset while serving 100% of customer energy needs
PGE is targeting 2,000 VPP-enabled megawatts by 2030

Customer actions during heat events

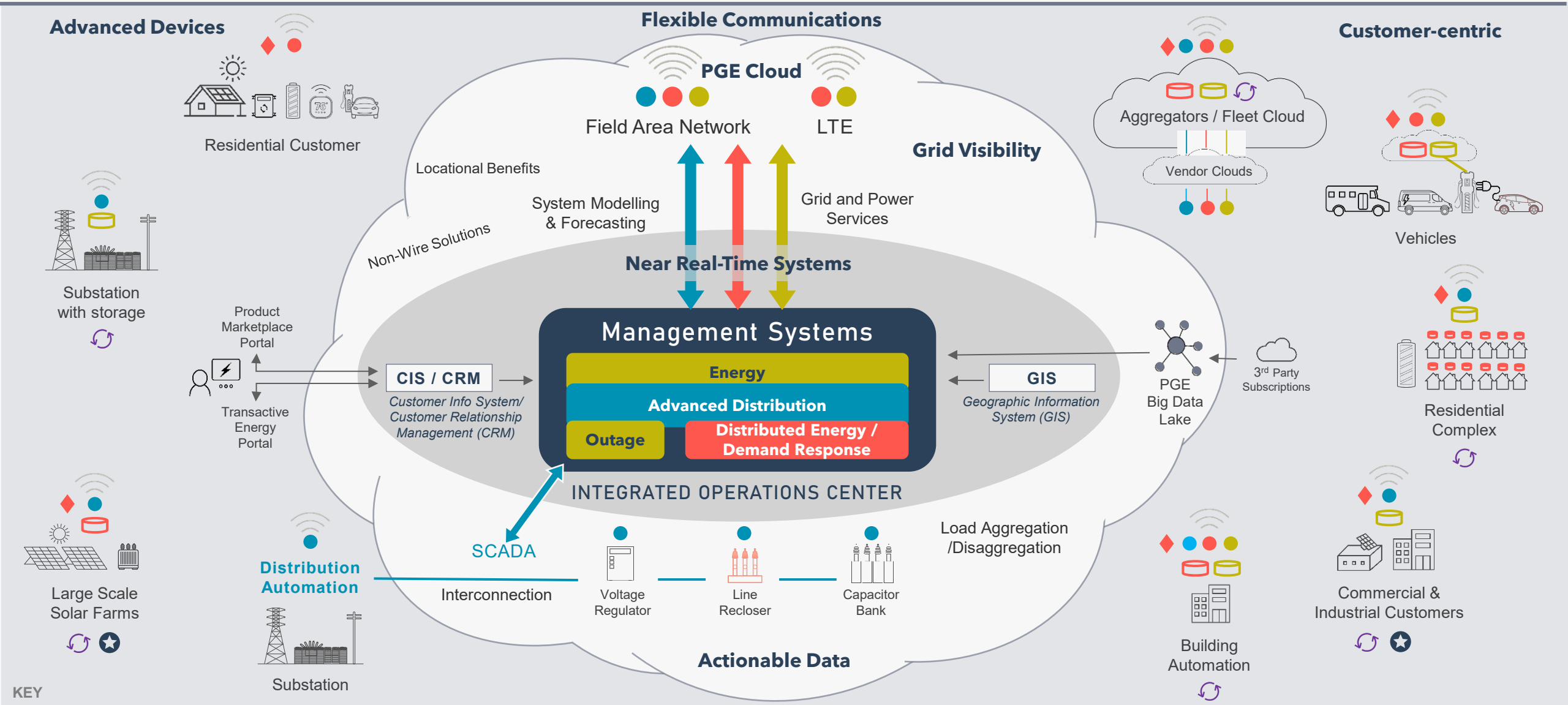
PGE Customers are making a big difference by shifting or reducing their energy use





On the inside

PGE manages the complexity of technology and infrastructure to provide reliable operation and deliver exceptional customer experience



KEY

- Potential µGrid / Microgrid
- Potential Qualified Facility
- Demand Response Mgmt System (DRMS)
- Distributed Energy Resource Mgmt System (DERMS)
- Nodes communicating with system
- Grid Edge Computing, Artificial Intelligence/ Machine Learning (AI/ML) Apps
- 1-way or 2-way communication through Vendor, Aggregator, or direct to PGE

On the outside

Customer expectations for increasingly clean energy, without compromising reliability and keeping costs as low as possible, require increased integration of Distributed Energy Resources and Flexible Loads

RESIDENTIAL

(SINGLE-, MULTI-FAMILY)

- Rooftop Solar
- Distributed Batteries
- Smart Devices
- Vehicle charging
- Heat pumps
- Thermostats
- Hot water

IOC

(INTEGRATED OPERATIONS CENTER)

- Uniform standards
- Open-source API
- Plug-and-play connectivity

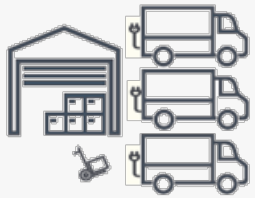
COMMERCIAL & INDUSTRIAL

- Heating Systems
- Building Management Systems
- Industrial Processes
- Warehouse automation
- Chillers
- Data Center
- Back up batteries & generation

MUNICIPALITY, SCHOOL, UNIVERSITY, HOSPITAL

- Community-based renewables
- Microgrids
- School bus V2G
- Advanced Heating/Cooling

As Virtual Power Plant capabilities increase, customers have more choice and control of the energy that powers their home, work, life and community.



TRANSPORTATION ELECTRIFICATION

- Transit & Freight
- Fleet charging
- Public charging
- Rental Properties
- OEM V2G and V2X

Let's meet the future together.

Contact:
Franco.Albi@pgn.com
Director, Regional Integration

PacifiCorp - Virtual Power Plant (VPP)






PACIFICORP®

POWERING YOUR GREATNESS

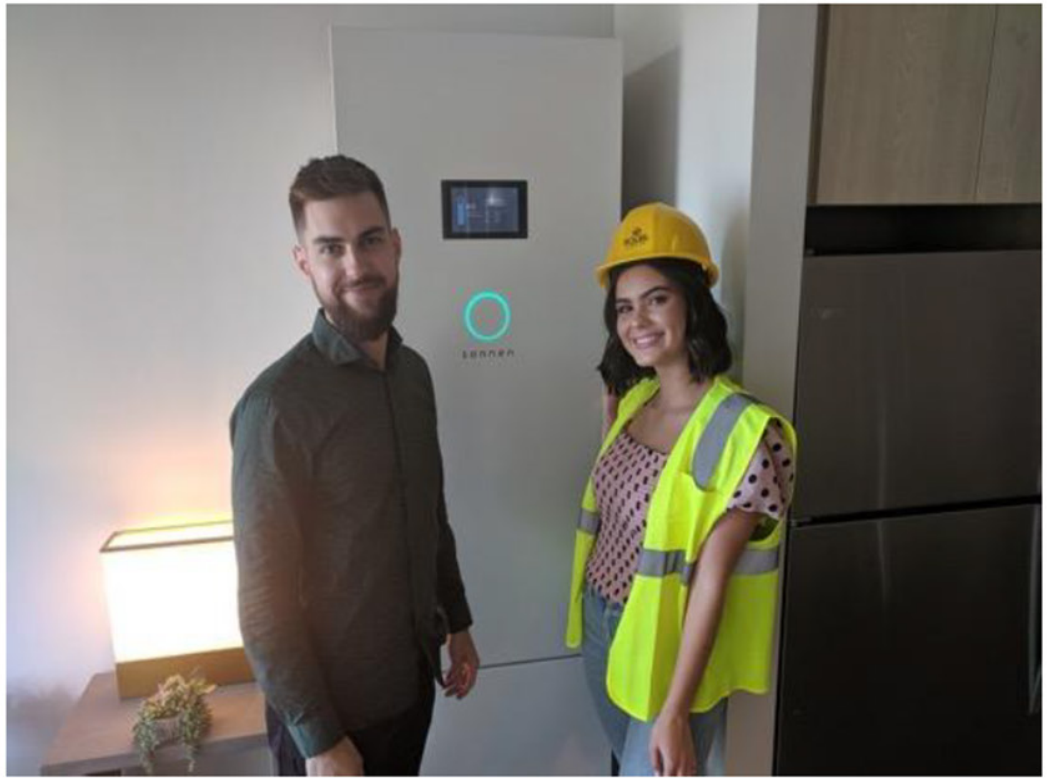
The Wasatch Soleil Lofts VPP,

Herriman, Utah

2019 - 2021

600 Units

- A 600-unit apartment complex which represents a genuine breakthrough for the clean energy industry
- First of its kind, utility controlled, all-electric, solar battery community Virtual Power Plant.
- Close partnership between sonnen, Wasatch Energy Group and Rocky Mountain Power (RMP)
- Project enabled by Rocky Mountain Power DBGMS innovation.



The Wasatch Soleil Lofts VPP,

Herriman, Utah

2019 - 2021

600 Units

- Total 4.5MW of instantly dispatchable capacity, 12.6MWh energy reservoir
- The Soleil Lofts Fleet VPP is being dispatched by RMP on a daily basis, bringing authentic value to the grid, representing an industry milestone, transforming erratic and intermittent renewable generation into a firm dispatchable grid asset
- Utility Dive "National Utility Project of the Year" 2020
- Soleil Lofts Named Utility Project of the Year 2020

Wattsmart Battery Program

Current Program Status

- 5,000 residential batteries enrolled – 30 MW
  - Additional 1,000 applications pending installation.
- Dispatch system fully integrated with PacifiCorp's Energy Management System for autonomous dispatch – primary used for frequency response
  - 2023 – 61 Events
  - 2024 – 150+ events YTD
- Program approved in Utah – 2020, Idaho – 2022, Wyoming – 2025; Pending approval in Oregon & Washington – expected Q1 2025

Grid Services Provided by Wattsmart Batteries

- Traditional demand response
- Daily peak shaving (load cycling)
- Distribution and site level Frequency Response – options for dispatchable or automated.
- Distribution feeder and substation peak management
- Distributed Battery Grid Management Solution (DBGMS)
  - Allows for flexibility in battery control total grid management
  - Approved Batteries
- Customer Partnerships
  - Back-up power for customers
  - Cost savings
  - Innovating for the grid of the future

Wattsmart Battery Program

- Battery Grid Management System (BGMS) allow for real-time autonomous dispatch
- Accelerates sustainable energy future
- Resilience benefits for customers
- Flexible resource to manage loads on the grid real-time
- 5,000 batteries enrolled
- Commercial batteries coming
- Forecasting 100 MW of batteries under control in near-term.

Technology Pioneer Winner:

“The Wattsmart Battery DR Program”

Wattsmart Battery Program-Innovating the grid of the future

(YouTube link for use in PDF)

Thank You!

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POWERING YOUR GREATNESS