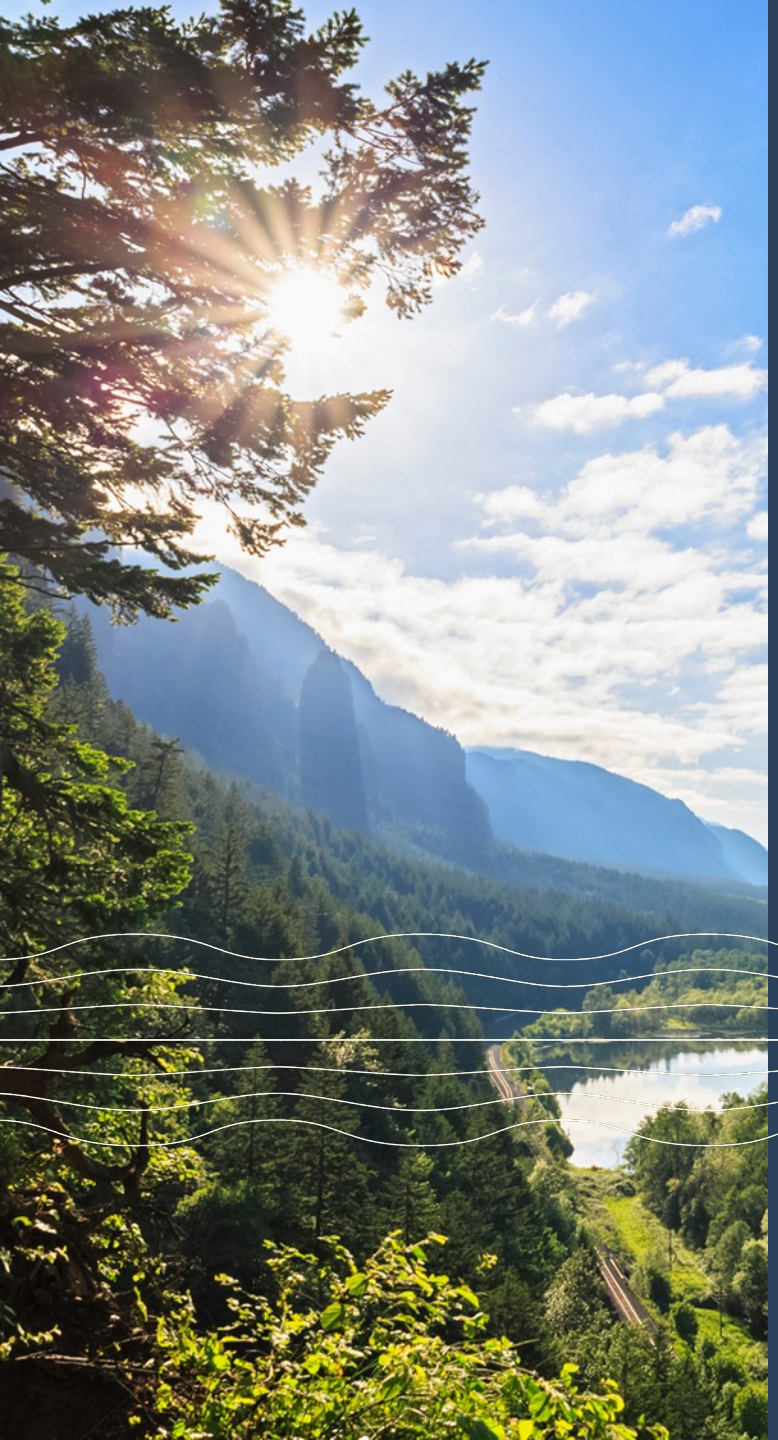


Transforming the Grid

Through Community-Based Demonstrations

NREL AES Workshop

May 10, 2022

Agenda

- PGE at a Glance
- Market Drivers
- Grid Modernization Overview
- Integrated Grid Roadmap
- Priorities for Rapid Progress
- SALMON
- Building a New Business Function

PGE at a Glance

Quick Facts:

- Vertically integrated utility including generation, transmission and distribution. Serving 4,000 mi^2
- PGE customers:
  - Residential 773,514
  - Commercial 110,028
  - Industrial 200
- Serves 46% of Oregonians, 51 incorporated cities
- Total number of employees ~3,000

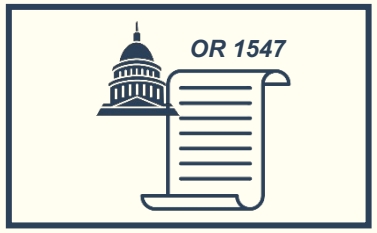
Service Territory

PGE is operating in an increasingly complex & changing environment

We need to evolve our grid capabilities to best meet our customer and community needs

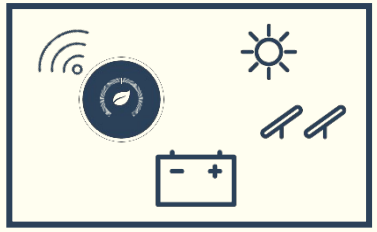
Customer Expectations

Regulatory Environment

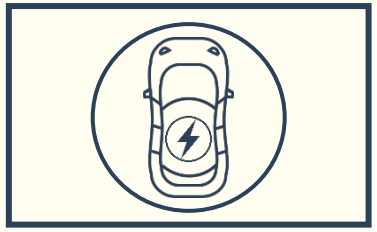


Evolving Energy Markets

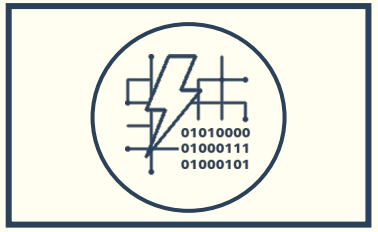
Distributed Energy Resources



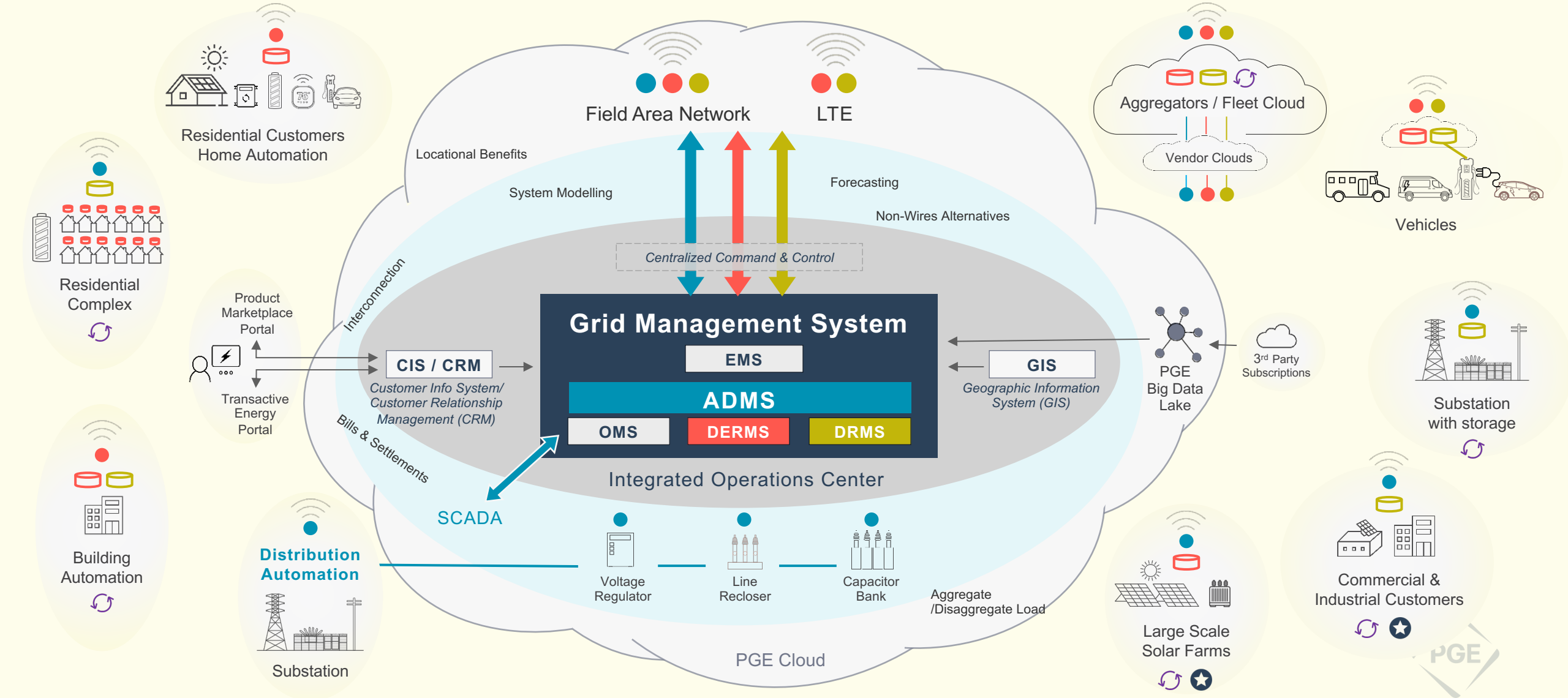
New Dynamic Loads



Increased Network Complexity

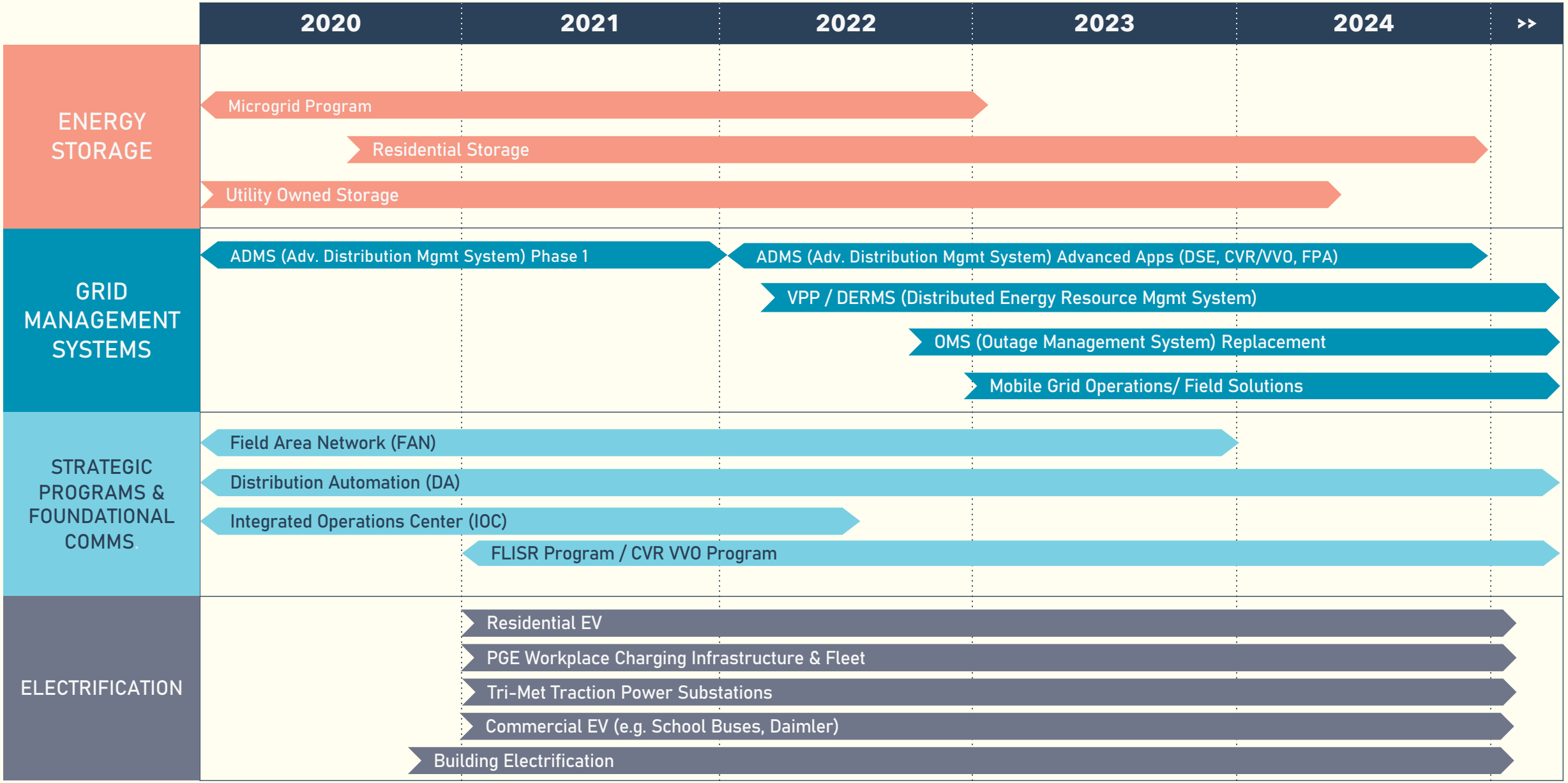


PGE Grid Modernization – Conceptual Overview of the Grid

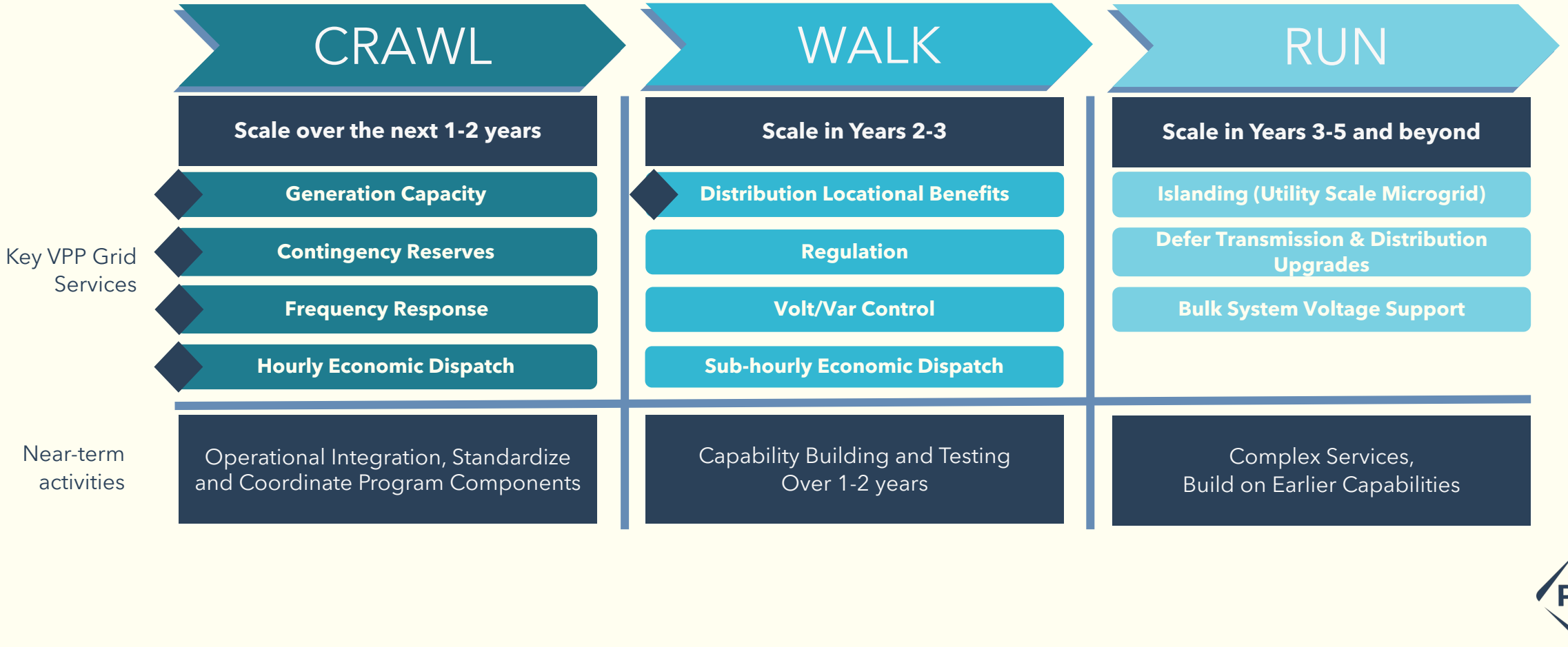


KEY Potential µGrid / Microgrid · Potential Qualified Facility · Demand Response Mgmt System (DRMS) · Distributed Energy Resource Mgmt System (DERMS) · Node communicating with system · 1-way or 2-way communication through Vendor, Aggregator, or direct to PGE

Integrated Grid Roadmap – 5 Year View



Strategic Priorities for Rapid Progress



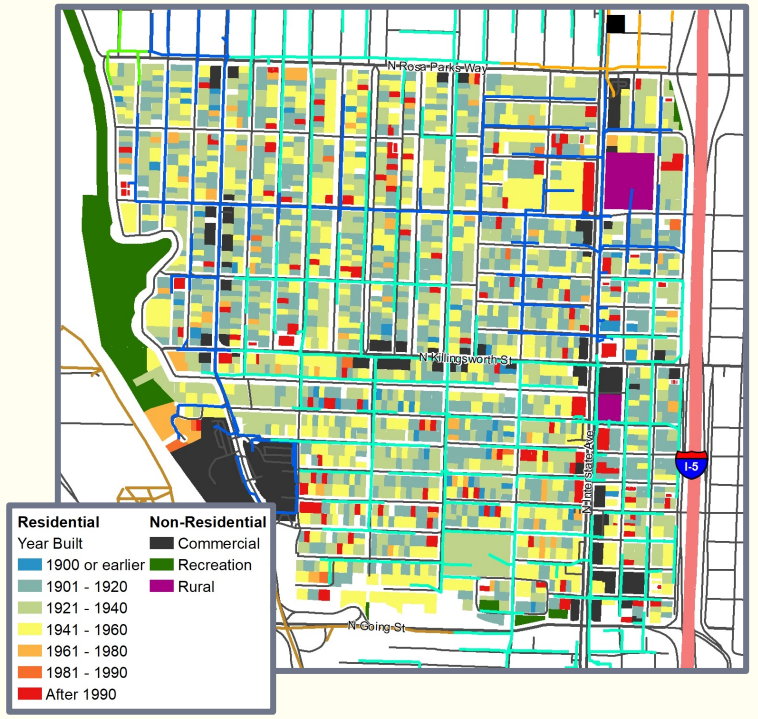
SmartGrid Asset Load Management & Optimized Neighborhood – SALMON

Project Team:

- Portland General Electric (PGE)
- Energy Trust of Oregon
- Northwest Energy Efficiency Alliance (NEEA)
- Community Energy Project (CEP)
- National Renewable Energy Laboratory (NREL)

Building Retrofits:

The project will retrofit ~580 buildings, improving the energy efficiency by an average of 10%, while building 1.4 MW of flexible load.



Goals:

- Build a flexible load resource consisting of EE, connected devices, solar, storage, and EV charging
- Demonstrate bulk services (energy, capacity and frequency response) and distribution services (capacity relief, power quality, and Volt/Var optimization)

Project Learning:

- Program Design
- Customer Engagement Strategies, focus on Underserved Communities
- New Partnership Models
- ADMS/ DERMS Assessment
- DER/EE Valuation and Co-Benefits
- Building on Regional Sharing

Building a new business function.

STRATEGIC PILLARS

DECARBONIZE:
Zero GHG Emission by 2040;
80% reduction by 2030

ELECTRIFY:
Leverage DERs and flexible load to meet customers' needs and keep the grid resilient as load growth increases

PERFORM:
Continue to meet customer needs and expectations by keeping power affordable and reliable and leveraging human-centered design principles

VPP OPERATING MODEL VISION

PGE enables and scales a **fully-integrated, system** (people, processes, tools) that can effectively plan, manage, and optimize a network of **dispatchable distributed energy resources (utility-owned or not)** to achieve a **safe, reliable, and resilient clean energy future** where all customers are enticed to participate and benefit.

Thank you!

Timothy Treadwell

Manager, Customer Technology Demonstration

Portland General Electric