PGE 2019 Smart Grid Report Update

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July / 16 / 2019

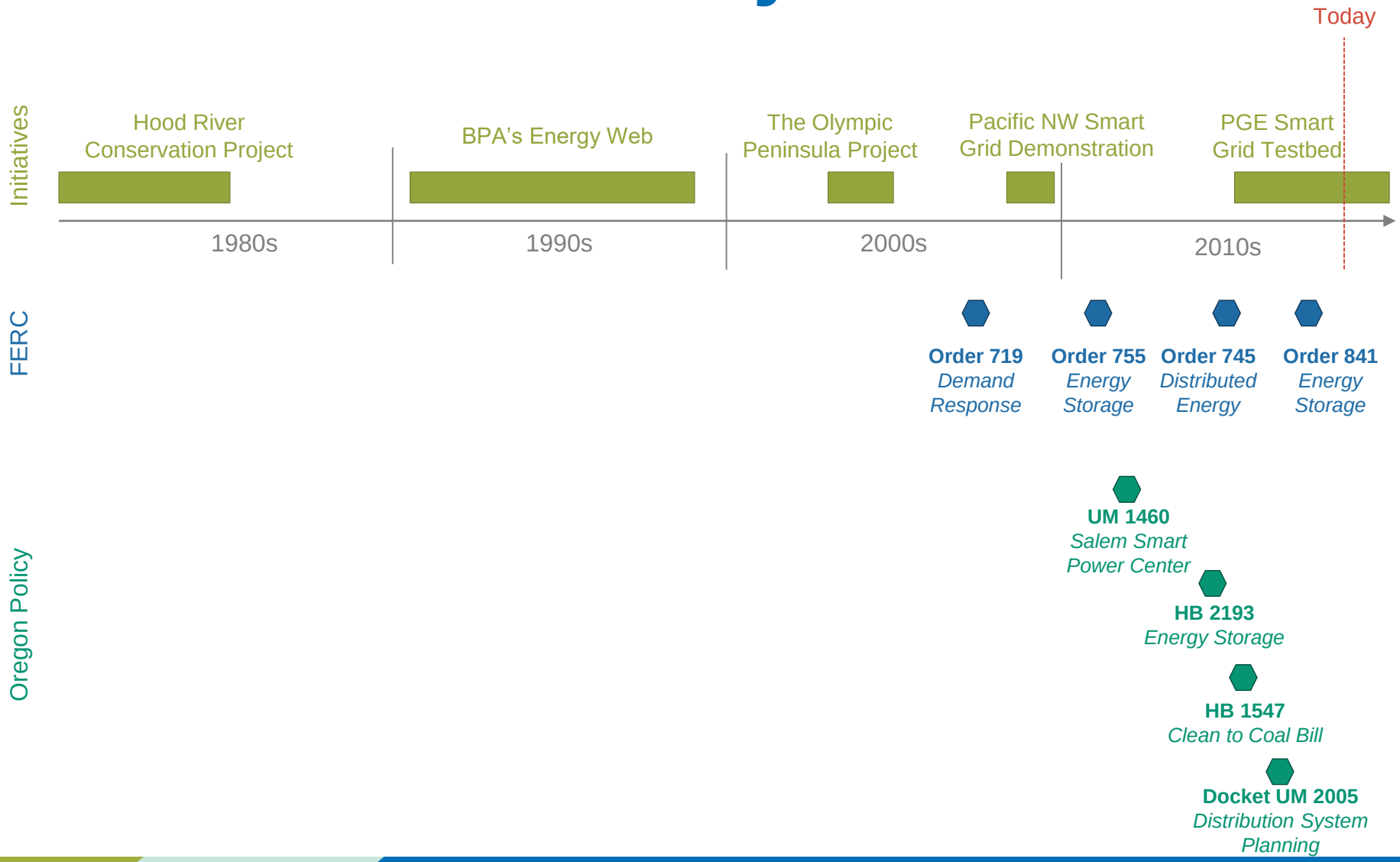
Docket UM 1657

Today's meeting

- Smart Grid Evolution
- PGE's 2019 Smart Grid Report
- Moving Forward

Smart Grid Evolution

Smart Grid History



Commission 2012 Vision

Order No. 12-158, Docket UM 1460

OPUC's Policy Goals and Objectives: The Commission's goal is to benefit customers of Oregon investor-owned utilities by fostering utility investments in real-time sensing, communication, control, and other smart grid measures that are cost-effective to consumers and that achieve some of the following:

- Enhance the reliability, safety, security, quality, and efficiency of the transmission and distribution network
- Enhance the ability to save energy and reduce peak demand
- Enhance customer service and lower cost of utility operation
- Enhance the ability to develop renewable resources and distributed generation

PGE's Original Smart Grid Vision

PGE's Smart Grid Vision

An end-to-end transformation of the distribution system that will deliver more value and control to customers while allowing PGE to operate the system more safely, efficiently and reliably.

- Technology as a means to achieving benefits:
  - Increased operating efficiency
  - More customer choices
  - Enhanced system reliability
  - Improved system asset utilization
  - Reduced cost of integrating renewables
  - Informed use of electricity

2014

2013

PGE's Smart Grid Vision

The transition to a smart grid will be *evolutionary, not revolutionary*

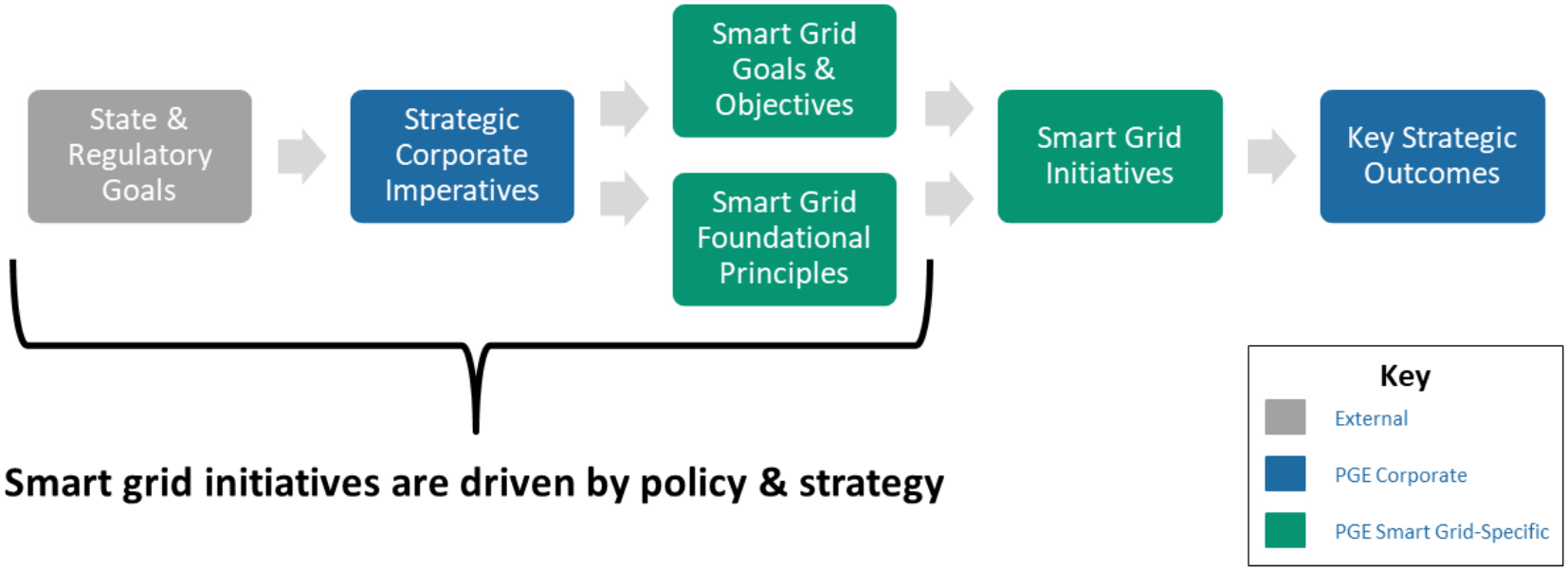
- End-to-end transformation of electrical distribution system
- Enhanced value
- Ability operate the system more efficiently, safely and reliably

"The transition to a smarter grid will be a significant challenge and involve far more than simply leveraging new technology. Realizing the benefits of a smarter grid requires major changes in the way electricity is provided and used. Arriving there will take time."

PGE's 2019 Smart Grid Report

PGE's 2019 Smart Grid Strategy

The goal of the PGE Smart Grid is to empower PGE customers with access to clean, reliable, affordable and equitable electricity through intelligent integration of automated and connected technologies and innovative operational practices and customer offerings.



PGE's Imperatives

Decarbonize

Reduce GHG emissions by more than 80% by 2050

Electrify

Increase electricity to 50% of total energy use by 2050

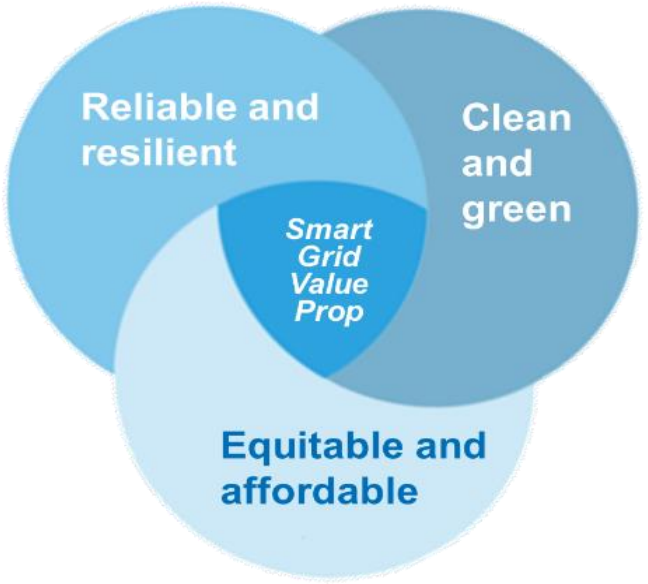
Reliability

Deliver operational excellence for future investment

Smart Grid Foundational Principles

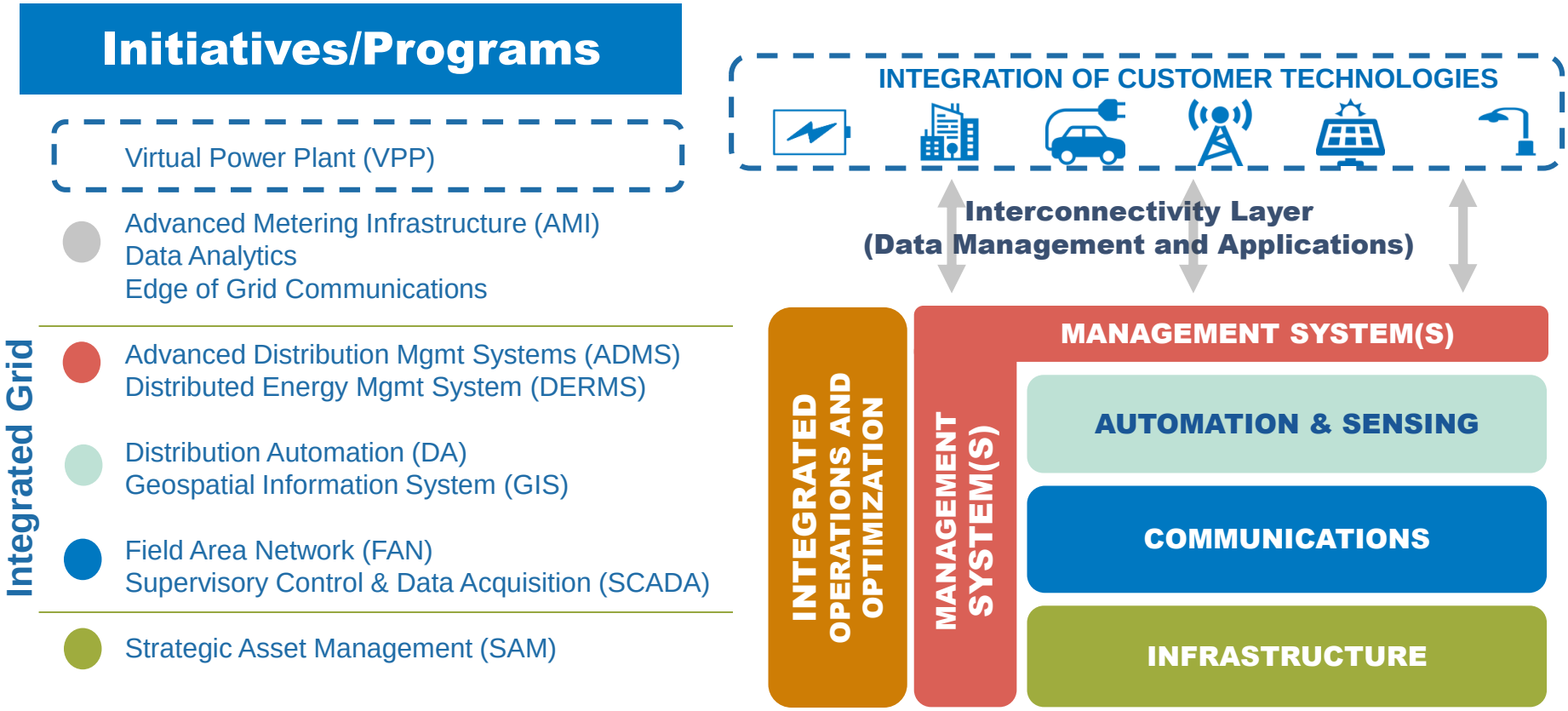
The three foundational principles that underlie the PGE Smart Grid are:

- **Clean & Green:** Customers expect the Smart Grid to help meet their energy needs while addressing greenhouse gas emissions
- **Equitable & Affordable:** Customers expect smart grid investments to result in fair prices and equitable access to energy
- **Reliable & Resilient:** Customers expect smart grid investments to build a more reliable, resilient, clean, and secure grid



Integrated Grid Program

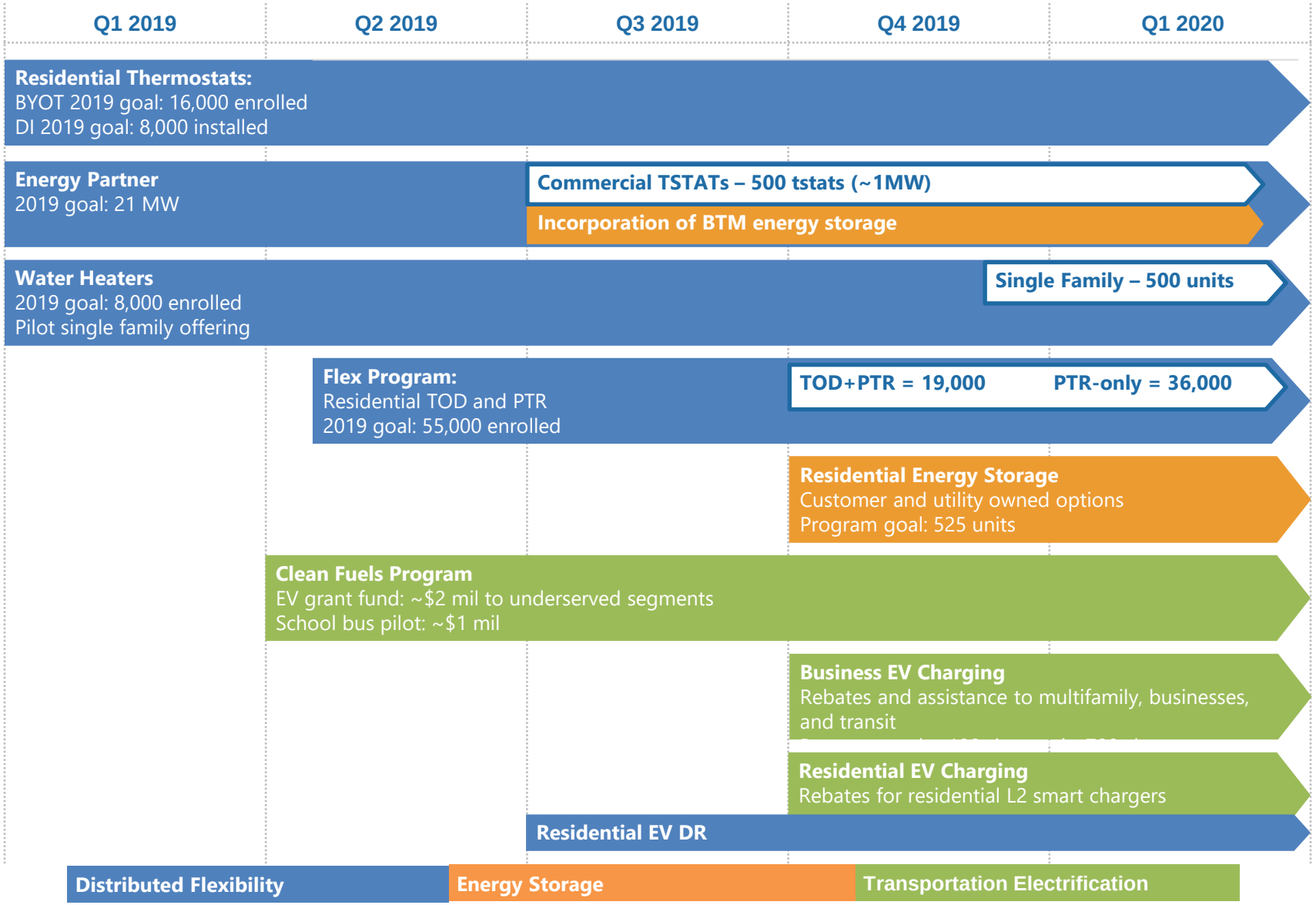
Integrated grid is the first conceptualization of what we will be planning for in the distribution system planning docket UM 2005.



Integrated Grid Roadmap

		2019	2020	2021	2022+
INTEGRATED GRID INITIATIVES					
	DERMS	Operation of existing platforms		Select Future Architecture/Toolset	DERMS Implement/Interface
	ADMS	Project Planning Phase	Phase 1 DSCADA, DMS Core	FLISR & Advanced Applications	
	DA	10 Feeders 40 Switching Devices	16 Feeders 64 Switching Devices	22 Feeders 88 Switching Devices	22 Feeders 88 S.D. 2022 & 2023
	GIS	Update GIS data model to support ADMS implementation and operation			
	FAN	Design/Phase 1 Implementation	Phased construction of full network		
	SCADA	Ongoing deployment of advanced SCADA to distribution substations for reliability and automation purposes			

2019 Program Plan



Smart Grid Initiative Themes

In this Smart Grid Report, we modified the way we organize smart grid initiatives to reflect higher levels of integration. Initiatives are grouped by theme in a way that reflects how different technology assets and operational practices enable and empower customers.

Customer Engagement & Empowerment

Data & Analytics

Connecting & Enabling Technology

Transportation Electrification

Research & Development

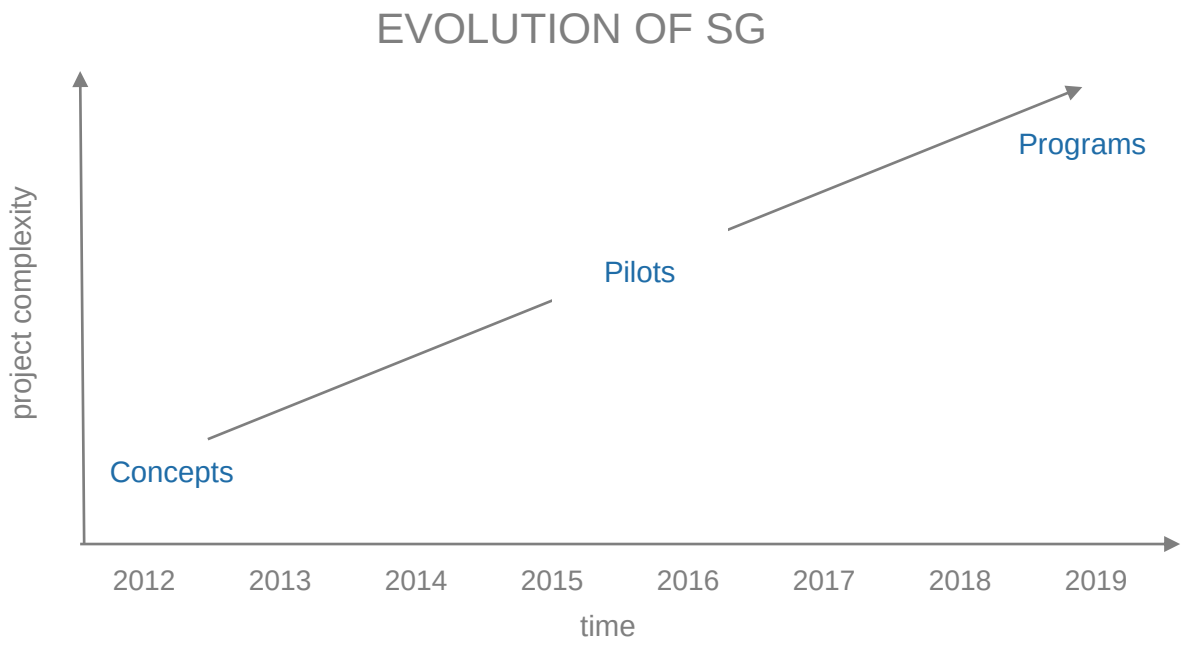
Physical & Cyber Security

Staff Report Recommendations

Category	Recommendation	Response
Demand Response Projects	PGE report on the effectiveness of the proposed changes to the Energy Partner, Smart Thermostats, and other demand response pilot projects.	PGE has given regular updates on Energy Partner, smart thermostats, and other demand response pilot projects. PGE created the demand response advisory group (DRAG) to help inform and give updates to Staff regarding PGE's demand response activities. Additionally, PGE has made preliminary filings and made a commitment to file a more comprehensive report on all demand response activities.
Distributed Energy Resources	PGE provide an update on cost-effectiveness methodologies of DERs.	As discussed at a workshop April 28, 2017, current PGE valuation practices are based on capacity savings in-line with our current acknowledged IRP. PGE anticipates additional and more granular avoided costs data would be developed through a PUC DR docket. The 2019 IRP and the Distribution System Planning (DSP) docket UM 2005 may also grant additional insights and information.
Distribution System Planning (DSP)	PGE provide an update to its DSP efforts as directed through LC 66 and other pertinent dockets	The OPUC opened a formal investigation into DSP on March 22, 2019 (UM 2005). PGE will be providing updates to the DSP consistent with the schedule and requirements coming out of UM 2005. The beginnings of a DSP-like tool, hosting capacity, is likely to be developed as part of UM 2005.
Customer Engagement Transformation Projects	PGE provide specific examples of how CIS and MDMS projects are enabling demand response and Customer Engagement Transformation project	CIS/MDMS enables Demand Response in the following ways: • Supports a high number of pricing buckets within a day (previous limit was 3). • Better identification of people associated to accounts allows for more tailored marketing efforts for programs • Can reflect credits associated with DR on the bill • Supports the display of DR events and the customer's actions via self-serve channels such as the web

Moving Forward

From Concept to Reality



2019 Transportation Electrification Plan

2019 Distribution System Planning Strategy

2019 Demand Response Reporting

New PGE Filings

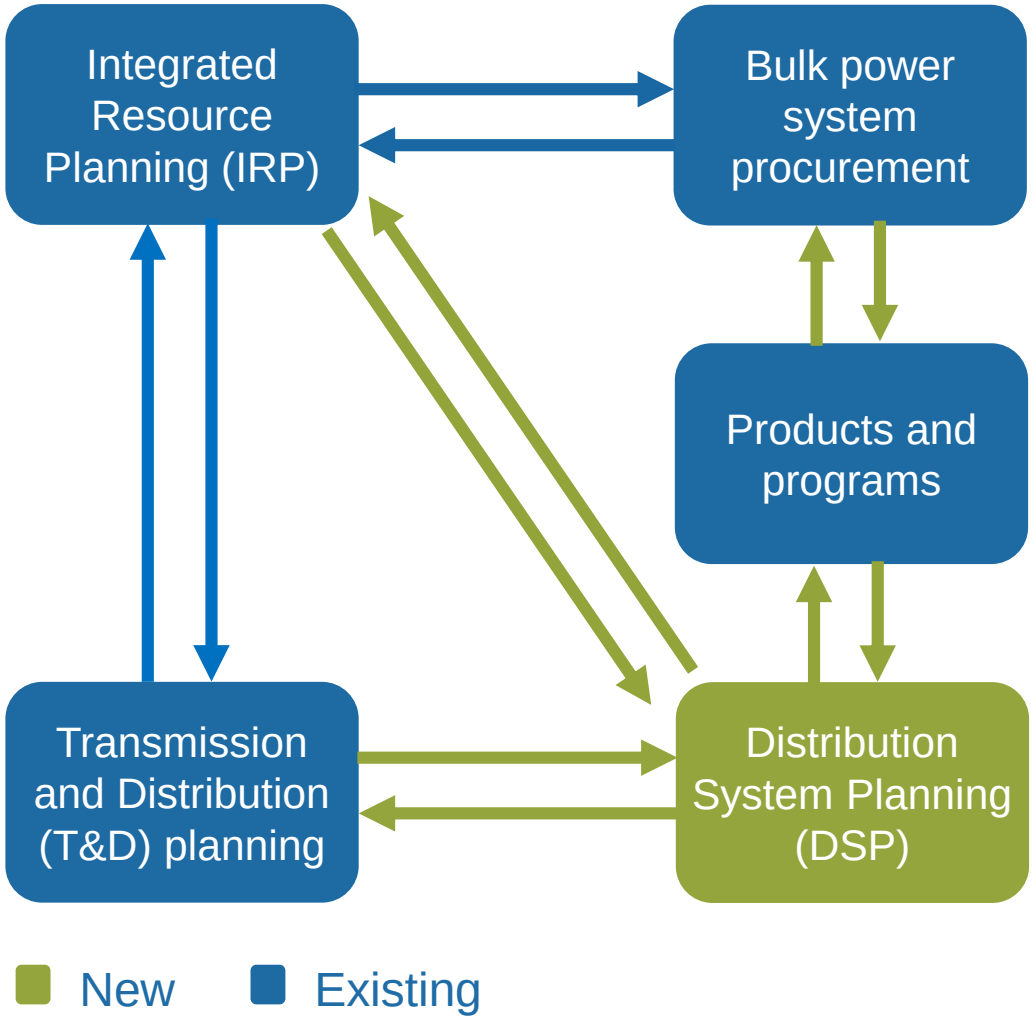
Smart Grid Report evolution

2012 SG Report:
Exploration of what SG might be

2013-2017 SG Reports:
Incremental focus on technologies meant to communicate, visualize, and control assets on the distribution system, project funding shift to distribution system

2019 SG Report:
Implementation of integrated grid and development of DERS

Enhanced planning across the integrated grid



Integrated resource planning capabilities:

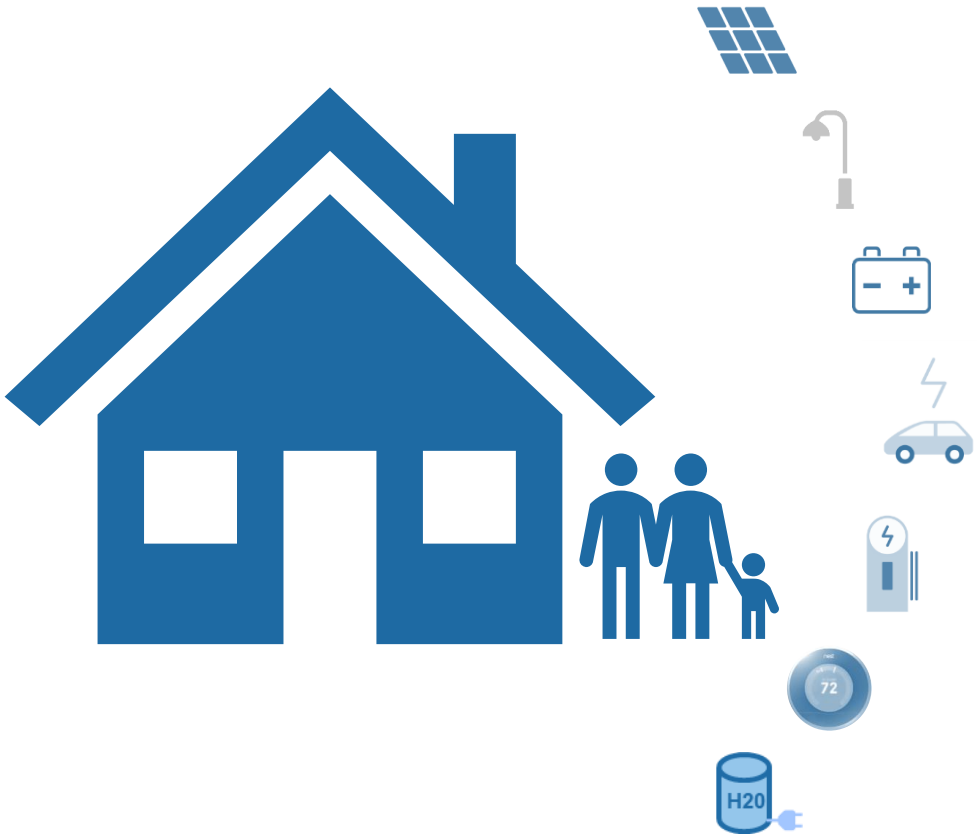
Analysis integrating the contribution of distributed resources – with all system resources, information and infrastructure – to ensure procurement decisions maximize system safety, reliability, and affordability and enable new opportunities

Appendix

Initiative Spotlight

PGE Testbed

Customer Engagement & Empowerment



Testbed Objectives

- Identify sustainable customer value proposition
- Gather learnings and insight to accelerate the pilot to program cycle
- Gather learnings and insight to accelerate resource development
- Identify EE/DR coordination opportunities
- Gather learnings and insight to incorporate the grid edge into PGE's integrated grid vision and operations
- Gather PGE service territory specific, applicable information about resource potential

Testbed Substations

Customer Engagement & Empowerment

Delaware

- Planned for reconstruction by end of 2019
- Modern SCADA and DA scheme in development
- University of Portland Solar + Storage
- Kaiser Interstate Campus

Roseway

- New Construction
- Planned for future reconstruction
  - Communication
  - Visualization
  - Remote operation
- Customer mix includes residential subsets

Island

- Multifamily and high concentration of commercial business
- High number of electrically heated homes
- Challenging recruitment
- High profile site for the City

Initiative Spotlight

Connecting & Enabling Technologies

Advanced Distribution Management System (ADMS) & Distributed Energy Resource Management System (DERMS)

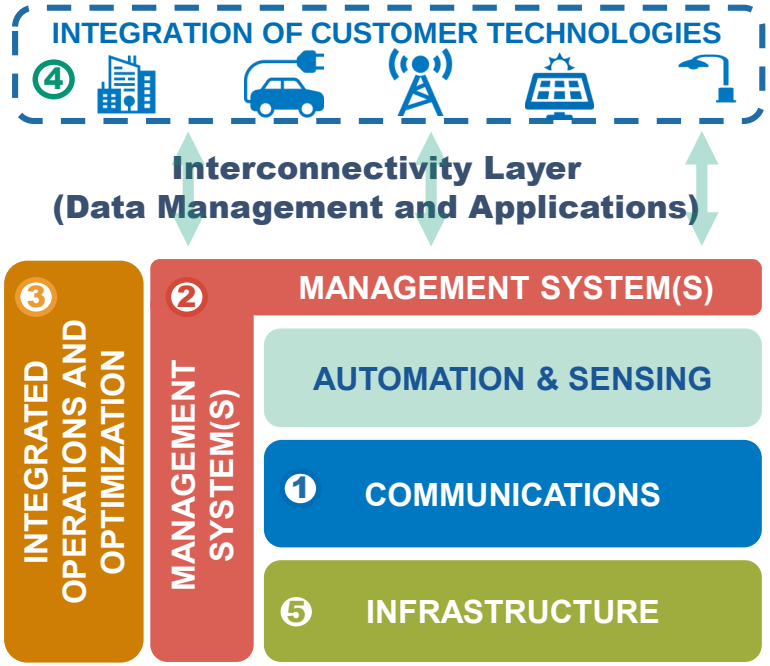
What is it?

Advanced Distribution Management System (ADMS) and Distributed Energy Resource Management System (DERMS) are operational technology systems that monitor, control, optimize, and safely operate all elements within a distribution system.

How does it add value and fit into PGE's strategy?

ADMS/DERMS provides the capability to monitor, control and optimize two-way energy flow within the integrated grid. This capability is foundational and critical to the management of a modern day distribution system and meeting customer expectations.

ADMS will provide increased visibility and control of the distribution grid by integrating *automation* and *sensing* devices and operating DERs. The project will also allow system wide deployment and operations of initiatives such as Demand Response (DR), Distribution Automation (DA), Energy Storage, and Fault Location, Isolation, System Restoration (FLISR).



Initiative Spotlight

Distribution System Planning (DSP)

Connecting & Enabling Technologies

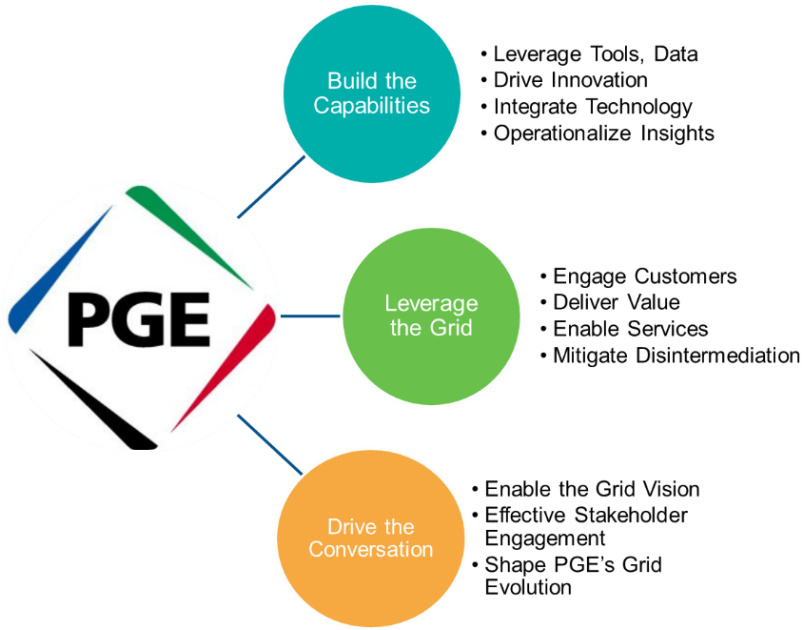
Robust distribution system planning is required to achieve our goals around equitable, affordable, and sustainable decarbonization of the energy economy. For this reason, PGE has formally kicked off a distribution system planning team and process in support of our own operational needs and to support the regulatory process underway.

DSP will support PGE to do the following

Enable PGE to continue delivering safe, reliable and secure energy as the mix of resources on the system continues to evolve;

Accelerate greenhouse gas reductions by enabling the integration of low carbon resources; and

Facilitate system efficiency and cost reductions by better reflecting the value of distributed energy resources.



Initiative Spotlight

Transportation Electrification – Active Initiatives

Transportation Electrification

Electric Avenue Expansion

- 6 new sites
- RFP complete; site selection on-going
- Milwaukie and Hillsboro in service
- Key Features:
  - Accessible
  - Visible
  - Reliable
  - Fast (50-kW)
  - Field Upgradeable (>300-kW)

Electric Mass Transit

- 40-foot all-electric bus (200 kWh/ea)
  - 2 buses in service; 3 buses in testing
- Charging equipment
  - 450 kW overhead fast charger
  - 100 kW depot charging
  - Upsized transformer pad, conduit, vault, and switchgear
  - Installation Q3/Q4 2018

Outreach & Technical Assistance

- Trainings: workplace and fleet charging classes offered to customers
- Ride & drives: National drive electric week; Uber
- Technical assistance support for customers
- Dealership engagement

Emerging Programs Under Development

- OPUC Order 10/9

Clean Fuels Program: Programs will support electrification, provide benefits to residential customers, and support traditionally underserved communities.

- Drive Change Grant fund proposals are currently being accepted

Residential Charging: rebates for customers installing a connected level 2 home charger--program filed for consideration.

Business Charging: incentives for businesses to install workplace or fleet charging stations—initial program filed; modified proposal forthcoming.

Transportation Electrification Plan: summary of all current and future EV activities to be filed with OPUC in Q4, 2019.

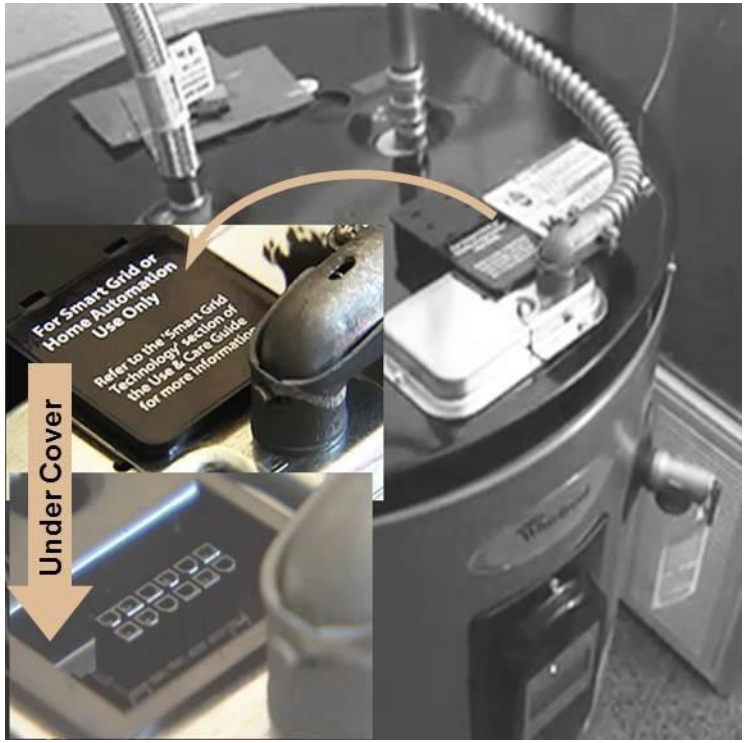
Initiative Spotlight

Smart Water Heater Market Transformation

Research & Development

Project Insights:

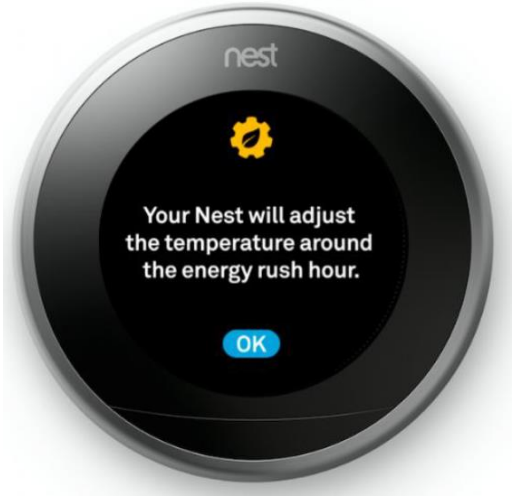
- The use of the standard socket (i.e. CTA-2045) for water heater control was highly successful from viewpoints of customer satisfaction and utility economic benefits
- So much so that Washington state passed HB 1444 in May, that among other things, requires CTA-2045 on all water heaters Jan. 1, 2021
- Economic water heater control in Oregon will be insignificant without CTA-2045 on tank shipped from the factory
- If Oregon cannot pass a similar law to HB 1444, PGE will request cost-effective funding for CTA-2045 market transformation beginning Jan 1, 2021

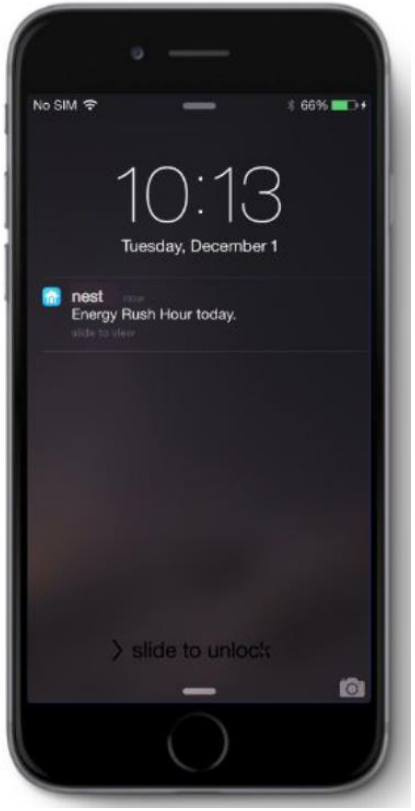


During an Event

Minimal impact to customer

- Adjust thermostat two to four degrees
- Average event lasts three hours
- No events on holidays





PGE 50MW DR Call on June 12, 2019