Chapter 4
Modernized Grid: Building a Platform for Participation

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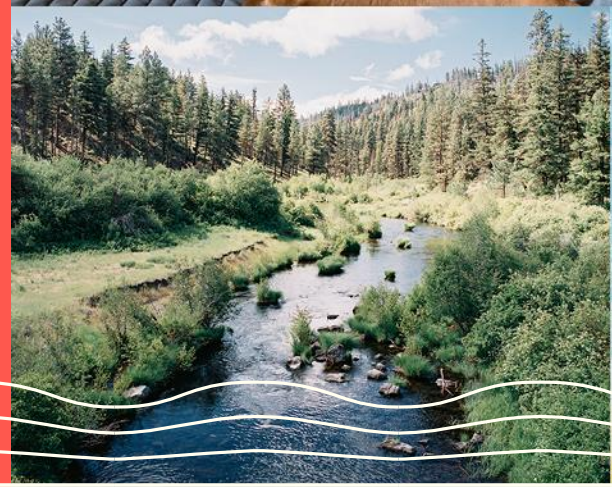


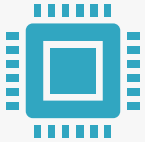
Chapter Regulatory Response

DSP Section	Summary Description	Action
4.5, 4.6	Smart grid investment opportunities Key opportunities for distribution system investments	Worked with SMEs across the company and using national best practices developed a modernized grid framework and investments within
4.7	Roadmap of planned investments, activities, and tools to achieve the vision	Leveraged Power Plan and SMEs to report on current and planned activities
4.8	R&D the utility is undertaking	Leveraging R&D filing in accordance with UE 294, Order 15-356

Desired Outcomes

Decarbonization

By managing DERs connected to the grid, grid operators can co-optimize across available resources to ensure least cost and carbon intensity in resource dispatch.



Reliability

Investments in sensors and communication devices to improve resolution of the distribution grid can help operators better predict distribution system needs and take necessary steps to prevent system reliability issues.

Resiliency

Through investments in smart algorithms and sensing devices feeder sections can be isolated to create microgrids that provide resilience during severe weather.

Security

While grid modernization investments increase the number of access points for cyber security risks, PGE is taking proactive steps through investments in cyber security solutions and integration of cyber-physical security in planned investments.

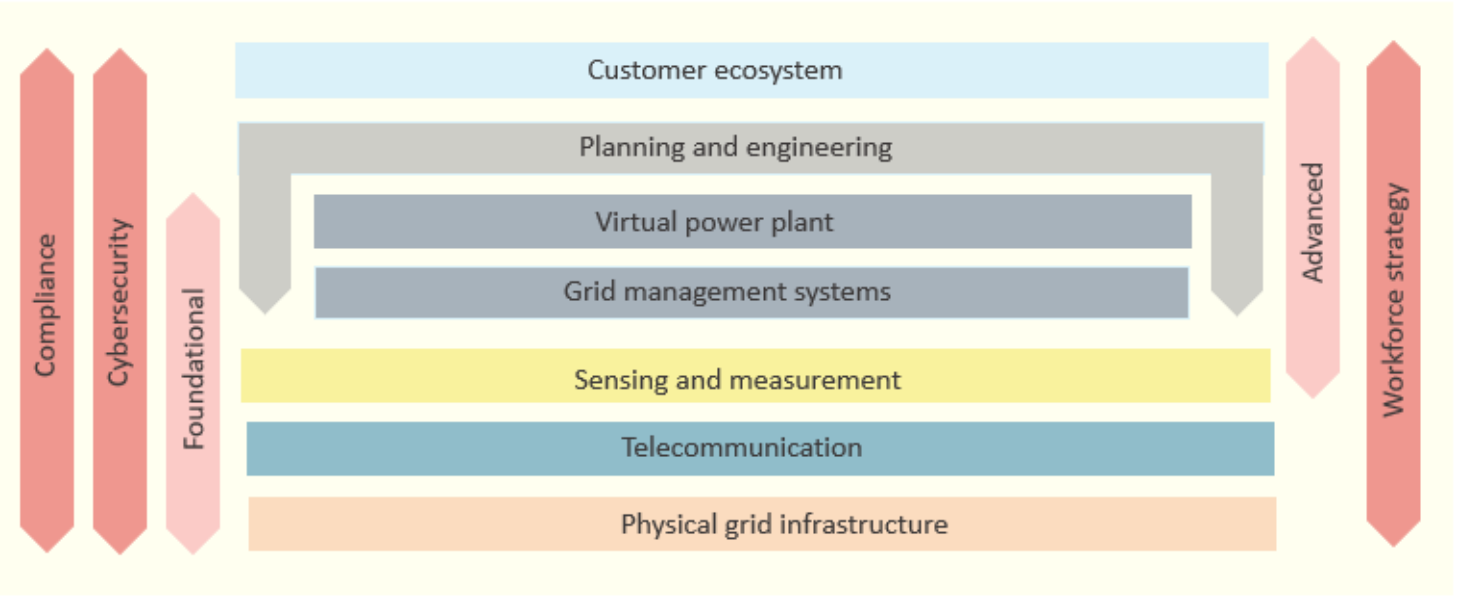
Assist Environmental Justice Communities

Through investments in analytics platforms that use smart meters, PGE can develop improved rate designs and DER programs to assist with energy burden relief in environmental justice communities. PGE has already started developing this load shaping solutions through its Time of Use programs.

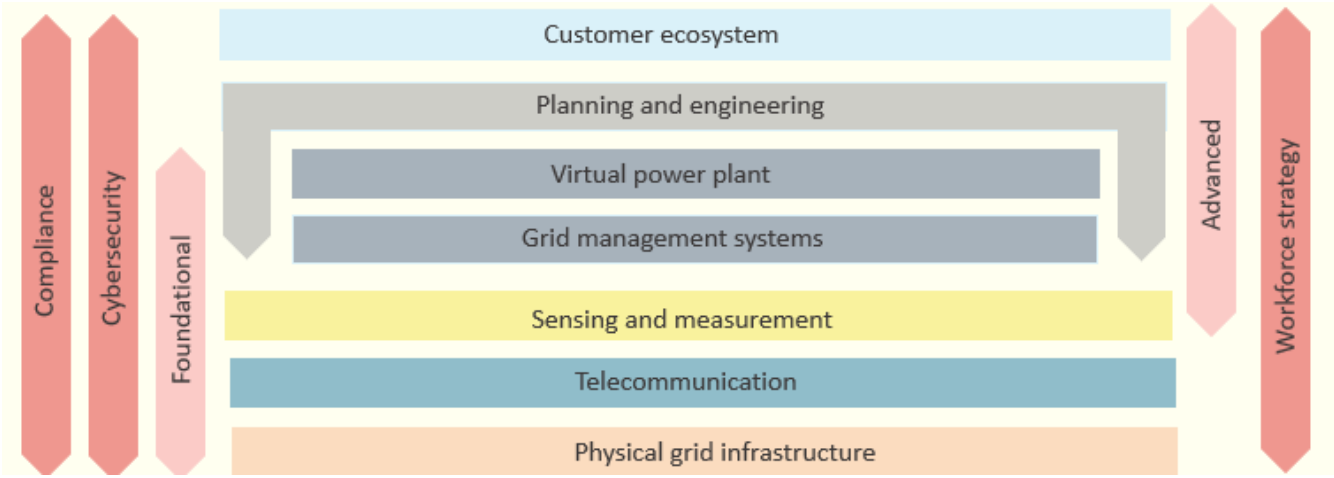
Modernized Grid

PGE has established a modernized grid framework. The different capabilities within this framework form layers that interact with each other to deliver customer value

PGE's modernized grid framework



PGE's Modernized Grid Framework



Foundational capabilities

- The set of core platform investments needed to improve resolution and basic control of the distribution system.
- These investments follow a least-cost, best-fit approach, usually through a request for proposal (RFP) or similar process.

Advanced capabilities

- Investments that build on or, in some cases, supplement foundational investments to develop advanced controls of the grid.
- Depending on their function, either go through a benefit-cost analysis or use a least-cost, best-fit approach.

Overarching capabilities

- Impact both foundational and advanced capabilities investment.
- Are key considerations when making the investments after the primary need is addressed.
- Include cybersecurity, workforce implications and other compliance needs.

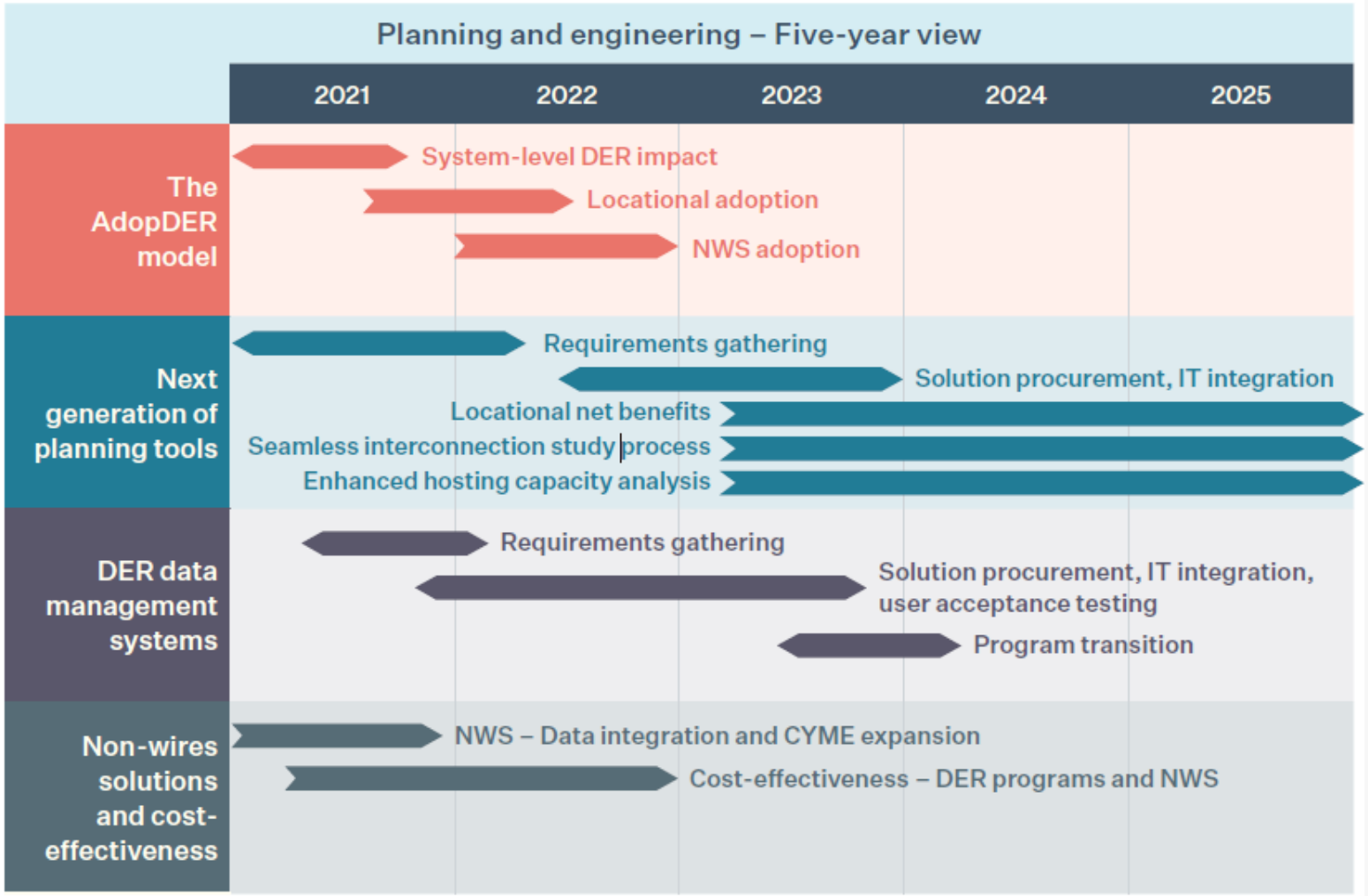
Planning and Engineering

Description	A suite of integrated tools to perform distribution system planning and engineering functions
Need Statement	Improved planning enables optimal grid investments including DER integration through information exchange and non-wires solutions
Example Technologies	CYME/Synergi (powerflow analysis), Envelio, cost-effectiveness tools, AdopDER (DER forecasting), OpusOne
Example Functions	Grid needs analysis, locational net benefit analysis, non-wire analysis, hosting capacity analysis, DER forecasting

Planning and Engineering – Continued

Cost	Robust distribution planning tools, Experienced planning engineers, IT integrations
Benefits	Distribution planning and engineering is how PGE accomplishes its goals and objectives for the distribution grid and its customers, such as, safety, reliability, resiliency, customer choice, decarbonization and electrification
Current Maturity	Enabling
Barriers	Advanced planning capabilities not supported by current market tools
Planned Investments	Bottom-up DER forecasting and potential – The AdopDER model, Next Generation Planning Tools Project, Non-wires solutions (NWS) – data integration and CYME expansion, DER Cost-Effectiveness Update Project, DER database management system (DERDMS)

Planning and Engineering – Planned Investments



Note: Includes future initiatives

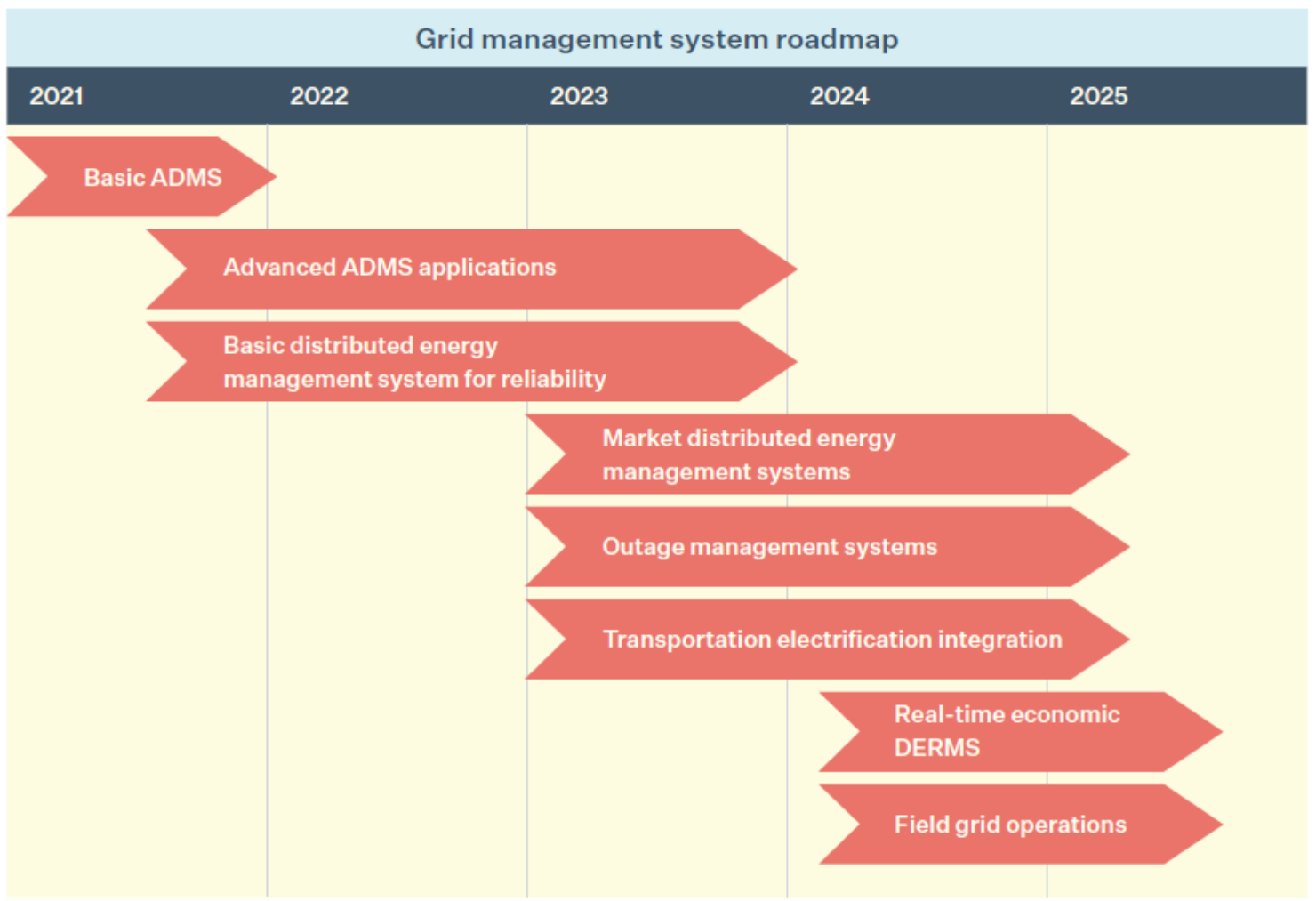
Grid Management Systems

Description	A set of computer-aided tools used by operators of electric utility grids to monitor, control, and optimize the performance of the distribution system
Need Statement	Shifting from central management of one-way power flows supplied by relatively few bulk generators to coordinating large numbers of DERs creating two-way power flows may cause grid stability issues. As DER adoption grows, the number of possible control actions will increase and the time to execute those control actions will decrease beyond the capability of human grid operators to react to events on the electric grid. Safety and reliability issues will increase in both frequency and magnitude unless advanced technologies are used to stabilize our electric grid.
Example Technologies	ADMS, DERMS, OMS, DRMS
Example Functions	Monitor grid operations, analyze the data collected, predict events and grid behavior through algorithms and issue commands to grid devices based on the analyzed information - FLISR scheme and CVR control

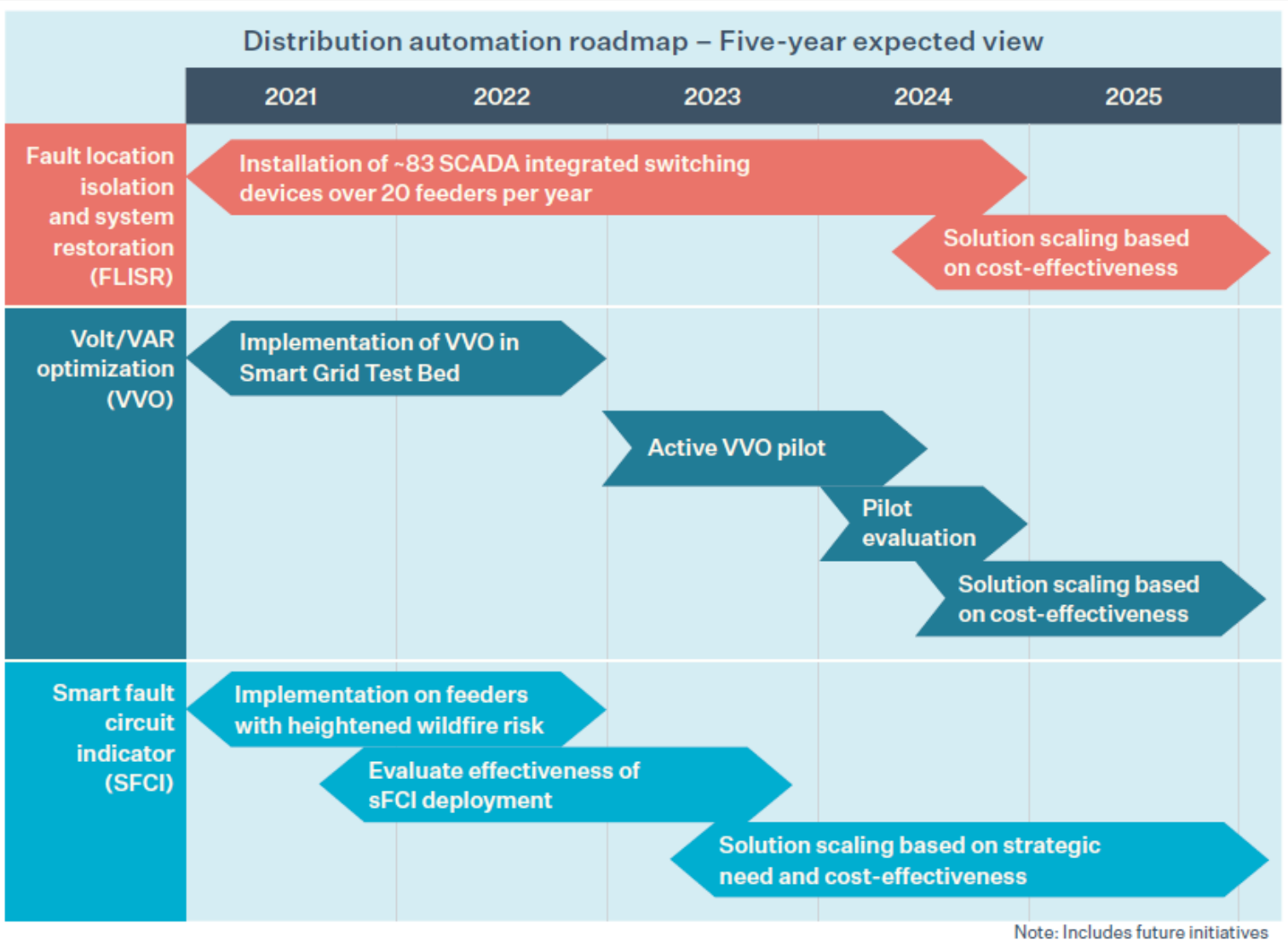
Grid Management Systems – Continued

Cost	Grid management system hardware, software and infrastructure, Cybersecurity infrastructure and protocols
Benefits	Empower customers and decarbonize through DER enablement, Improve workforce safety and productivity, Improve grid efficiency and reliability, Improve grid resiliency
Current Maturity	Integrating
Barriers	Balancing spending with rate impacts, Complex IT/OT integration
Planned Investments	ADMS, OMS, Distribution Automation (FLISR, VVO, sFCI), Substation Protection and Automation, FAN, Automated Metering Infrastructure Improvements

Grid Management Systems – Planned Investments

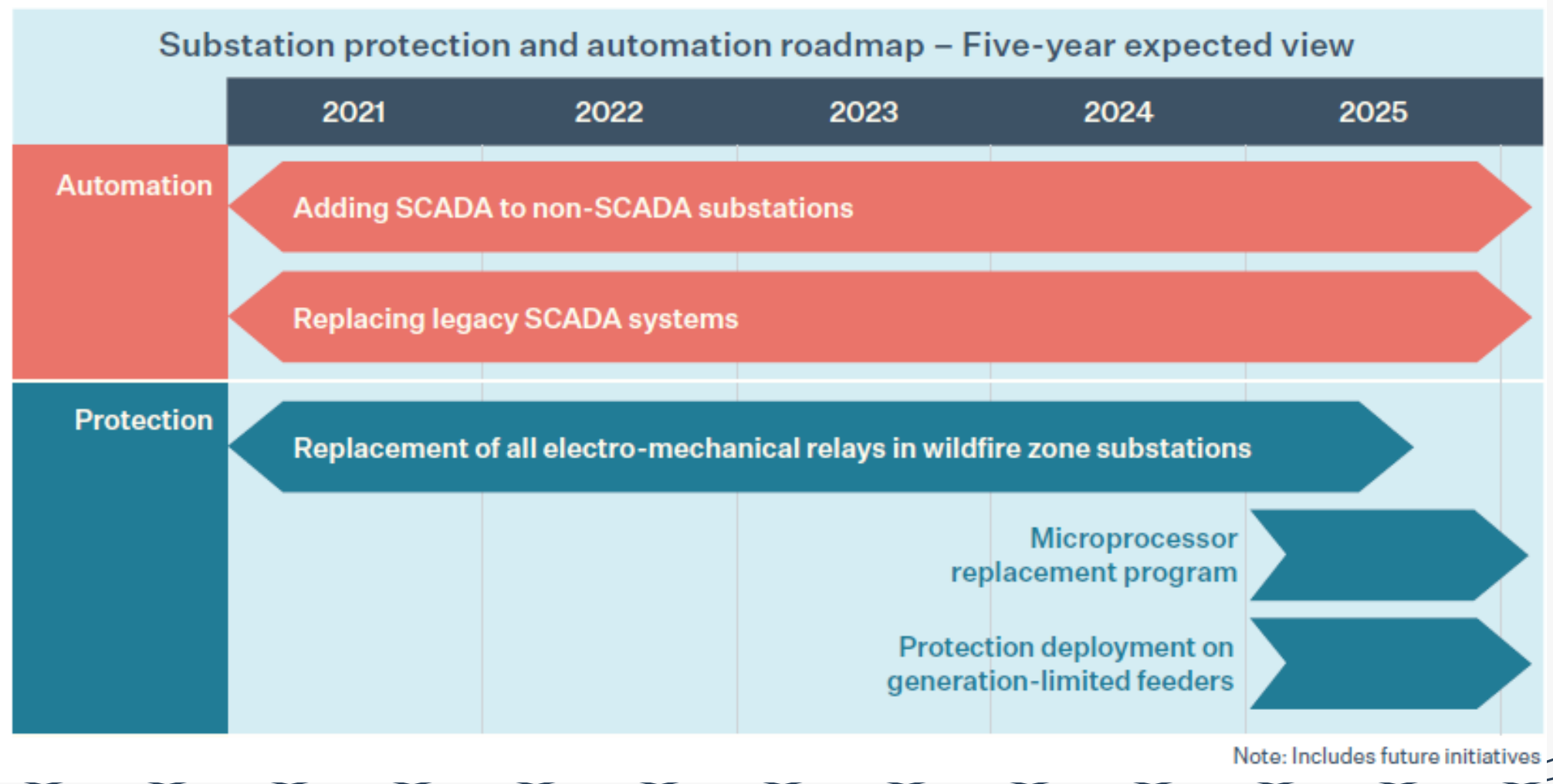


Distribution Automation – Planned Investments



Note: Includes future initiatives

Substation Protection and Automation – Planned Investments



Modernized Grid Investment Framework

DOE's Recommended Framework to Justify Grid Modernization Investments

Expenditure need	Methodology	Examples
Grid expenditures to replace aging infrastructure, new customer service connections, relocation of infrastructures for roadwork or the like and storm damage repairs.	Least-cost, best-fit or other traditional method recognizing the opportunity to avoid replacing like-for-like and instead incorporate new technology.	Planning tools and models, physical infrastructure, sensing devices, telecommunication devices
Grid expenditures required to maintain reliable operations in a grid with much higher levels of distributed resources connected behind and in front of the customer meter that may be socialized across all customers.	Least-cost, best-fit for core platform, or Traditional utility cost-customer benefit based on improvement derived from technology	Smart meters, volt-VAR management, optimization analytics
Grid expenditures proposed to enable public policy and/or incremental system and societal benefits to be paid by all customers.	Integrated power system and societal benefit-cost (e.g., EPRI and NY REV BCA)	Non-wires solution analysis
Grid expenditures that will be paid for directly by customers participating in DER programs via a self-supporting, margin-neutral opt-in DER tariff, or as part of project-specific incremental interconnection costs.	These are "opt-in" or self-supporting costs, or costs that only benefit a customer's project and do not require regulatory benefit-cost justification.	Customer portion of DER costs

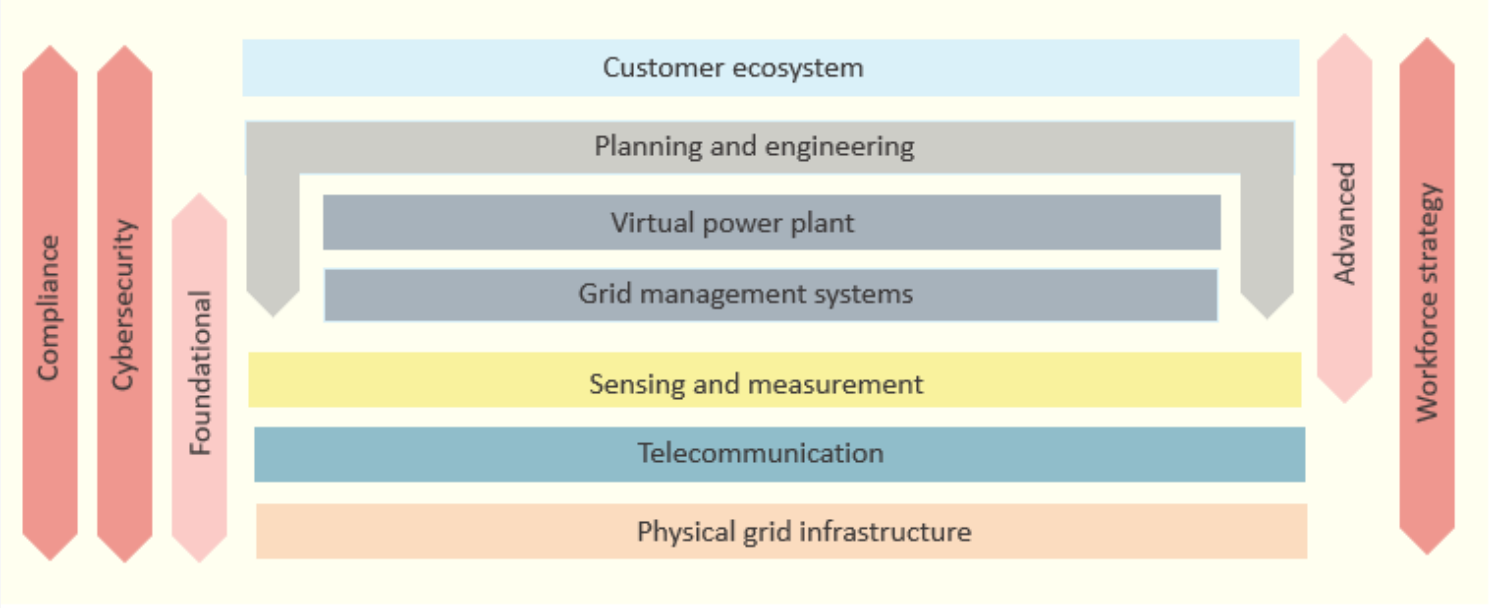
*Grid modernization cost-effectiveness framework from DOE's DSPx Volume III

Chapter Take-Aways

Modernizing the grid is an ever-evolving scope and creating a platform approach can help build these modernization layers

PGE has leveraged best practices to develop and follow a framework to modernize the grid to balance value and rate impact

PGE has provided both long-term high level investment opportunities and short-term detailed planned investments



Questions?

Please email us at
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