Current Distribution System Plans






PACIFIC POWER

POWERING YOUR GREATNESS

Distribution Projects and Typical Timelines

Distribution Feeder & Substation Capacity Increases

- Approximately 47 distribution feeder upgrade projects and 20 distribution substation upgrade projects in Oregon planned across 10-year horizon.
- Solutions range from distribution feeder transfers to:
  - upgrade existing distribution feeders to adding new feeders.
  - replacing existing transformers to constructing new distribution substations

Distribution Feeder High Level Project Timelines

- Feeder transfers: 3-18 months
- Upgrade existing feeders: 6-18 months
- New feeders: 6-24 months

Distribution Feeder High Level Project Timelines

- Feeder transfers: 6-18 months
- Transformer replacements: 12-24 months
- Substation rebuild/expansion: 18-30 months
- New substations: 18-60 months

Grid Modernization Projects

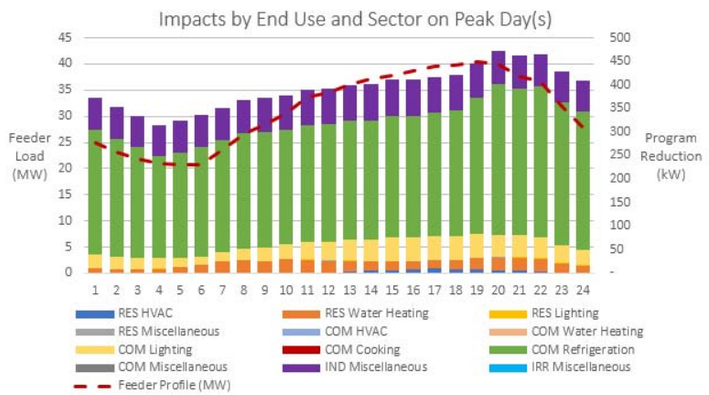
The development of an objective grid modernization road map must consider the economic value of individual components, technology maturity, and system interdependencies. Although funding levels will vary, PacifiCorp's 10-year capital plan provides for investment in the listed smart grid plans. In addition, funding is planned for smart grid technologies expected to be leveraged by the implementation of AMI, such as data analytics, outage management and DA.

- Replacing Equipment (transformers, circuit breakers/reclosers, disconnect switches)
- Distribution Highlights
  - AMI
  - Distribution Substation Metering
  - Automation
  - Fuse Saver
  - Reclosers
  - Line Scopes
  - Fault Detection, Isolation Recovery
  - Communicating Fault Indicators
  - CYME
  - PDX-Low Voltage Secondary Network
  - Targeted Communities Pilot

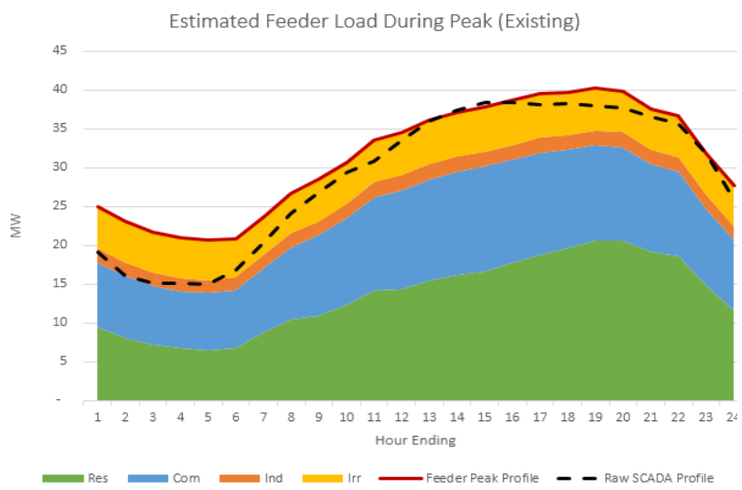
DER Impact Tool

- Revised DER Impact Tool
  - Review all capitals projects for DER: demand response, solar, and storage alternatives.
  - Step 1: Screening criteria
    - Estimated capital cost ≥ $1 M
    - 3 – 5 years out
    - Within 25% of traditional project costs
    - Must meet capacity reductions at time of need
  - Step 2: Conduct further review of sites that meet above screening criteria
    - Determine feasibility of location and customer mix
    - Determine appropriateness of reduction shape
- Integration of Data
  - GREATER
  - Customer Billing Data
  - Load Forecast
  - Load Research
  - EE End-use Loadshapes
  - Feeder Loadshapes
  - Energy efficiency

	Start	End
Years of Interest:	2016	2019



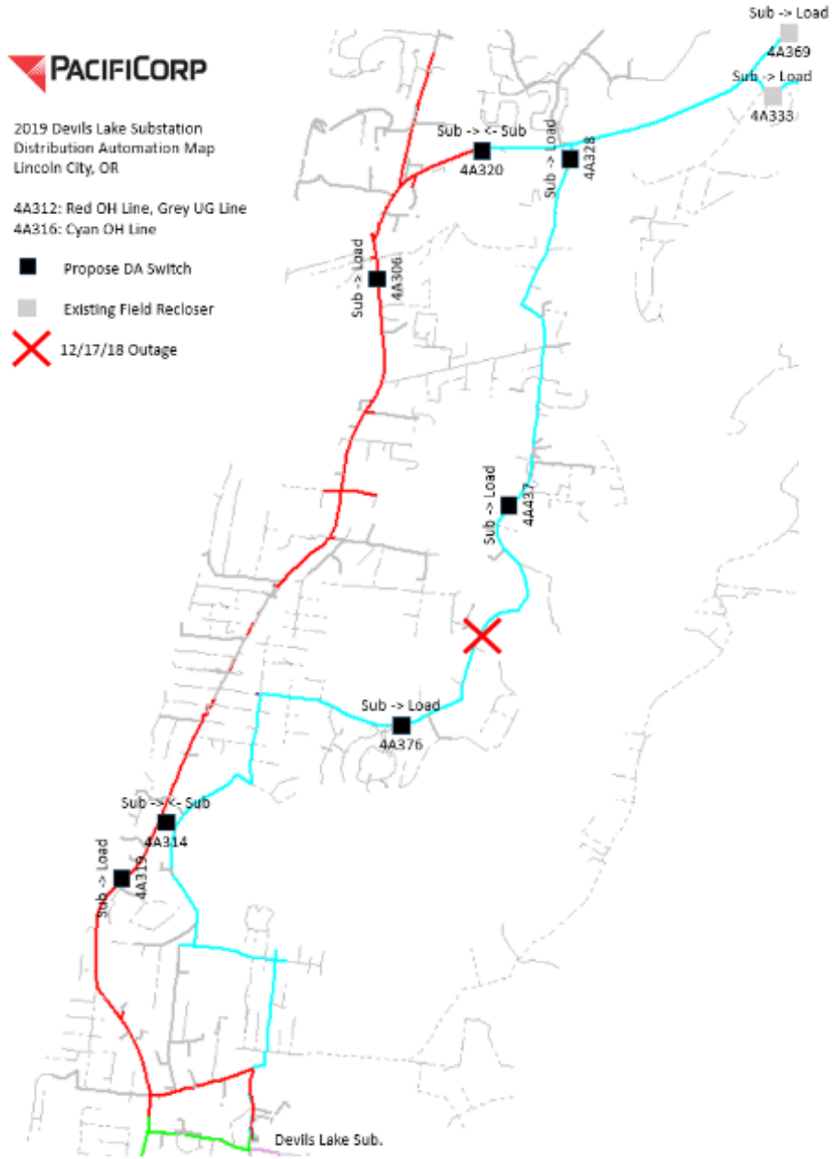
Load Composition



Sector	Feeder/Substation/System Load Usage (MWh)	Feeder Peak (MW)	Customers
Residential	95,586	18.2	6,301
Commercial	78,610	13.1	461
Industrial	16,233	1.9	438
Irrigation	20,113	5.7	428
Total	**210,542**	**38.9**	**7,628**

Distribution Automation and Reliability

- PacifiCorp is in the process of deploying a pilot DA FLISR scheme to improve system reliability in the distribution loop out of Devil's Lake substation in Lincoln City, Oregon.



VaultGard Portland Low Voltage Secondary Network Project

- In the first quarter of 2019 PacifiCorp installed a network monitoring system on the downtown Portland portion of the underground distribution system fed from Lincoln and Albina substations

The Portland downtown underground consists of three independent underground networks: Lloyd, Lincoln, and Albina

Network	# Feeders	Primary Spot Voltage [V]	Secondary Mesh Voltage [V]	Customers	Peak Load [MVA]
Lloyd	3	480/216	n/a	710	12
Lincoln	7	480	216	2,590	40
Albina*	6	480	216	2,189	20

*The Albina network includes two river crossings between Broadway and Fremont (I-405) bridges (7 cables – Centennial Mills Crossing, 1 cable – Broadway Crossing)

Distribution Planning Process Opportunities

- More dynamic and holistic view to inputs and outputs
  - DER
  - EV
  - Customer preferences
  - Policy and opportunity driven trends
  - Integration with neighborhood/community/city plans and goals
- Improve planning models, information and assumptions
  - Continued development of customer load data, with much higher granularity possible than in legacy tool
  - Richer dataset for better precision of customers' uses through application of AMI data analytics
  - DER Screening Tool → DER Impact Tool (Locational Planning)
- Improve system operation and flexibility
- Modernize the energy grid / increased deployment of advanced technologies
- Customer side solutions
- More efficient utilization of existing system capacity