Distribution System Planning Workshop
Public Workshop #2
June 29, 2021






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Workshop #2 Information

Teams Meeting Information

- Microsoft Teams meeting

  Join on your computer or mobile app

  Click here to join the meeting

  Or call in (audio only)

  +1 563-275-5003,,984393064# United States, Davenport

  Phone Conference ID: 984 393 064#

- **Please place your phone on "Mute" when not speaking**
- **Please do not use the "Hold" function on your phone**

- Meeting attendance and public chat will be available at the website.
- Please use the chat function in TEAMS to provide any questions or comments during this presentation. We will do our best to address those as they come up, if we are unable to get to them, we will follow-up directly or at an upcoming workshop.

Today's Goals

- Introductions
- Technology and its role in DSP
  - *AMI*
    - *The use case behind PacifiCorp's Oregon AMI deployment*
    - *What its foundational implementation does not support*
  - *Load Planning*
    - *Current/Future Approach*
    - *CYME/WEST*
  - *Customer Usage Changes*
    - *Demand Side Management*
    - *Customer Generation*
    - *Transportation Electrification*
  - *Distribution automation*
- How to make technology building blocks part of the conversation with stakeholders
  - *Website, feedback and other methods*
  - *Review upcoming workshop topics*

Progress To Date

- ✓First workshop held
- ✓Developed and shared initial baseline info
- ✓Collaborated with PGE (thanks PGE team!) to leverage their work with the baseline template and have begun populating with Pacific Power data
- ✓Reached out to CBOs and other parties with whom we engage regularly to invite them to the process
- ✓Community engagement plan being “envisioned”

Technology Overview






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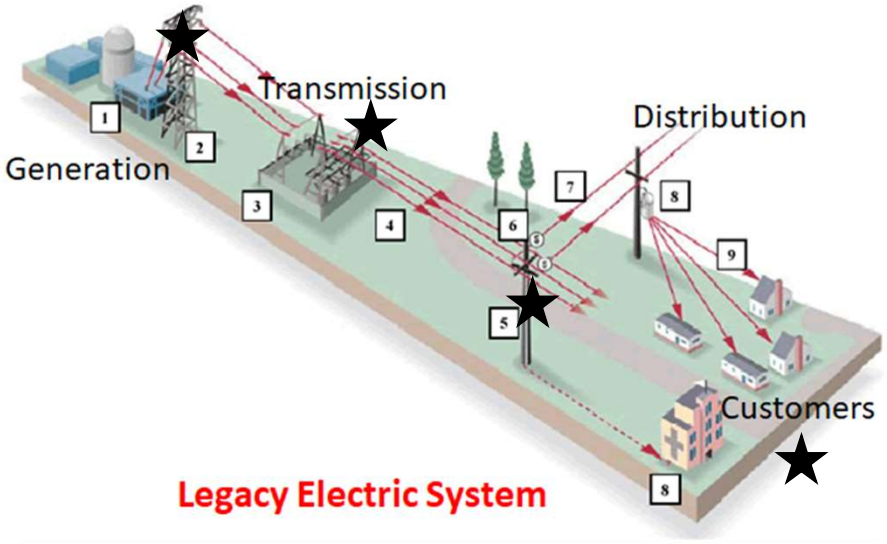
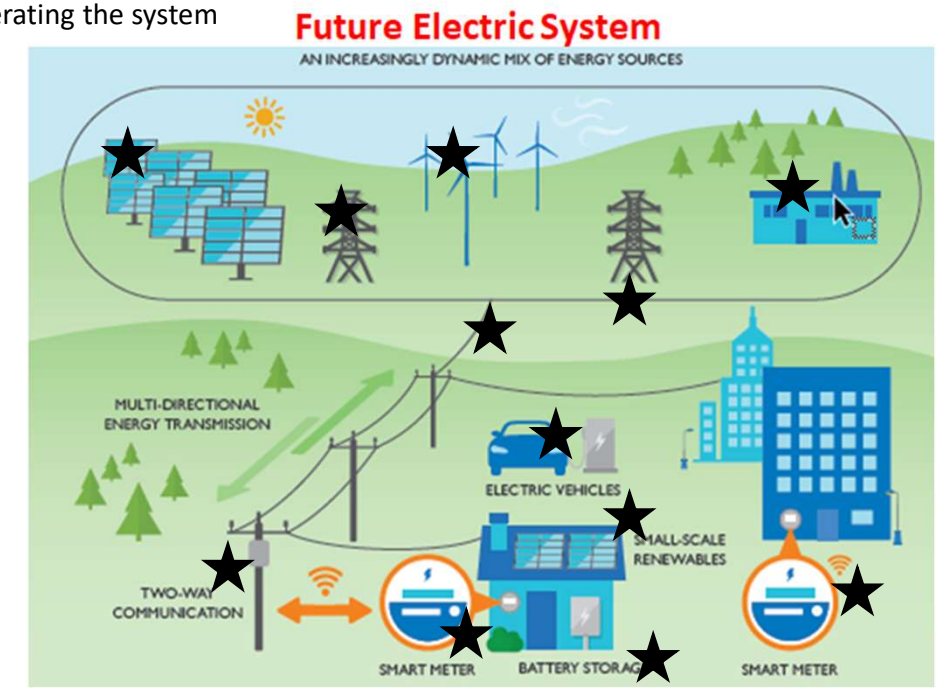
Electric Utility...Current & Future

★ Indicate a potential data point important for operating the system



Legacy system had limited data needs and was keyed around a handful of "peak" events
Credible scenarios was derivative of large populations of customers with patterns at a macro scale

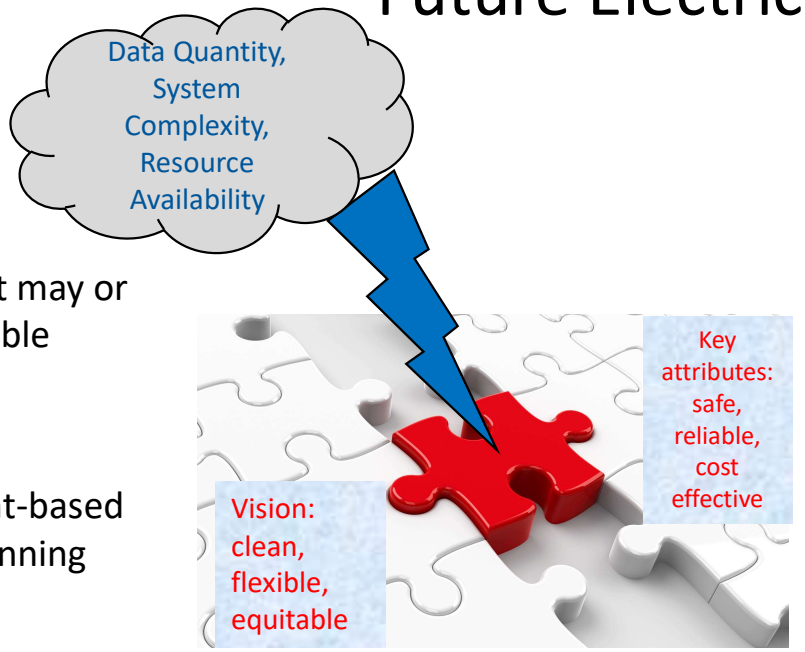
Moving from legacy to future takes a measured steady progression



Future system requires a much more situationally-aware environment for all interconnected equipment, to the extent it can render a credible case that is beyond the capacity of the shock absorption of the system
This is particularly significant when discussing real-time 24x7 variations in customer usage, resources and network performance; requires increased device, computing, communication and technical resources

Future Electric System Puzzle Pieces

- Customer Choices
- Clean Energy Options
- Emerging Technologies that may or may not be broadly extensible across the system
- Greater need for locale/customer/equipment-based insights to fuel credible planning cases
- Climate change and risks
- Varying uses of the electric system, i.e. customer generation, transportation electrification



Enablers

- Data and intelligent application of historic and forecast cases
- Technologies not previously heavily deployed in distribution environment
- Wide variety of influencers that may help frame study approaches

Oregon Smart Meters



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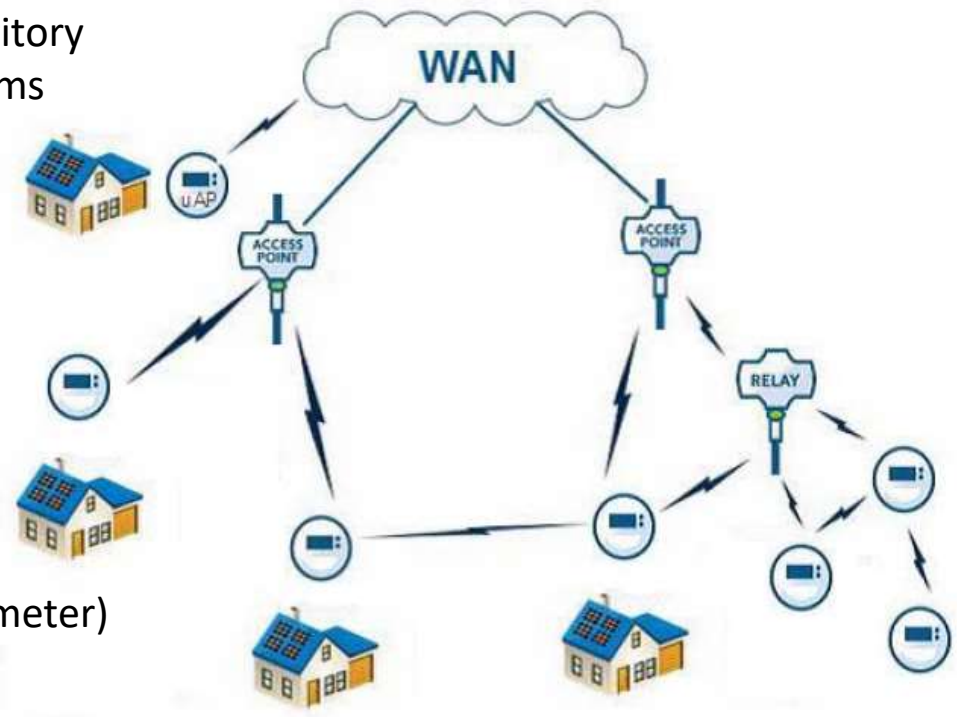
Oregon AMI Timeline

- AMI stands for Advanced Metering Infrastructure
- In its fully realized vision, it is an integrated system of smart meters, communications networks, and data management systems that enables two-way communication between utilities and customers
- Oregon AMI project started 2016
- 2016-2017 integrated AMI system into PacifiCorp back-office systems
- Meter deployment began Q1 2018 in Independence, OR
- Meter deployment completed in Q4 2019 in Pendleton, OR
- 618K smart meters installed in Oregon

AMI Network Overview

Wide Area Network (WAN) fits rural service territory

- Terrain, limited communications platforms
- 900 MHz Radio Frequency (RF) mesh
- Cellular backhaul (AT&T/Verizon)



Primary network components:

1. Access Points (APs) for cellular backhaul
2. Relays for extended RF connectivity
3. Meters - Aclara kV2c and I-210+c models
4. Micro APs (allows cellular backhaul within meter)

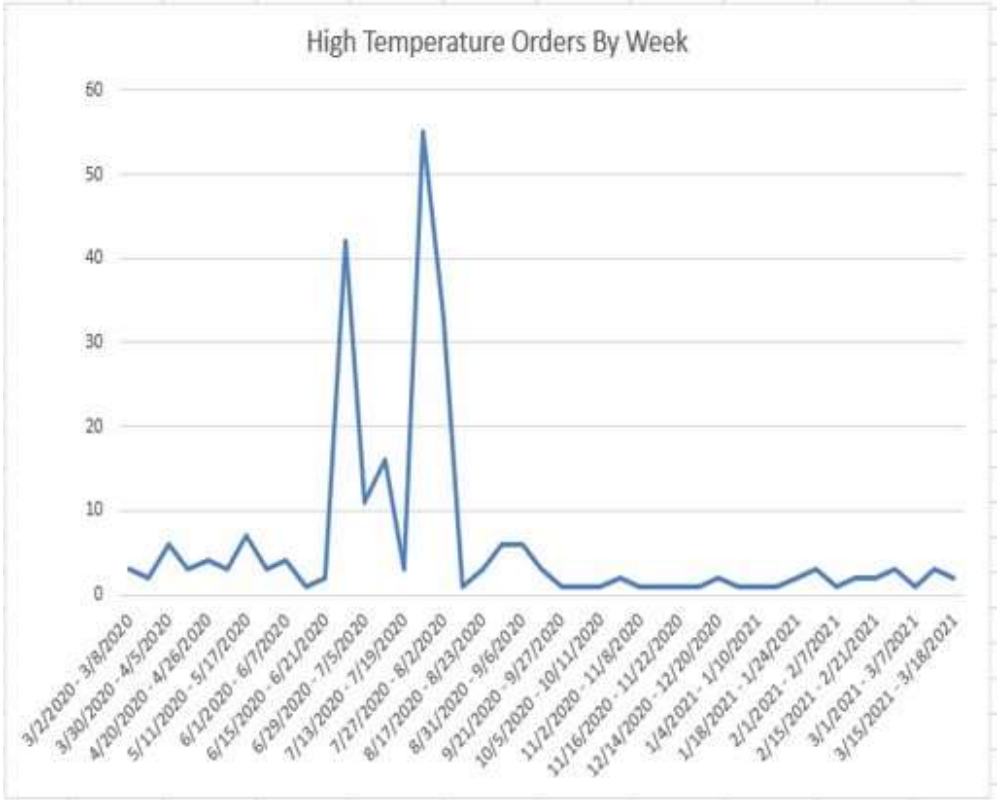
Outage Notification

- AMI meter outage notifications are reported to central outage detection system for validation
  - Check for open work orders at location
  - Wait 15 minutes for a power restore message
  - If either “restore” message is received or an existing work order is in process the notification is not advanced
  - During extreme system events, false positives increased dramatically requiring additional validation

- Verified outages are sent to outage management system (OMS) for handling by a system dispatch operator.

Meter Temperature Monitoring

- AMI meters report a high temperature alert when a temperature above 85° Celsius is reported
- High temperature alerts are validated and then sent for field investigation
- Field investigation consists of inspection of service, meter socket and meter
- More than 400 field investigations have been completed.
  - 70% degrading meter base
  - 15% overloaded service
    - Unbalanced load
  - 15% no issue identified



Piloted/Complete AMI Opportunities

❖Interval usage data available to customers via their online account

✓AMI data uses for evaluating loading history of equipment (i.e. service transformer loading)

✓AMI data uses for planning studies

✓Energy theft detection

❖= Available now

Future AMI Opportunities

- Limited unbilled revenue by disconnecting service between customers
- Managing and understanding of coincidence of loading throughout the electrical network for scenario development
- Calibration of network topology, i.e. conductors, configuration and devices
- Use AMI data with additional analytics to infer and improve transformer to customer relationship
- Advanced rate designs
- Prepaid metering
- Voltage analysis

Load Planning



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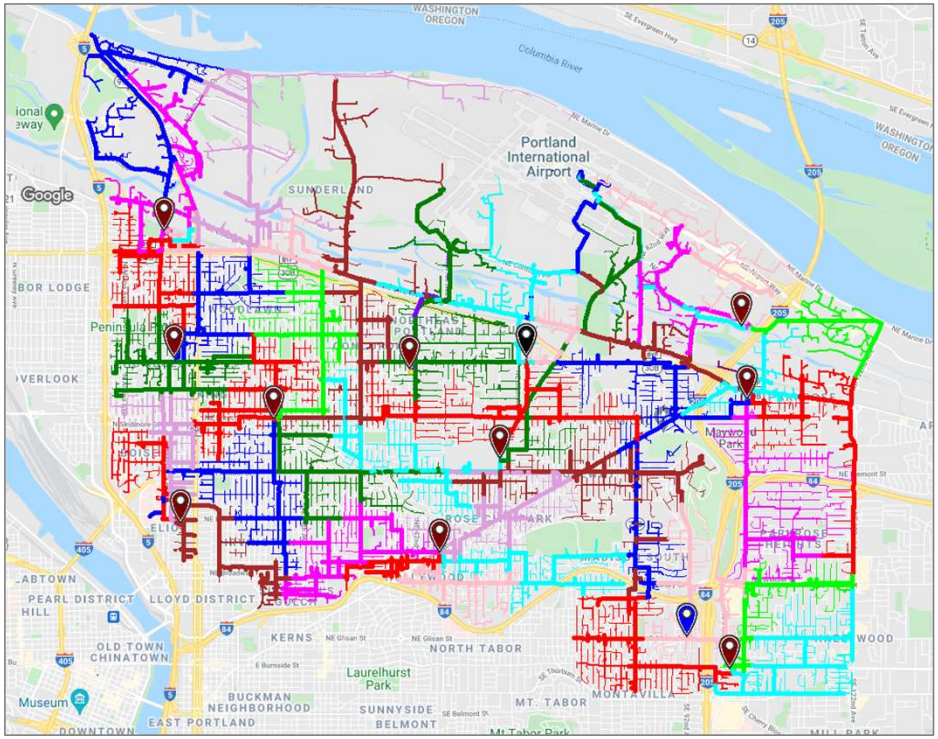
Proactive Load Planning Process

- Load forecast and distribution system analyses in study process to evaluate the load changes to support investment decisions
- Helps determine necessary and sufficient projects (location, timing) on distribution system to accommodate load changes
- Helps company prioritize capital work and support rate recovery of proposed projects

Legacy process:

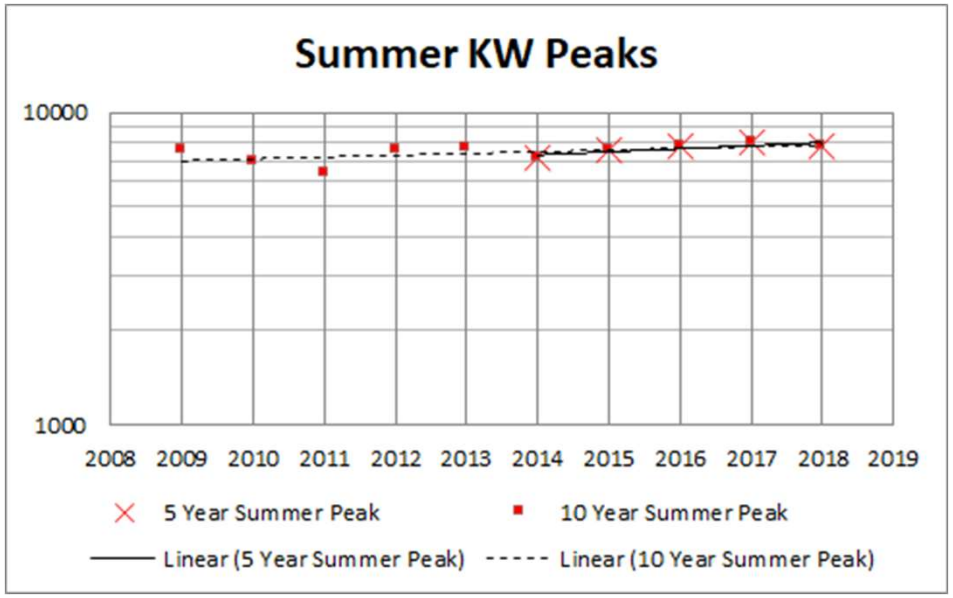
Resolves worst case load condition for both summer and winter scenarios

Informs customer outage risk due to load



Current Load Planning Inputs

- Primarily uses SCADA or manual read peak load information at a feeder (substation breaker) level
- Load information collected regularly, but only one summer and winter peak load value is used at an annual level
- Growth estimates include:
  - Previous weather-normalized peaks
  - Detailed large load additions (when known)
- Known and anticipated customer load additions/ reductions
- Known or estimated customer and feeder load profile information

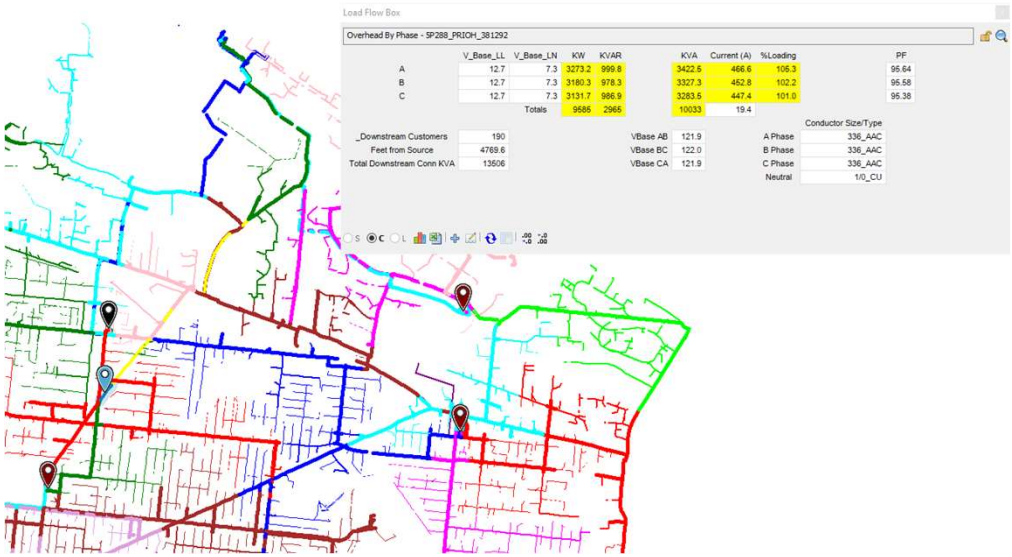


	Jan	Feb	Mar	Apr	May	Jun	July
2015	7529	7672	6548	6506	5820	7044	7355

Aug	Sept	Oct	Nov	Dec	Win Pk.	Sum Pk.
7529	6495	7455	7782	8727	**8890**	**7529**

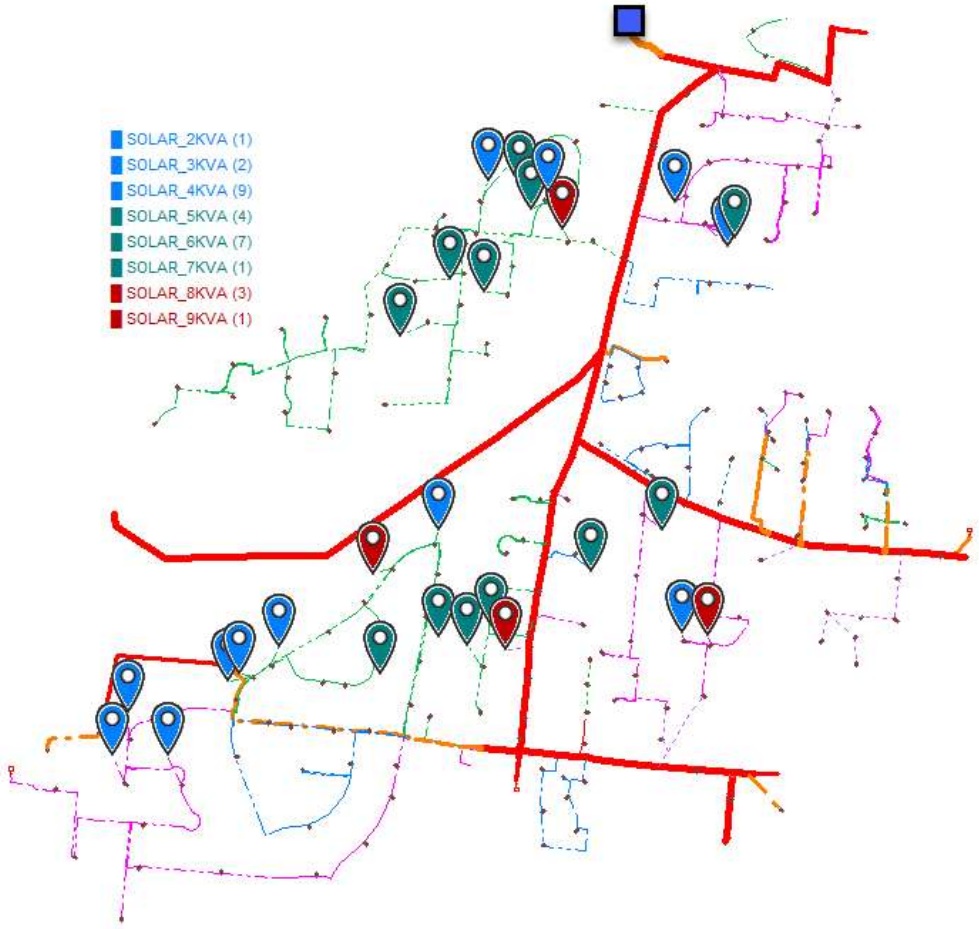
Load Planning Analysis

- Load planning is the primary input for system planning study analysis
- Power flow model (CYME) utilizes GIS model
  - Data inaccuracies can significantly impact results (planned mitigations)
- DER, energy storage, and EV load data are uncertain and not readily available
  - Incorporating into the analyses is time-consuming
  - Volatility introduces risk due to lack of confidence



Load Planning Future Needs/Priorities

- Improved SCADA availability
  - Substation Transformer
  - Feeder breaker
  - Field devices (reclosers, Fusesavers, etc.)
- Incorporate DER, energy storage, and EVs information to the load planning process (further develop forecasts and relate this to feeders)
- Incorporate daily and seasonal profiles that include EVs, DERs, and load into load planning analysis
- Demand Side Management Program and Transactional Energy Forecasts
- Fix mapping/model issues and improve data for state estimation



Load Planning Future Tool Ideals

- Scrubbed, reliable SCADA data from substation, feeder, and field devices incorporated into PI Historian
- Further develop and script analysis tools such as CYME and PSS/E
- Incorporate generation, weather, load data from multiple locations into a central repository that is read by analysis tools
- Use AMI and other profile data in analysis (time series power flow)
- Acquire and leverage hosting capacity analysis tools (e.g. CYME modules like EPRI DRIVE and/or Integration Capacity Analysis)

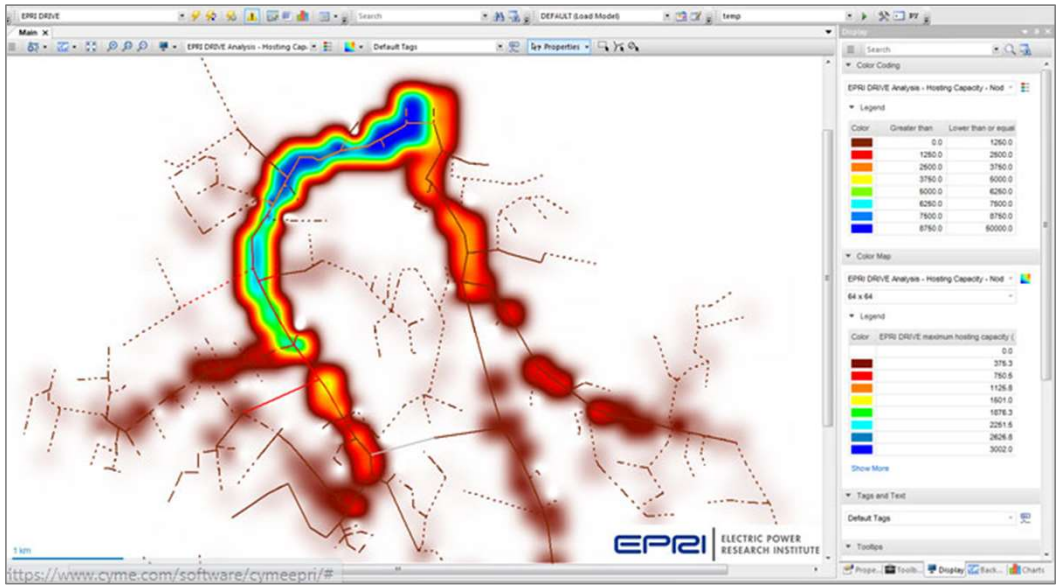


Image: Courtesy of CYME

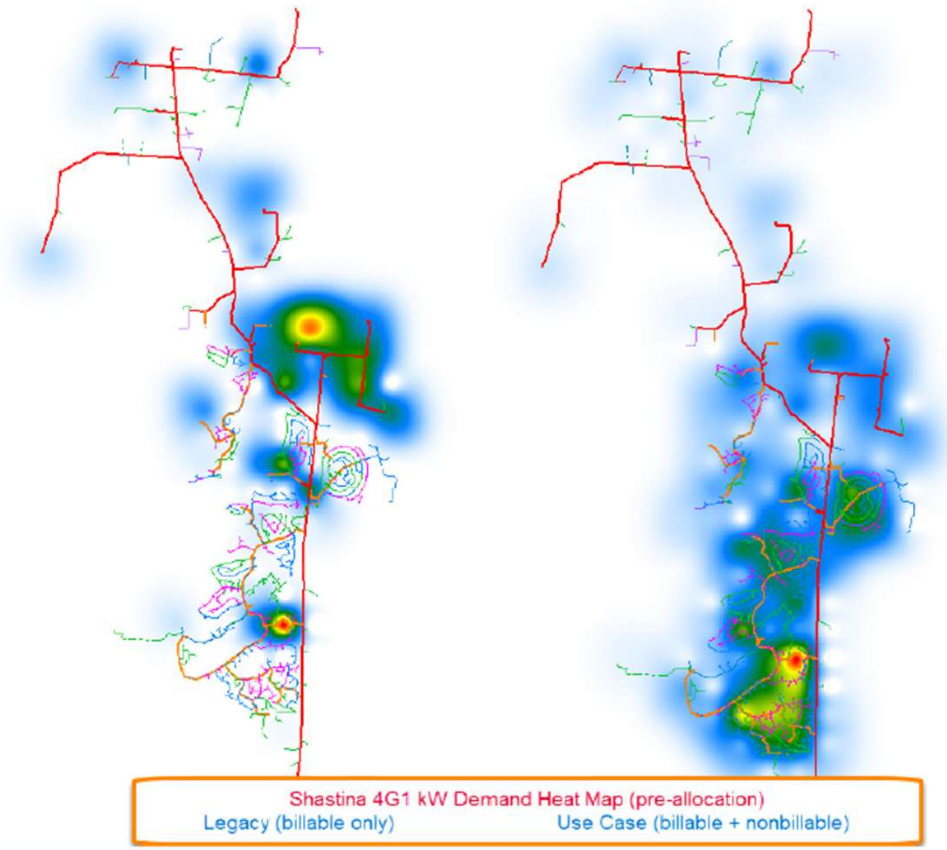
Load Planning Case Study - AMI

Left image:

- Start with commercial customers (known load centers), then allocate breaker load
- (Typically) use transformer size to refine an estimate of where the breaker load is delivered for a scenario

Right image:

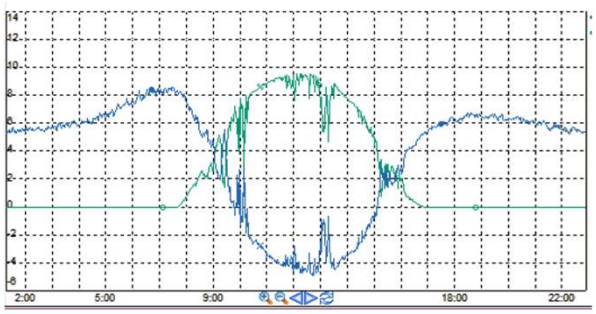
- Start with AMI values, so all customers act as initial load centers
- Adjust that starting point with allocation to match a given loading scenario



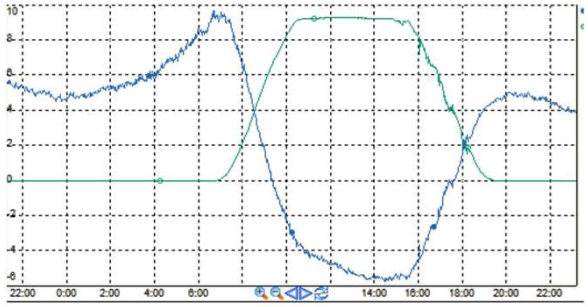
Load Planning Case Study
Deschutes Transformer Load & Solar Output

- Generation output uncertain
- System must maintain ANSI “A Range” voltage under all conditions
  - Heavy regulator activity (device wear, loss of life)
- Which load scenarios must be studied? How frequently?
- If generation output changes next year, the system needs to handle that too

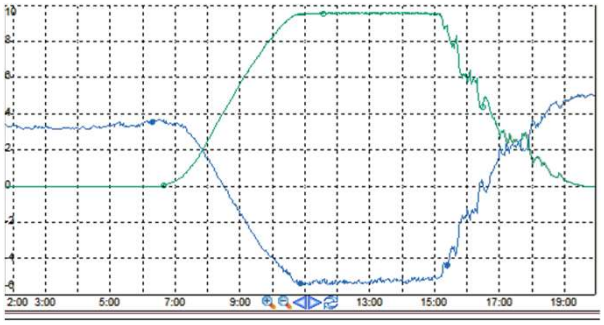
Winter 1-day Load Profile



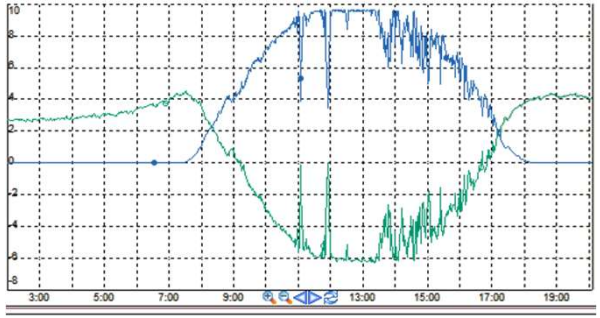
Spring 1-day Load Profile



Summer 1-day Load Profile

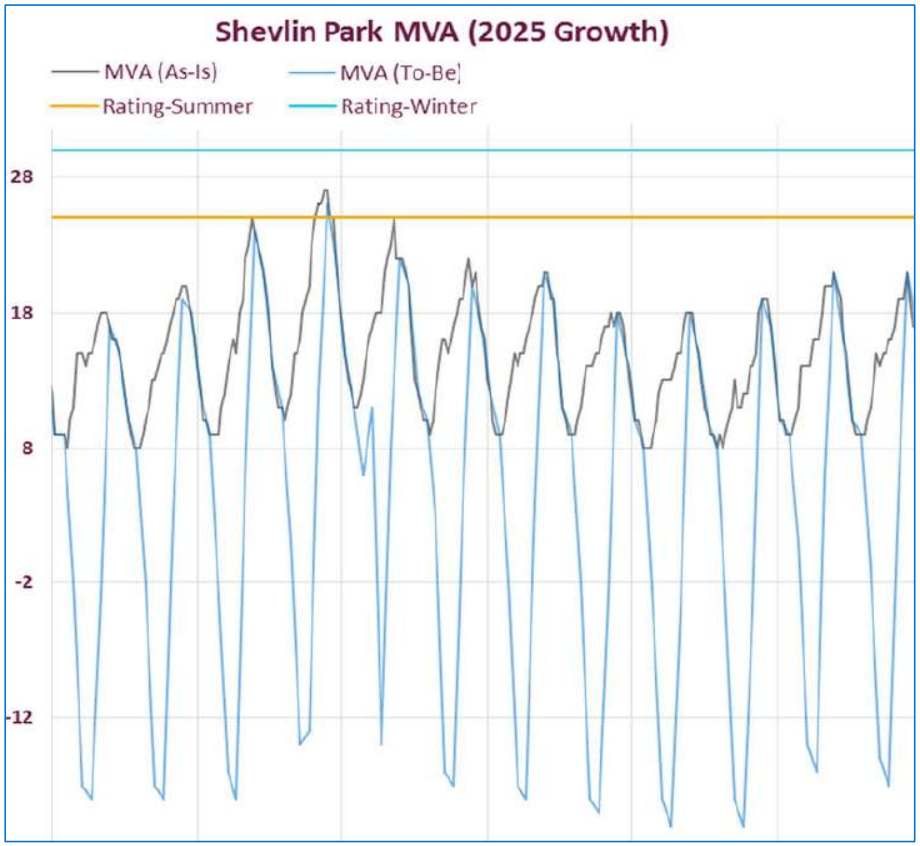


Fall 1-day Load Profile



Complexity

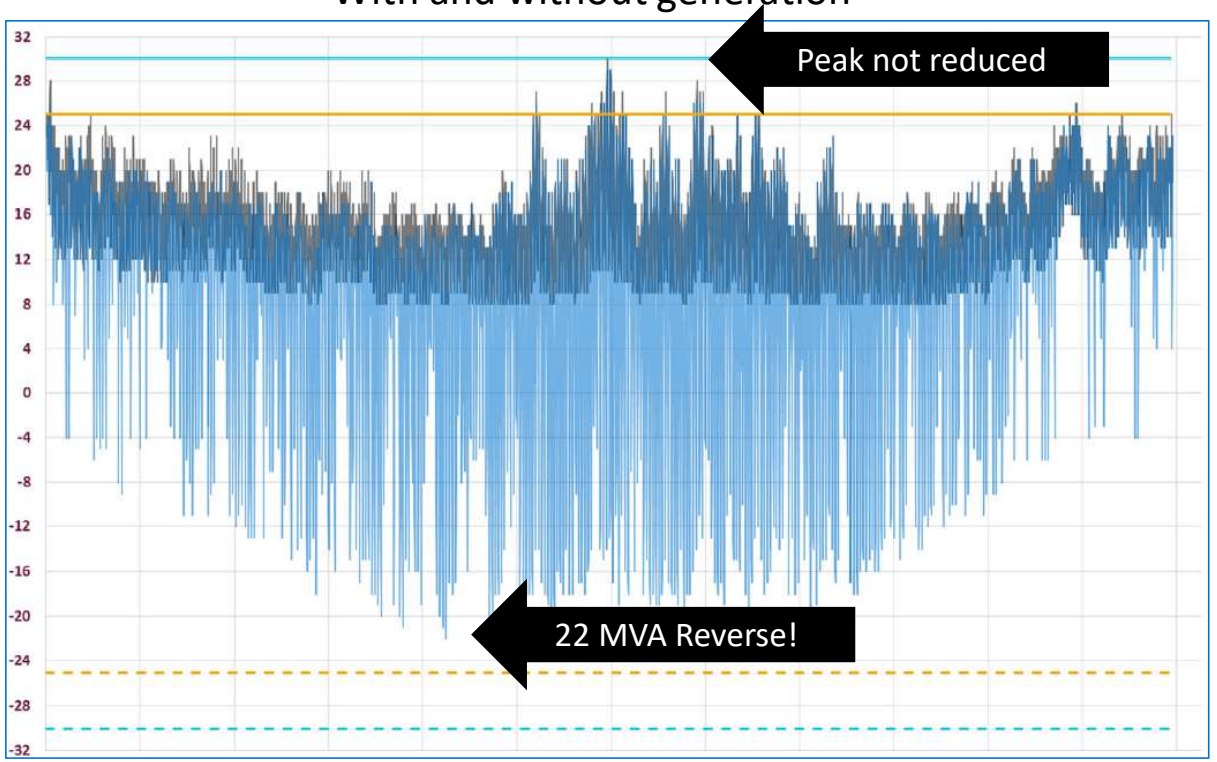
- Studying with load and generation profiles is far more complex and time consuming than studying with seasonal peak data
- Without storage, private generation usually does little to alleviate peak load issues
- Beware of system losses and protection issues from reverse flow
- Still evaluating cost and benefit of alternatives
  - Strategic points in time
  - 8760-hour
  - 525,600-minute (?)



Complexity

- Still evaluating cost and benefit of study options for future
  - Winter and summer peak
  - Strategic points
  - 8760-hour
  - 525,600-minute
- Factors include
  - Data density
  - Computation time
  - Stochastic results, risk management

MVA (12-months)
With and without generation



Closing



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Next Steps

- Schedule
  - Pacific Power Public Workshop #2 Continuation – TBD
  - Pacific Power Public Workshop #3: Friday, July 30, 2021, from 1 pm to 3 pm: ALERT, this conflicts with an IRP meeting so likely will be rescheduled
    - Intended topics: Integration of system planning: IRP, wires (both T&D) and customer usage changes
  - Pacific Power Public Workshop #4: Tuesday, August 24, 2021, from 10 am to 12 pm
    - Intended topics: : Integration of stakeholder feedback into legacy planning processes and the roadmap toward PacifiCorp's DSP vision
  - Distribution System Plan (Part 1) to be filed on October 15, 2021

Meeting dates and times subject to change

Additional Information

- DSP Email / Distribution List Contact Information
  - DSP@pacificorp.com

- DSP Presentations
  - Pacific Power Oregon DSP Website

- Additional Resources
  - Pacific Power's 2019 Oregon Smart Grid Report
  - Pacific Power's Oregon Transportation Electrification Plan
  - PacifiCorp's Integrated Resource Plan

Thank You!






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