NARUC
National Association of Regulatory Utility Commissioners

Considering Advanced Building Technologies in Distribution System Planning

NARUC/NASEO/LBNL Distribution System Planning Peer-Sharing Webinar

June 22, 2026

AGENDA

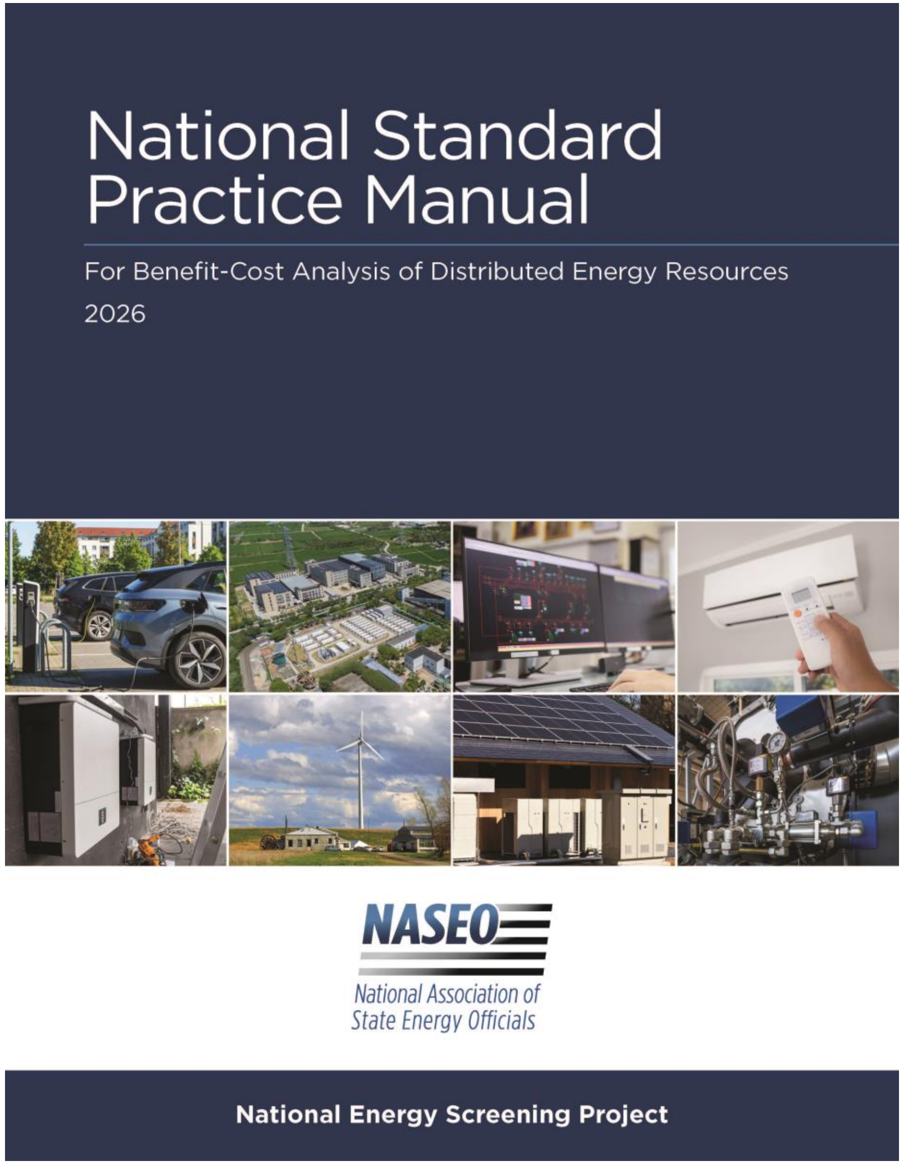
- NASEO and NARUC intros
- Presentations
  - Abhishek Jain– ICF
  - Schuyler Matteson– NY DPS
  - Ari Zwick– MN Dept of Commerce
- Q&A w/ SMEs

About NASEO

- The only national non-profit association for the governor-designated energy officials from each of the 56 states and territories
- Serves as a resource for and about the State Energy Offices through topical committees, regional dialogues, and informational events that facilitate peer learning, best practice sharing, and consensus building
- Advances the interests of the State and Territory Energy Offices before Congress and the Administration
- Learn more at www.naseo.org

NASEO Resources

- [2026 National Standard Practice Manual Released]
- [NASEO Distribution Planning Training for State Energy Offices]
  - Distribution Planning Fundamentals
  - Engagement with Utilities and Industry Partners
  - Examples of State Energy Office Engagement in Distribution Planning
  - Resources and Tools



EXISTING NARUC RESOURCES ON DISTRIBUTION SYSTEM PLANNING

- Late 2024-early 2025 in-person trainings “2.0” Planning for Load Growth and Local Resources – Action Planning Workshop Reference
- Late 2024 Virtual Workshops “Planning for a Modern Distribution System” - Planning for a Modern Distribution System - NARUC
- Late 2023-early 2024 in-person trainings “Distribution System Planning and Resilience” - Regional Training: Planning for Distribution Systems, Distributed Energy Resources, and Resilience | Energy Markets & Planning; IDSP Training March 2024
- Early 2023 Peer-sharing webinars on IDSP - Peer-Sharing Webinars for Public Utility Commissions on Integrated Distribution System Planning - NARUC

Emerging Best Practices for Advanced Building Technologies in Distribution System Planning

Peer-Sharing Webinar for Public Utility Commissions and State Energy Offices on Distribution System Planning

ICF

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06/22/2026

Prepared for Lawrence Berkeley National Laboratory

Today's conversation includes:

Why building-side data matters for distribution planning?

A case for Grid Utilization

Forecasting and Solutions empowered through data

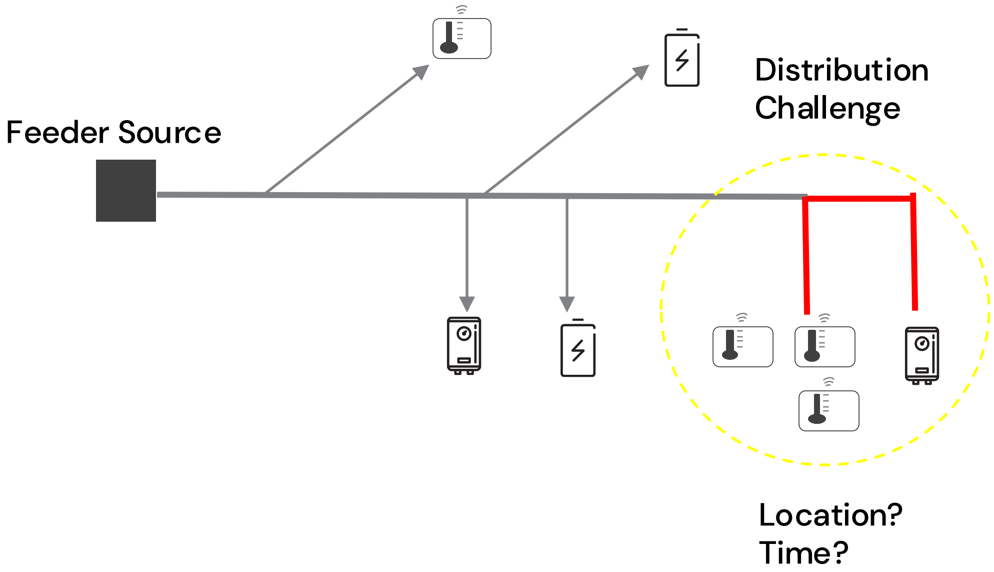
Why building-side data matters for distribution planning

Traditional planning inputs are often too coarse to diagnose localized constraints or under-utilized assets

How building side data helps distribution planners

Traditional Planning Inputs

- Feeder head SCADA
- Distribution system technical constraints
- Primary meter customer data
- Validated system configuration (GIS) including components and settings
- New Load/generation with anticipated energization dates



Load Allocation

- How is load allocated across the feeder?
- Fine tune solutions for today and load changes in the future
- Using AMI data for operational and planning forecasting (e.g., LoadSEER)
- Useful for investment planning

Load Disaggregation

- Granularity behind the meter
- Building capacity and performance
- Design programs
- Setting and controls useful to grid
- Offset utility investment

Advanced Building Data → Iterative Program Design → Evaluate Setting and Controls → Change in Building Performance → Enhance Operational Efficiency → Downward Pressure on Investment in New Infrastructure

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Grid utilization as a measure of system efficiency under the spotlight

Utilization

Asset Specific ← → *Time Varying*

Transformers *Feeders* *Laterals*

Short peaks can make assets constrained at specific hours, but on average assets may be underutilized.

Utilization is a measure of system efficiency and can be used to determine how well flexibility is applied before authorizing a traditional approach to resolving the planning constraint.

What is the achievable potential ?

How is it valued?

What programs can improve utilization?

What incentives are warranted to make use of the flexibility?

ow doe flexible use compare with investment in traditional infrastructur e?

best use o customer $ — Investment in flexibility or nfrastructu

Improving utilization is more than a control or program problem, it’s a **data and forecasting problem.**

Grid utilization as a measure of system efficiency under the spotlight

Provide assessment of current electric distribution system performance as compared with optimal utilization of existing electric grid assets

Measure and report how efficiently grid assets are used

Propose electric grid utilization metrics and improvement plans

Include utilization metrics in future integrated resource plans (IRPs)*

Use metrics to evaluate grid investment proposals

Metrics				
Ratio: Peak load/ Total distribution electric grid capacity	Ratio: Load delivered/ Total potential deliverable electric load	% Distribution Losses	Constrained circuit analysis	Distribution system performance at system peaks

Commission shall also analyze the potential for utility to increase electric grid utilization through the deployment of non-wires alternatives

Legislation in Virginia (HB 434, 2026) requires utilities to measure, report and improve grid utilization.

Grid utilization can be improved by lowering system peaks. Leveraging localized technical potential and access to advanced building data can play a key role in distribution system planning.

*IRPs filed in Virginia include distribution system planning elements.

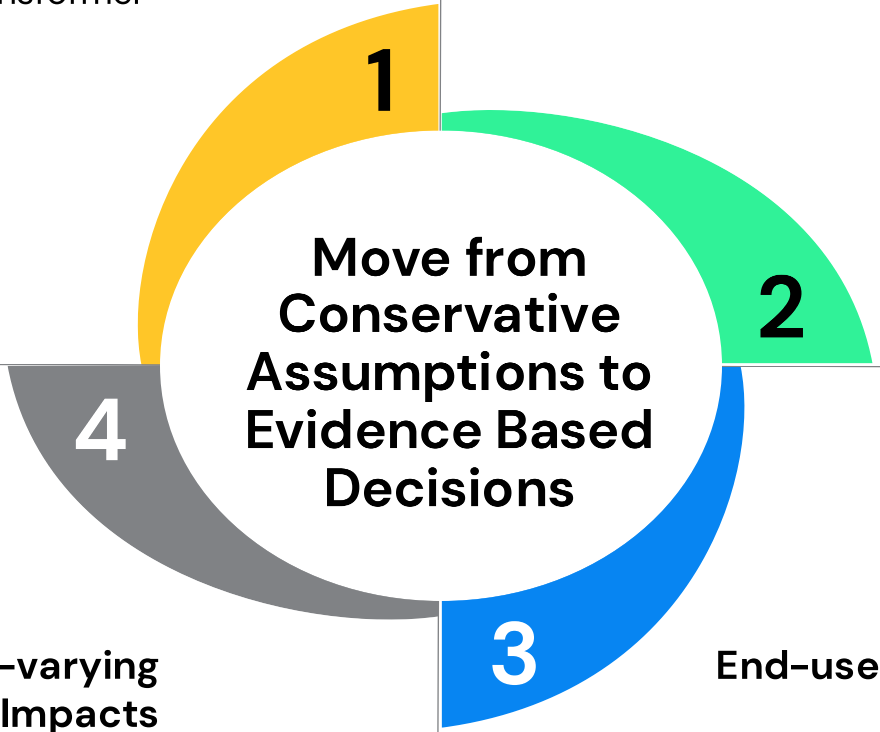
What do distribution planners need from building technologies?

Location

Premise → Feeder → Transformer

Time Resolution

Hourly / Sub-hourly



Measured Time-varying Impacts

Not assumed shapes

Persistence, diversity, and confidence levels

End-use Attribution

HVAC
HPWH
Storage
Plug loads

Mapping technologies to distribution planning use cases

Building Technology	Type of Data Generated
Battery Energy Storage Systems (BESS)	Real power (charge/discharge), Reactive Power (output/input), Battery State of Charge, State of Health, Voltage, Current and Thermal status
Heat Pump Water Heater (HPWH)	On/off status, power draw (kW), water temperature, thermostat setpoint, storage capacity
Smart Panels/Home Energy Management System (HEMS)	Device level energy usage and generation data. (Monitors, controls and optimizes residential heating, energy storage, solar, smart meters, consumption)
Commercial Building Automation Systems (BAS)	Whole building energy usage by end use

- Grid utilization assessment
- Granular load forecasting
- Responsive/localized demand response
- Hosting capacity improvement
- DER detection and load attribution
- Feeder and transformer overage detection
- Resiliency support at the edge

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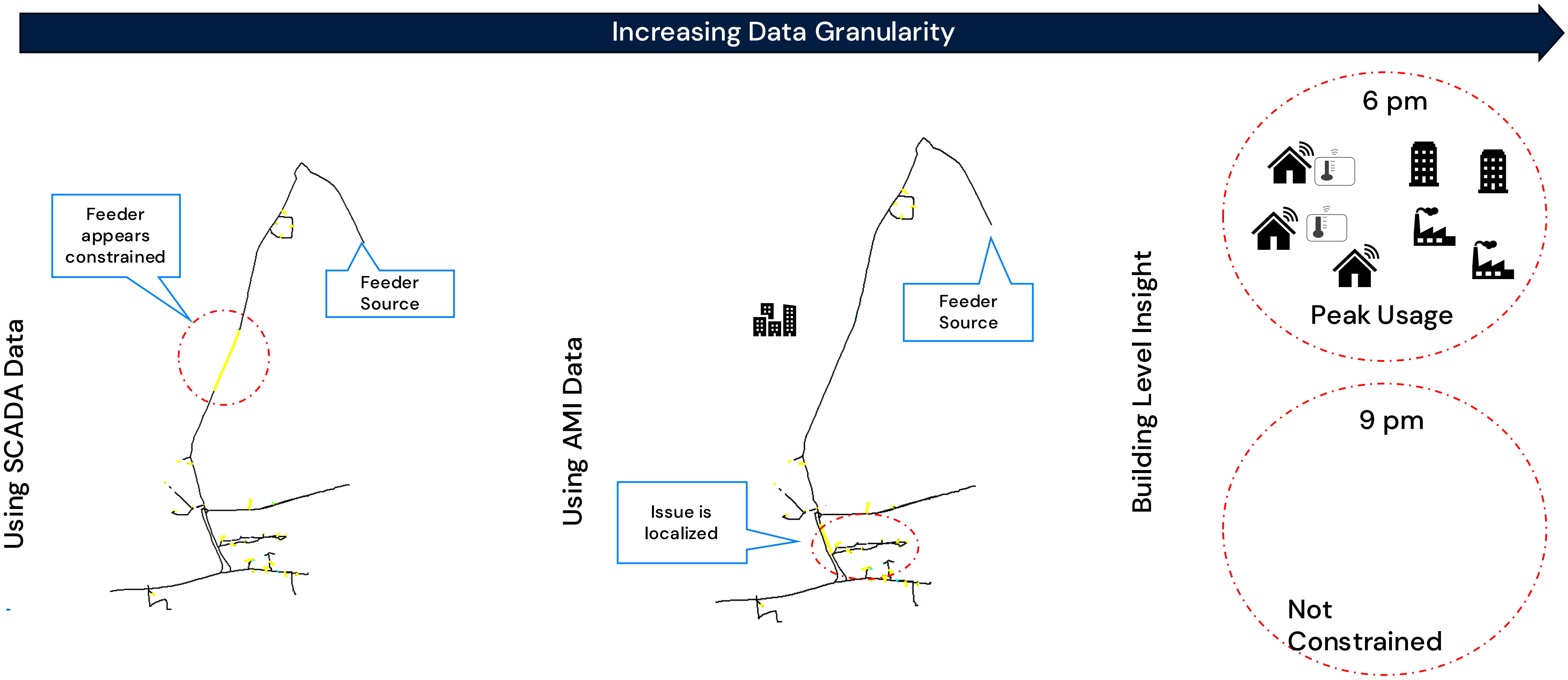
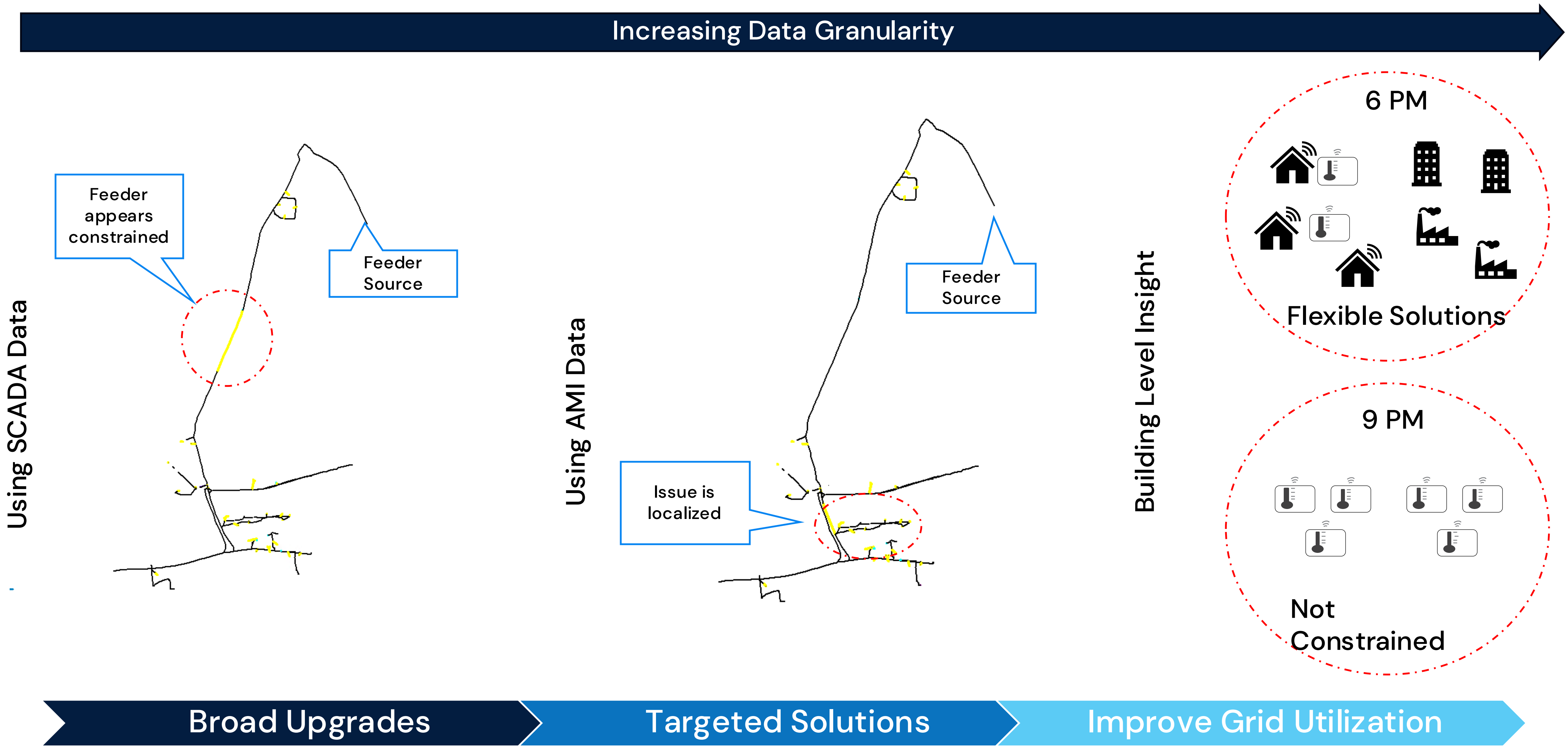
Thought experiment



Thought experiment



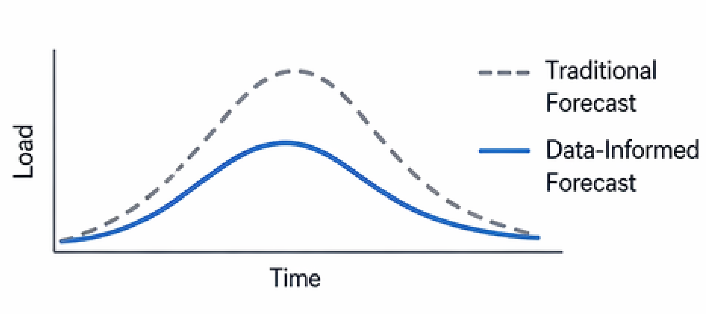
Examples of building data incorporated into distribution system planning efforts across the country

State	Planning Function	Brief Summary
New York Joint Utilities of New York IEDR Program (Integrated Energy Data Resource)	Integrated Data Platform	Statewide platform providing the public with access to energy-related data, including building level data • Data acquisition efforts are standardized to enable cross-referencing between data pipelines, enabling analysis of flexible stakeholder use cases related to building level data, network data, and utility rates • The Energy Infrastructure Assessment Tool (EIAT) provides map-based visibility into utility upgrades and hosting capacity maps, supporting DER siting and interconnection decisions
Oregon Portland General Electric 2024 Distribution System Plan	DER Forecasting	Integrates building level data via AMI and customer datasets • Use Residential building stock assessment data (building characteristic and energy usage data on residential buildings in the Northwest) • AMI data to create baseline load profiles for Service Point Identification, meters • Residential appliance saturation survey – to get equipment data on heating/cooling
New York Coordinated Grid Planning Process (CGPP)	Distribution planning	New York's PSC launched Coordinated Grid Planning Process (CGPP) and directed utilities to file a proactive planning framework that moves beyond system-level forecasts by requiring utilities to develop granular electrification load assessments for buildings and transportation using local load studies, customer information, and other data to identify localized grid needs.
California High DER Future Grid Proceeding (R.21-06-017) Kevala's 2023 Electrification Impacts Study	Bottom-up load forecasting for distribution grid investment	Kevala built address-level, premise-specific load forecasts using AMI interval data and building parcel data used to identify which distribution circuits will be overloaded under electrification scenarios and estimate upgrade costs by feeder.

Implications for forecasting and investment decisions

Better Load Forecasts

Measured, time varying building data captures how and when load occurs.



Lower Risk

Reduced over building or under building risk

Confident Investments

Data driven insights inform when, where and how much to invest

Does not replace traditional planning but makes planning more precise and data driven

Reframing the role of building technologies

Advanced building technologies become relevant to distribution planning only when their data improves forecast accuracy, locational insight, grid utilization, and confidence in investment decisions.

- Forecast Accuracy
- Locational Insight
- Grid Utilization
- Confidence in Investment Decisions

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NEW YORK STATE OF OPPORTUNITY. Department of Public Service

June 22, 2026

Considering Advanced Building Technologies in Distribution Planning

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The Situation in New York

- Load growth throughout electricity system
- High level of electrification in transportation and buildings
- Concentrated development of building electrification in NYC driven by state and local law, policy, and incentives
- *All this is happening on the oldest electricity system in the world

Addressing The Situation

- Building new generation or T&D infrastructure is VERY difficult and expensive, especially in NYC
- We need to make sure:
  - 1) that we minimize the need to build
  - 2) that the projects we build are the right ones in the right locations

Minimizing New Infrastructure Needs

- Most technologies being used in major electrification projects (i.e. HVAC, hot water systems, etc.) are controllable and offer the potential for load flexibility
- Load flexibility is good everywhere, but REALLY good in constrained areas and at peak times
- Comparing distribution planning scenarios with, and without, load flexibility is important
  - Show where and when it would be most valuable, what the value is to the system, and what loads are most important and available for flexing

Planning for the Right Investments

- Timing issue: Building electrification can add significant load in a short period of time. System upgrades take a while, and we don't want to slow down decarbonization
- Size/Granularity Issue: Electrification often comes in chunks all at once, aligned with incentive program availability, nearing compliance deadlines, and pockets of shared customer behavior
- Traditional approaches of spreading load growth proportionally across system or fractionally across years no longer works - no more peanut butter
- System is near the margin in many places and loads are chunkier >> high risk of over/underinvestment in specific areas
- **Solution: proactive planning with granular forecasts**
  - Better planning tools, more customer outreach, and initiating investments ahead of time can solve the timing and Size/Granularity issues

Proactive Planning Best Practices

- Launched in NY in 2024, PSC Order directed utilities to produce more electrically granular forecasts of load growth
- Must incorporate forecasts of DER and load flexibility in both forecasts and solution sets
  - Work with sister organizations and industry groups to understand penetration of different technologies and their capabilities
- Existing/planned load flexibility is included in load forecast up front >> avoids distribution needs altogether
  - State programs then work to ensure the flexibility operates as needed to provide expected benefits
- Additional new load flexibility can be considered in areas where grid upgrades are needed to minimize or eliminate investments

Getting what we asked for

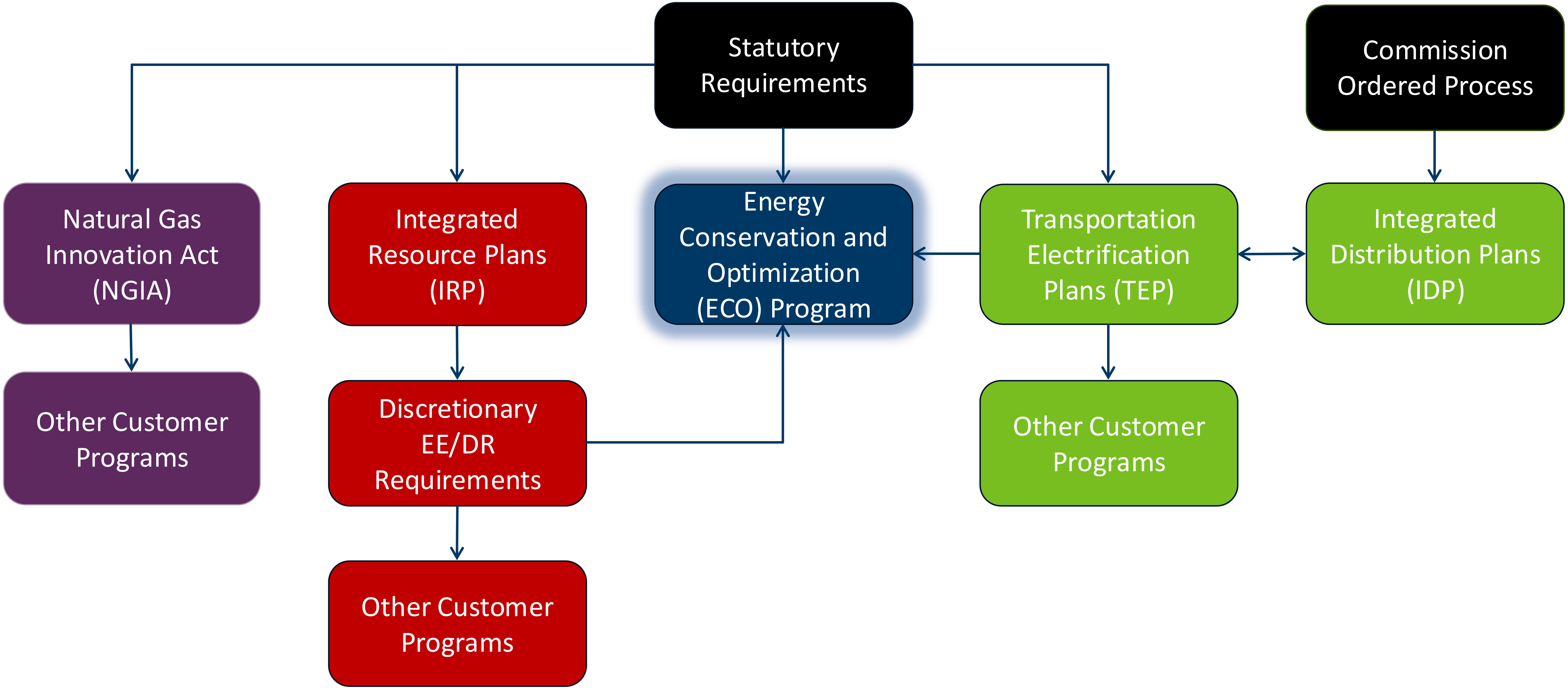
- Program design, including dispatch and compensation, becomes the key to making sure the load flexibility shows up and performs as expected
- Need to avoid underpaying for services that are necessary to avoid major investment
- But also need to understand persistence of flexibility performance, resource adequacy and transmission security contributions, and pre- and post-dispatch load impacts (avoid snap-backs and shoulder impacts)
  - This work is ongoing through studies, pilots, and review of programs that already exist elsewhere

Considering Advanced Building Technologies in Distribution System Planning

Ari Zwick | Public Utilities Rates Analyst

MINNESOTA

Energy Efficiency (EE) & Demand Response (DR) Planning Landscape

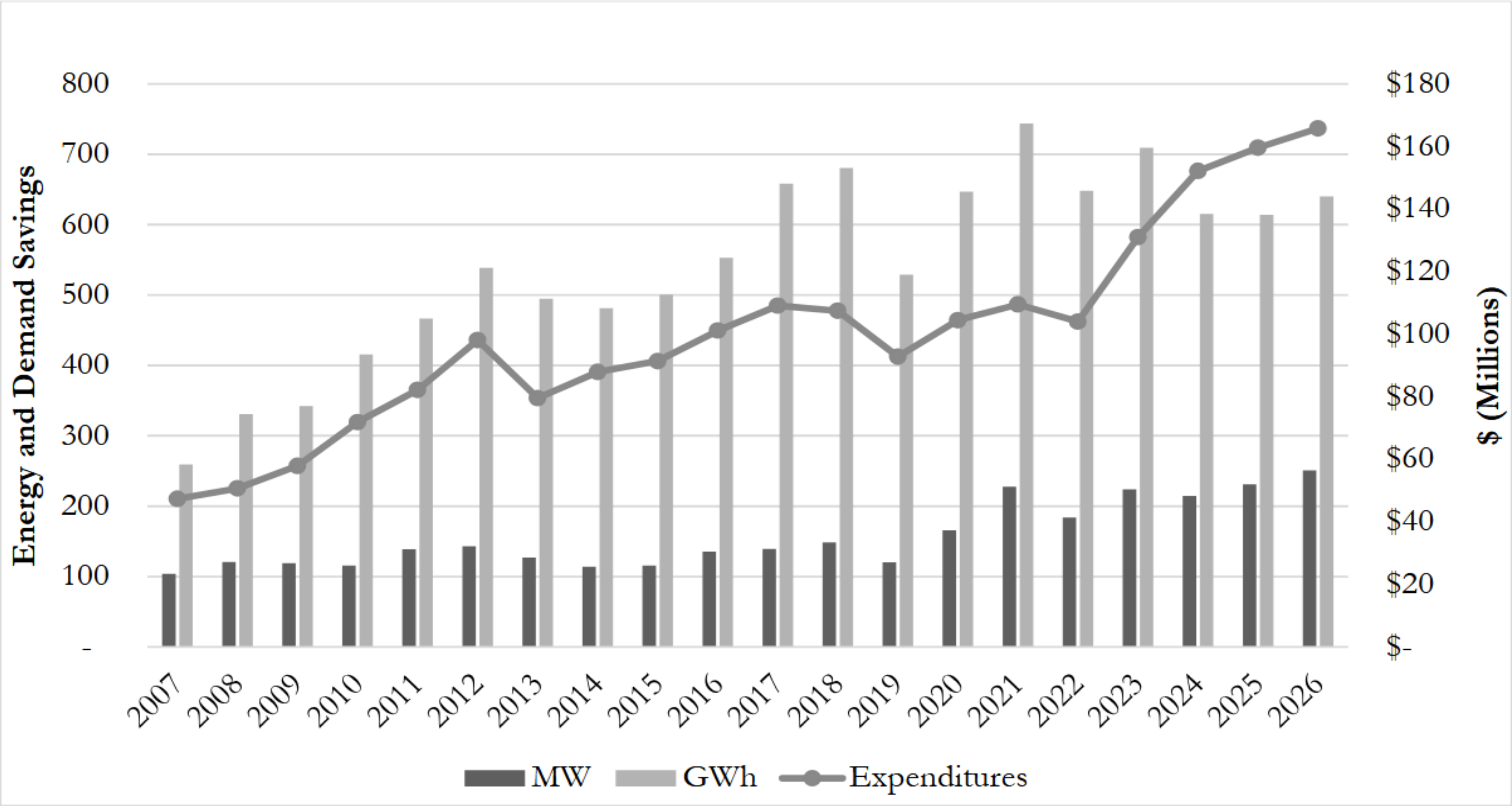


MN ECO Program

- The Energy Conservation and Optimization (ECO) program is a utility-administered program with regulatory oversight provided by the Minnesota Department of Commerce (Department).
- Utility ECO portfolios promote energy-efficient technologies and practices by providing rebates, marketing, and technical assistance to utility customers.
- The Department reviews and approves utility ECO regulatory filings to ensure that energy savings are calculated accurately, statutory requirements are met, and programs meet cost-effectiveness standards.
- The ECO Act (passed in 2021) primarily serves to modernize what was the Conservation Improvement Program (CIP) to provide a more holistic approach to energy efficiency programming. Notable highlights of the ECO Act include:
  - Providing participating electric and natural gas utilities the opportunity to optimize energy use and delivery through the inclusion of load management and efficient fuel switching programs
  - Raising the energy savings goals for the state’s electric investor-owned utilities
  - More than doubling the low-income spending requirement for all investor-owned utilities

Xcel Energy and Demand Savings Projections by Year

Figure 1: ECO Electric Achievements, 2007-2026



Source: Xcel Electric and Gas 2024-2026 ECO Triennial Plan

Examples of Xcel ECO Rebates for DR

- Commercial AC Control (Curtailment & Demand Shifting)
- Critical Peak Pricing (TOU Rates)
- Electric Rate Savings (Curtailment)
- Peak Partner Rewards (Curtailment)
- Residential Demand Response
  - AC Rewards / Saver's Switch (Curtailment)
  - Smart Water Heaters (Demand Shifting)
  - Voluntary Curtailment (No Incentive)

Examples of New Distribution Capacity Programs

- Xcel Distributed Capacity Procurement (DCP)
  - 50-200 MW of company-owned batteries by 2028.
  - Distributed connected battery storage program to participate in the Midcontinent Independent System Operator (MISO) market.
  - Requires that siting decisions include distribution capacity benefits for load and generation.
  - Program originated in ECO
- Xcel Vehicle-to-Grid (V2G) pilot
- Managed EV Charging Tariffs in development
  - Xcel's Charging Perks Program specifically addresses distribution capacity needs
- Xcel and the Dakota Electric Association have distributed battery tariffs

Distribution Capacity Benefits of Advanced Building Technologies

ECO

- Utilities are directed to account for avoided transmission and distribution costs as part of the cost-effectiveness methodology for ECO programs. The Minnesota Cost Test (MCT) is ECO's primary cost-effectiveness test that the gas and electric IOUs use to screen their energy efficiency, load management, and efficient fuel-switching programs.
- Most proposed programs must have a cost effectiveness test.
- Separate from the distribution capacity planning process.

IDPs

- Most rate-regulated utilities in Minnesota do not formally state that EE and DR are studied as part of their distribution planning process.
- If system-wide load forecasts are used for distribution planning, then EE and DR are included in the forecast.
- NWA is required for all Minnesota utilities, but there is very limited deployment.

LoadSEER – A Geospatial Distribution Load Growth Model

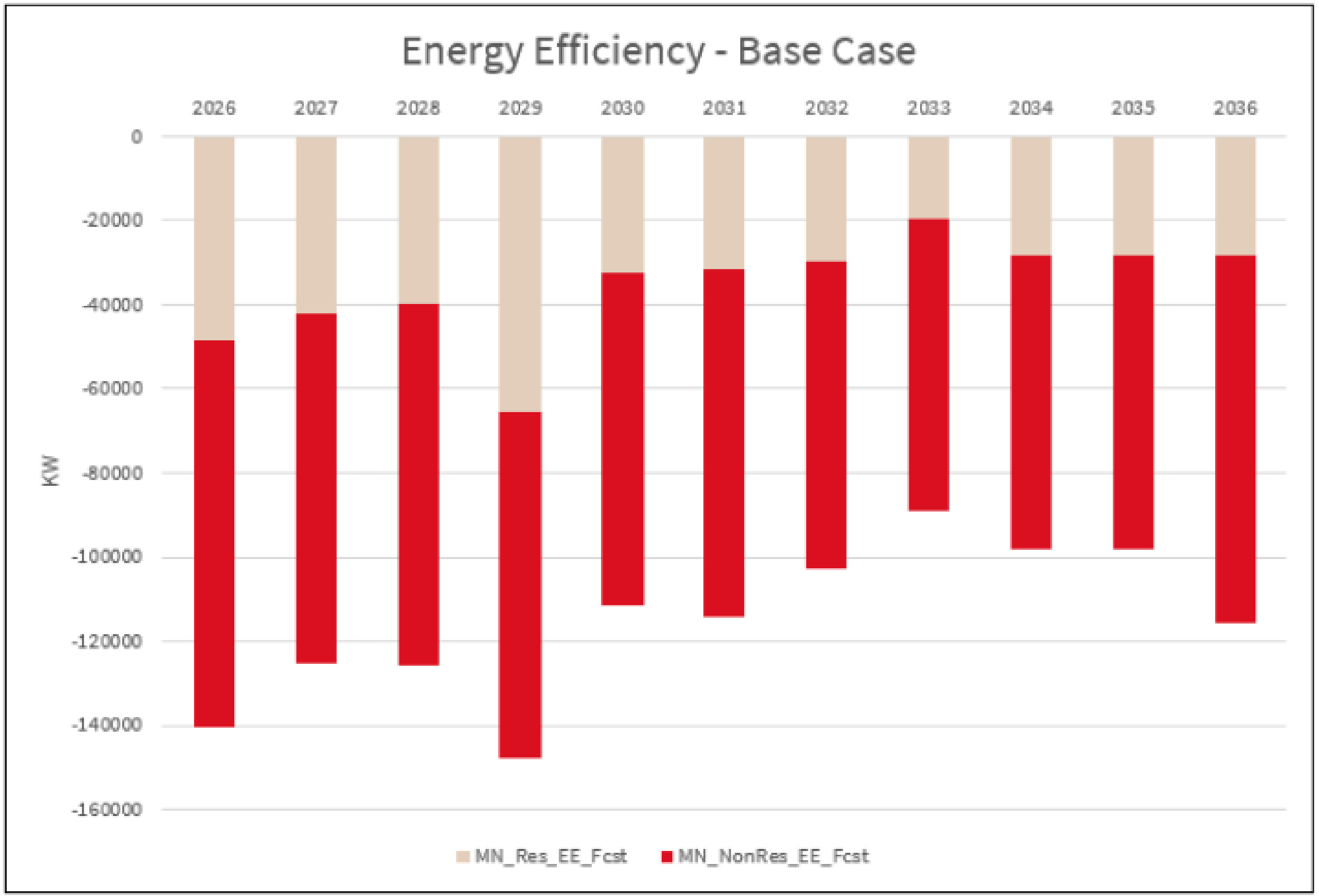
- Uses Xcel's system-wide forecast as an input to geospatially allocate anticipated EE and load growth.
- Data inputs include SCADA, Customer Billing, Weather, Transformer/Feeder Capacity Limits
  - Advanced Metering Infrastructure (AMI) is still improving.
- DR is included in the system-wide forecast.
- Xcel does not know where all of the EE is installed on its system, which limits its ability to forecast EE growth.

LoadSEER – A Geospatial Distribution Load Growth Model

Figure 1 – 5
LoadSEER Application Example

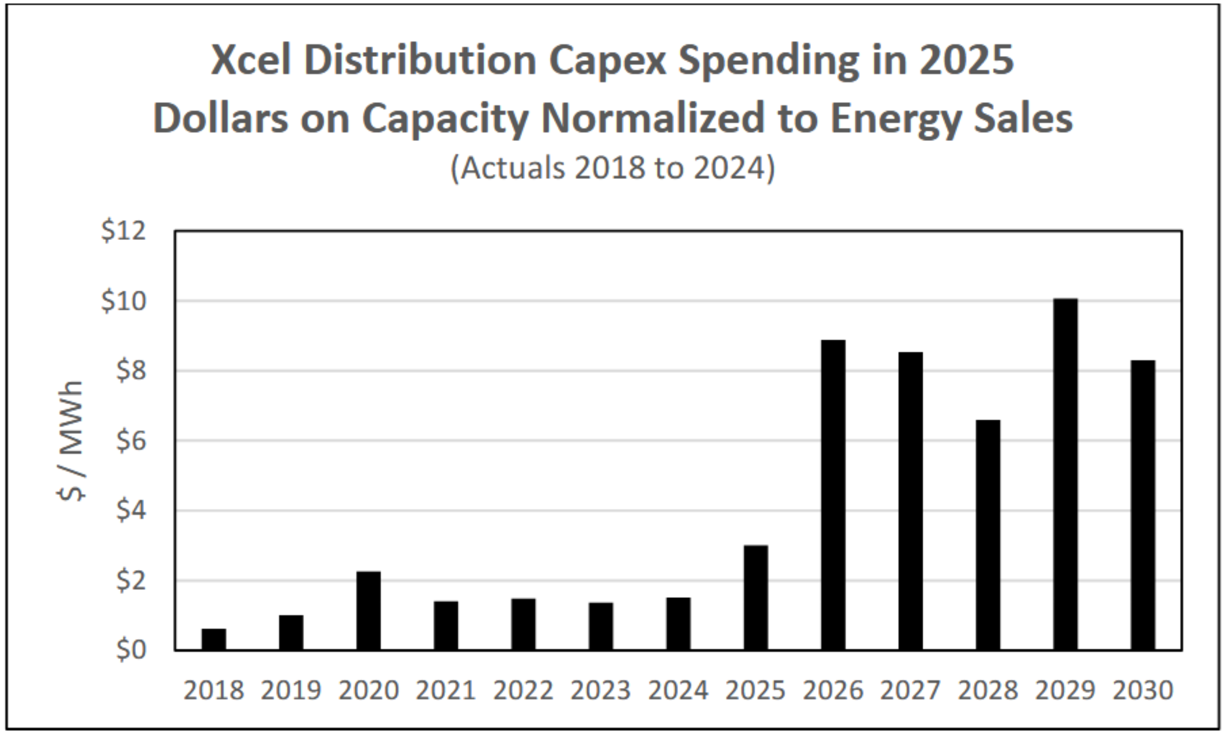
LoadSEER – EE Forecast

ENERGY EFFICIENCY FORECAST BREAKDOWN



LoadSEER – Forecast Accuracy

Figure 12: Xcel Capacity Spending Adjusted to Energy Sales



Source: 2025 IDP – Attachment L, IR 32, IR 33, IR 37

- 2025 is the first planning year when LoadSEER was used for capacity planning.
- Current recommendation in the IDP docket for Xcel to report on the forecast accuracy of LoadSEER
- LoadSEER predicts worst-case peak load conditions, and it is therefore difficult to assess forecast accuracy when worst case peak load conditions rarely occur.

What levers can PUCs and State Energy Offices use to improve consideration of advanced building technologies in distribution system planning?

- Distributed Energy Resource Management Systems (DERMS)
  - Integration of behind the meter (BTM) and front of the meter (FTM) DERMS platforms is required to deploy demand response for distribution capacity needs.
  - Utilities can theoretically dispatch demand response at the feeder level, but their system are not setup to regularly dispatch demand response and measure the effects of it.
- The Department recommends the Commission order Xcel to begin a pilot program to test localized distribution grid benefits from its Aggregator Distributed Energy Resource Management System. At minimum the pilot should:
  - Test different incentive levels to determine the optimal incentive structure;
  - Test at least two controllable load types; and
  - Provide a cost-benefit analysis of localized distribution grid benefits compared to standard distribution grid upgrades.

What levers can PUCs and State Energy Offices use to improve consideration of advanced building technologies in distribution system planning?

- Start tracking the number of controllable devices installed and location of them.
- Ensure interoperability with utility systems.
- Consider geotargeted EE/DR programs to avoid distribution capacity upgrades.
- Start quantifying the value of advanced building technologies for the distribution grid.
- Conduct experiments on incentive levels to optimize grid benefits and participation costs.

Thank You!

Ari Zwick

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DISCUSSION QUESTIONS, 1 OF 2

- What levers can PUCs and State Energy Offices use to improve consideration of advanced building technologies in distribution system planning?
- How do utilities in your state take building technologies into account in distribution system plans? For example, how do plans consider energy efficiency and load flexibility (e.g., utility programs, aggregated load flexibility, non-wires alternatives, smart electrical panels)?

DISCUSSION QUESTIONS, 2 OF 2

- How do utilities in your state account for potential reduced distribution capacity needs due to consumer adoption of energy-saving building technologies?
- What are the top barriers (existing or perceived) to effectively integrating building-level granular data into distribution planning? What are some examples of how this has been effective — and why?