Bridging the Gap on Data and Analysis for Distribution System Planning

Information That Utilities Can Provide Regulators, State Energy Offices and Other Stakeholders

Berkeley Lab public webinar

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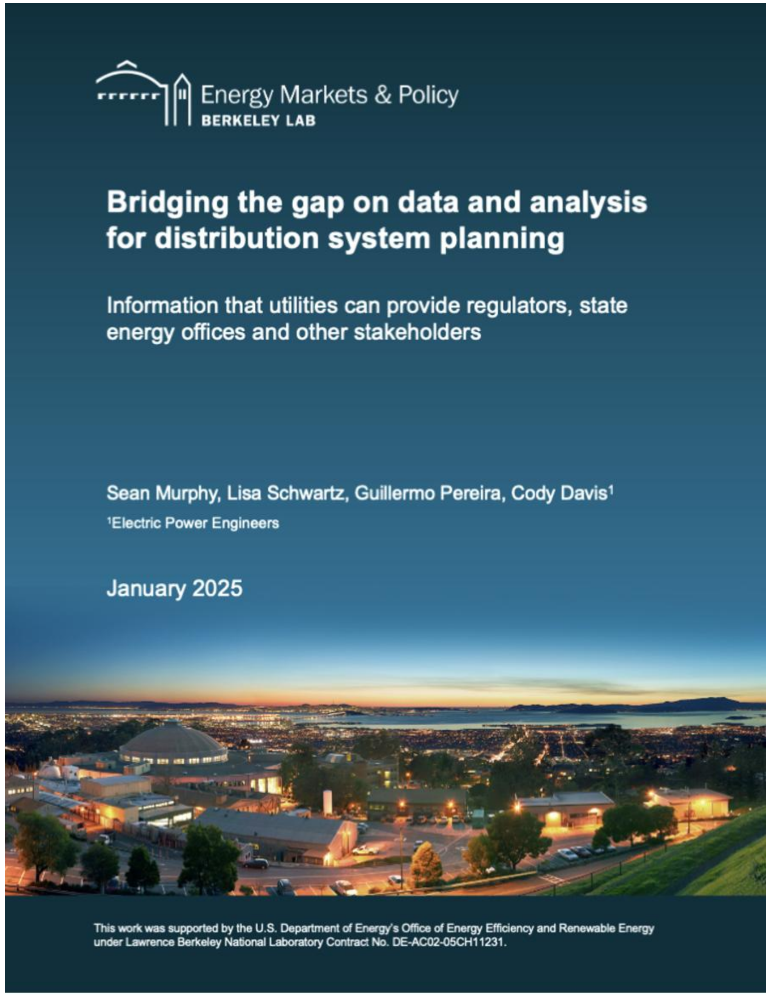
Today’s webinar

- Utilities conduct extensive analysis to develop distribution system plans. But state utility regulators, state energy offices, and stakeholders often do not know:
  - What data are available
  - How the utility uses the data in planning
  - How the data and analysis affect utility decisions
- Today’s webinar will discuss a recently published Berkeley Lab report funded by the U.S. Department of Energy’s Office of Energy Efficiency and Renewable Energy.
- The report aims to increase understanding.
  - Types of data, metrics, and analyses utilities use and can provide
  - Impacts on planning and decision-making
- All participants are in listen-only mode. You can use the Q&A box to make a comment or ask a question. Q&A follows presentations.
- Slides are posted to our website. We’ll post a recording soon.
- See our complementary report on resilience planning data.



Approach

- Interviewed representatives of electric utilities, public utility commissions (PUCs), and state energy offices
- Reviewed utility distribution system plans filed with PUCs
- Identified data and analysis relevant to 11 distribution system planning topics
  - Interactive Decision Framework for Integrated Distribution System Planning includes several additional topics.
- Organized data into a collection tool that regulators and stakeholders can adapt to their needs.

Distribution system planning topics covered
1. Forecasting loads and distributed energy resources
2. Scenario analysis
3. Worst-performing circuits
4. Asset management strategy
5. Hosting capacity analysis
6. Value of distributed energy resources (DERs)
7. Grid needs assessment
8. Cost-effectiveness evaluation for investments
9. Distribution system investment strategy and implementation
10. Geotargeted programs
11. Non-wires alternatives procurements

Interviewees' insights on data sharing approaches, challenges, and impacts

- Common data sharing approaches include annual reports, data portals, data requests in proceedings, and discussions outside of proceedings.

- Regulators and stakeholders found value in extensive reporting but reported challenges with format, lack of standardization, and volume of data.

- Interviewees identified strategies to address these challenges, including:
  - Establishing filing requirements on data at the start of the distribution planning process (or in rules)
  - Determining what data overlaps with other filings, is missing, or is superfluous

- Examples of how interviewees used distribution planning data include:
  - Comparing historical, actual, and projected expenditures
  - Reviewing and validating utility modeling decisions
  - Tracking reliability performance
  - Informing review of grid investments

Load and DER forecasting

Data reported and impacts on planning

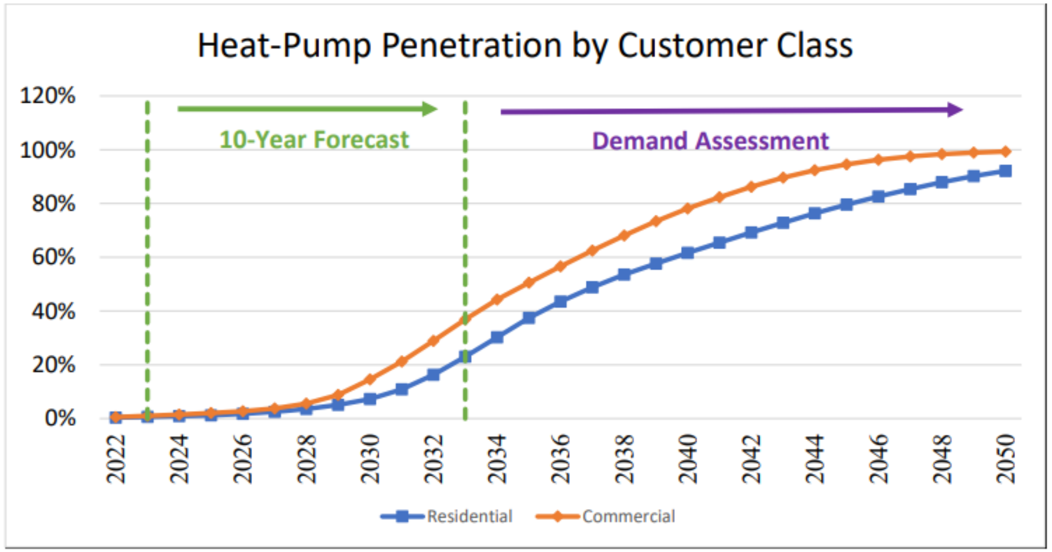
- Utilities estimate peak demand at specific locations on the distribution system to inform timing, need, and type of distribution system investments.

Data category	Type of data reported	Impact of data on planning
Gross load forecast	Model parameters and sources	Provides transparency and enables regulators and stakeholders to validate utility decisions and propose alternatives and scenarios
Load-modifying technologies and distributed generation	Input assumptions and modeling decisions on technologies that affect load growth	
New construction	Size, timing, and location of new loads	Characterizes future grid conditions, identifies drivers of increased peak demand, and informs grid investment strategies
Forecast outputs	Peak demand	

Load and DER forecasting

Load-modifying technologies and distributed generation

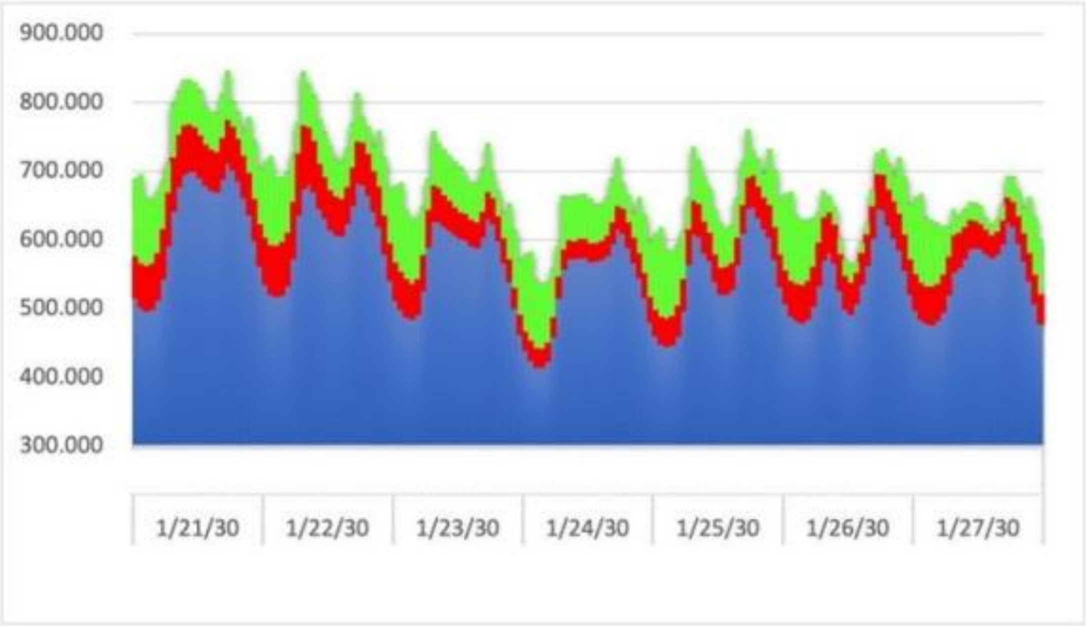
- Utilities can report key assumptions on load-modifying technologies and distributed generation that affect peak demand estimates.
  - Technology adoption estimates
  - Technology operations
- Technology adoption estimates can be systemwide or at the feeder-level and vary by customer class.
- Operational assumptions impact the load shapes of load-modifying technologies and distributed generation (e.g., managed charging, equipment efficiency).
- Utilities can develop scenarios based on different assumptions on technology adoption rates and operations.



Source: National Grid New York, *2024 to 2033 Electric Peak (MW) Forecast and 2050 Load Assessment*

Load and DER forecasting
Leading practices for data sharing

- Identify parameters and design temperatures used in gross load forecasts
- Provide feeder-level adoption estimates for DER and load-modifying technologies
- Develop forecasts for scenarios with different technology adoption levels and operations
- Provide hourly load shapes for peak days that include the impacts of DERs and load-modifying technologies
- Estimate peak demand and DER impacts by circuit



Source: Green Mountain Power, *2021 Integrated Resource Plan*, December 2021

Scenario analysis
Data reported and impacts on planning

- Scenario analysis examines a range of plausible futures based on potential trajectories of planning drivers. Scenarios can identify challenges and risks that the distribution system may face and manage uncertainties by analyzing a range of conditions.

Data category	Type of data reported	Impact of data on planning
Scenario structure		Identifies the types of uncertainties addressed by scenarios
Scenario assumptions	Narrative descriptions	Documents the range of uncertainties used and supports assessment of reasonableness of assumptions
Implications for planning activities		Increases awareness of planning risks and informs discussion of risk mitigation and adaptation

Scenario analysis

Scenario assumptions

- Scenarios can address uncertainties related to technology adoption, efficiency, and operations.
- Documentation on scenario assumptions enables regulators to assess whether scenarios align with:
  - State policies
  - Expected market and technology changes

Modeling Scenario	Purpose	DER Forecast	EV Forecast	EE Forecast	Non-DER/EV TOU Forecast	EV Load Shape	Fuel Price Forecast	Resource Potential
Base	Reference scenario.	Base	Base	Base	Base	Managed EV charging	Base	NREL Alt-1
Land-Constrained	Understand the impact of limited availability of land for future solar, onshore wind and biomass development.	Base	Base	Base	Base	Managed EV charging	Base	**Land-Constrained Resource Potential**
High Load	Understand the impact of customer adoption of technologies for DER, EVs, EE and TOU rates that lead to higher loads.	**Low**	**High**	**Low**	**Low**	**Unmanaged EV charging**	Base	NREL Alt-1
Low Load	Understand the impact of customer adoption of technologies for DER, EVs, EE and TOU rates that leads to lower loads.	**High**	**Low**	**High**	**High**	Managed EV charging	Base	NREL Alt-1
Faster Technology Adoption	Understand the impact of faster customer adoption of DER, EV and EE.	**High**	**High**	**High**	**High**	Managed EV charging	Base	NREL Alt-1
Unmanaged Electric Vehicles	Understand the value of managed EV charging relative to unmanaged.	Base	Base	Base	Base	**Unmanaged EV charging**	Base	NREL Alt-1
DER Freeze	Understand the value of the distributed PV and BESS uptake in the Base forecast. Informative for program design and solution sourcing.	**DER Freeze**	Base	Base	Base	Managed EV charging	Base	NREL Alt-1
Electric Vehicle Freeze	Understand the value of the electric vehicle's uptake in the Base forecast. Informative for program design and solution sourcing.	Base	**EV Freeze**	Base	Base	Managed EV charging	Base	NREL Alt-1
High Fuel Retirement Optimization	Understand the impact of higher fuel prices on the resource plan while allowing existing firm unit to be retired by the model.	Base	Base	Base	Base	Managed EV charging	**EIA High Fuel Price**	NREL Alt-1
Energy Efficiency Resource	Understand the value of energy efficiency as a resource. Informative for program design and solution sourcing.	Base	Base	**EE Freeze + EE Supply Curves**	Base	Managed EV charging	Base	NREL Alt-1

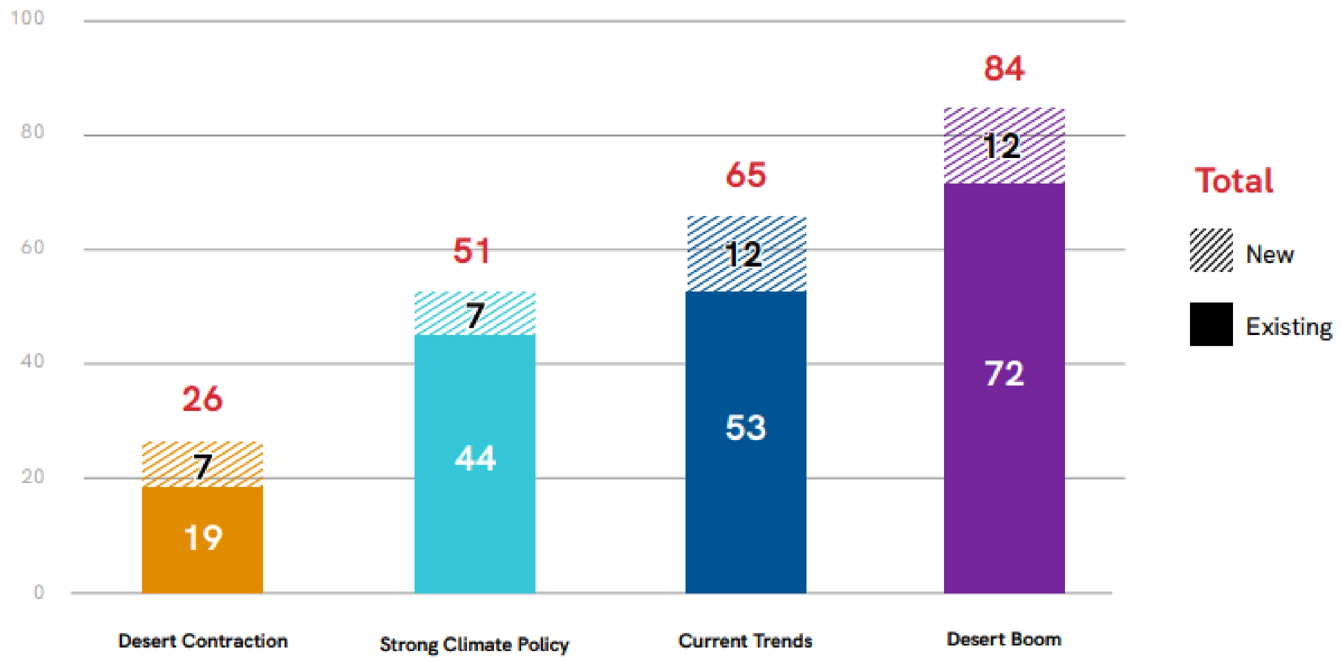
Source: Hawaiian Electric, *Integrated Grid Plan*, May 2023

Scenario analysis

Implications for planning

- Scenario narratives can identify potential challenges and risks to distribution system planning activities.
- Narratives also increase regulator awareness of risks and create a starting point for analysis and discussion of risk mitigation and adaptation.
- Utilities can report data on planning activities to which they apply scenarios (e.g., load and DER forecasts).

Salt River Project substation bay additions through 2045 by planning scenario



Source: Salt River Project, *2023 Integrated System Plan*, 2023

Scenario analysis

Leading practices for data sharing

- Describe structure of scenarios used and uncertainties that each scenario addresses
- Document assumptions that differentiate scenarios
- Provide narrative descriptions that identify risks and challenges
- Report scenario-specific data on planning activities

DTE (MI) 2023 DSP Grid Modernization Scenarios

Scenario	Description
Electrification	High electrification of transportation, buildings, and industrial processes
Increasing CAT Storm	Increased frequency and intensity of catastrophic (CAT) storm threats to electric infrastructure
DG/DS	High adoption of distributed generation (DG) solar PV and distributed storage (DS) as batteries behind the meter (BTM)

Source: DTE 2023 Distribution System Plan

Worst-performing circuits
Data reported and impacts on planning

- Utilities analyze the duration, frequency, and number of customer service interruptions to identify circuits (feeders) with the worst reliability.

Data category	Types of data reported	Impact of data on planning
Identification of worst-performing circuits	Metrics, methods, and criteria for selecting worst-performing circuits	Focuses efforts on circuits with the poorest performance and resulting local grid conditions
Worst-performing circuit characteristics	Circuit technical details, customer counts and classes, reliability performance, event and maintenance history	Provides historical and operational context for understanding circuit reliability
Remediation plans	Criteria for developing a remediation plan and planned remediation actions	Specifies how utilities plan to respond to known drivers of poor reliability performance

Worst-performing circuits

Identification of worst-performing circuits

- Utilities rank circuits by reliability performance metrics and apply screening criteria to those metrics.

- The outcome of the worst-performing circuit analysis depends on:
  - Choice of metric (e.g., duration- vs. frequency-based)
  - Types of interruptions eligible for analysis
  - Time frame of analysis

- Utilities often select worst-performing circuits based on defined percentages of circuits with the lowest metric score.

Metric	Description
SAIFI	System Average Interruption Frequency Index
SAIDI	System Average Interruption Duration Index
CAIFI	Customer Average Interruption Frequency Index
CAIDI	Customer Average Interruption Duration Index
MAIFI	Momentary Average Interruption Frequency Index
CEMI	Customers Experiencing Multiple Interruptions

Worst-performing circuits

Worst-performing circuit characteristics

- Technical details (e.g., voltage, line length) provide context for causes of interruptions and remediation efforts.
- Event history (e.g., interruption causes and impacts) informs mitigation strategies.
- Reliability performance metrics help regulators track performance over time.
- Maintenance history (e.g., tree trimming dates) informs the extent of utility progress in addressing reliability issues.

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	Interruptions		Customers Interrupted		Customer Hours of Interruption	
Tree In Row	7	11.48%	169	2.44%	619.503	4.29%
Tree Out Row	28	45.90%	3378	48.82%	4993.385	34.54%
Overloads	2	3.28%	229	3.31%	646.109	4.47%
Operational Errors	0	0.00%	0	0.00%	0	0.00%
Equipment Failures	7	11.48%	549	7.93%	207.464	1.44%
Accidents/Non-Utility	4	6.56%	1865	26.95%	6294.908	43.55%
Prearranged	1	1.64%	9	0.13%	19.647	0.14%
Customer Equipment	1	1.64%	1	0.01%	1.167	0.01%
Lightning	7	11.48%	531	7.67%	1242.753	8.60%
Unknown	4	6.56%	189	2.73%	430.749	2.98%
Totals	61	100%	6920	100%	14456	100%

Source: New York State Electric & Gas, 2022 Annual Reliability Report

Worst-performing circuits
Leading practices for data sharing

- Describe the choice of performance metrics, interruptions excluded from metric calculation, and screening criteria for circuit identification
- Report detailed data on worst-performing circuits (e.g., event history, reliability performance history)
- Provide detailed information on remediation plans (e.g., cost, timeline, and description of planned actions)

Source: EPRI

Asset management strategy

Data reported and impacts on planning

- Utilities establish an inventory of distribution system assets, analyze condition and performance, and make capital and maintenance spending decisions to efficiently maintain system safety and reliability.

<table>
<tr><th>Data category</th><th>Type of data reported</th><th>Impact of data on planning</th></tr>
<tr><td>Standards and guidelines</td><td>Equipment and design standards, engineering guidelines</td><td>Shapes physical grid infrastructure and types of solutions available to address system challenges</td></tr>
<tr><td>Asset and reliability data</td><td>Reliability indices, equipment testing and inspection data, device settings</td><td rowspan="3">Impacts distribution infrastructure and provides opportunities to coordinate asset management with distribution system planning to optimize spending on capacity upgrades</td></tr>
<tr><td>Programmatic asset-related investments</td><td>Utility programs and associated goals and budgets</td></tr>
<tr><td>Discrete asset management investments</td><td>Asset needs identification and prioritization</td></tr>
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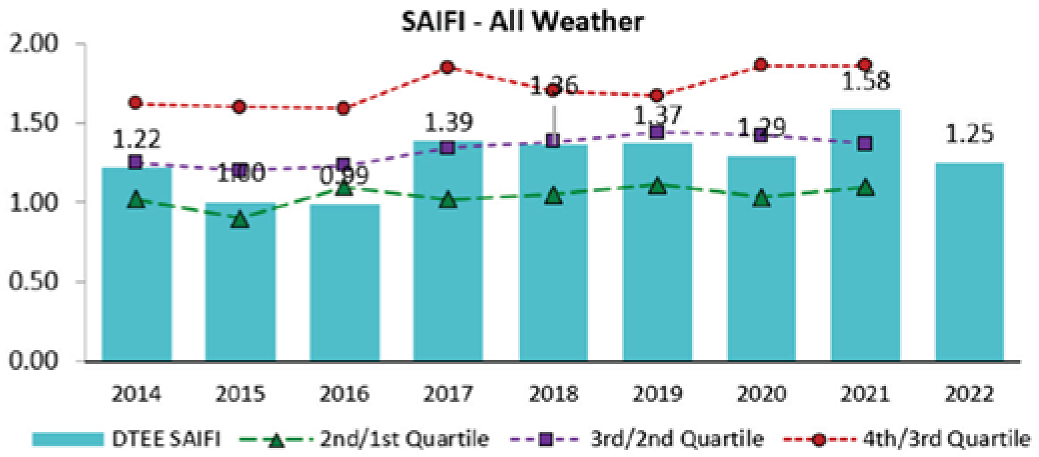
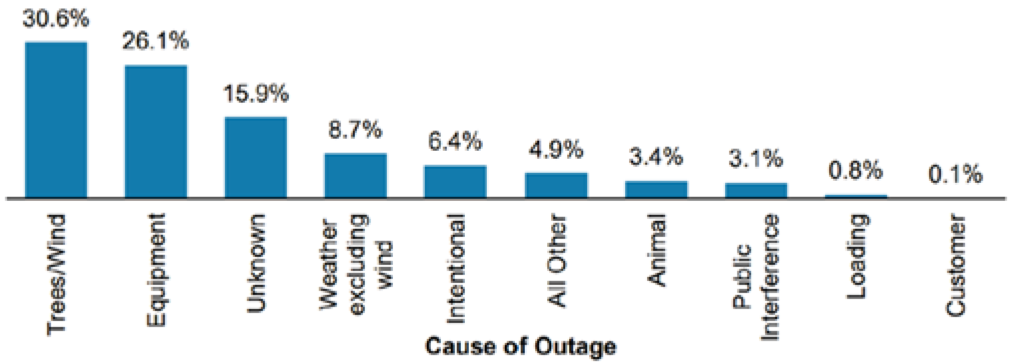
Asset management strategy

Asset and reliability data (strategy inputs)

- Utilities can describe and report **asset data** such as:
  - Pole and device counts
  - Average equipment age by type
  - Inspection and health assessment programs and results
  - Equipment design and settings strategies

- **Outage and reliability data** are critical inputs to utility investment strategies.
  - Outage frequency/duration at the system, region, or circuit level
  - Outage cause information
  - Worst performing circuits





DTE 2023 Distribution Grid Plan SAIFI and Outage Cause Data

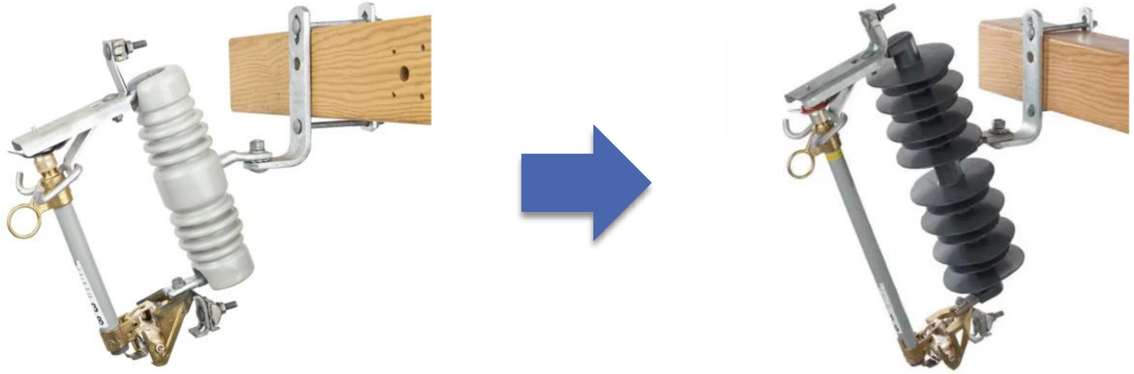
Asset management strategy

Asset management investments (strategy outputs)

- Asset health and performance data are used as inputs to strategic decision-making, resulting in investments to ensure safety and maintain or improve reliability.

- **Programmatic investments** address repeating system needs, remediating widespread issues over time, or scaling up deployment of new technologies.
  - Investment drivers, costs, and performance tracking are key to successful programs.
  - Example: Porcelain Cutout Replacement Program

- **Discrete investments** address specific needs at specific locations based on reliability, asset health, or safety considerations.
  - Spending reporting likely aggregated into categories



Porcelain and Polymer Cutouts (Hubbell)

	Bridge Year	Budget					Budget Avg
IDP Category	2023	2024	2025	2026	2027	2028	2024-2028
Age-Related Replacements and Asset Renewal	$136.9	$179.4	$199.6	$231.2	$252.7	$272.4	$227.1
New Customer Projects and New Revenue	$50.1	$44.9	$47.6	$49.2	$51.1	$53.5	$49.3
System Expansion or Upgrades for Capacity	$35.8	$61.8	$93.2	$159.0	$193.3	$227.1	$146.9
Projects related to Local (or other) Government-Requirements	$29.2	$37.2	$39.6	$40.6	$41.6	$43.3	$40.4
System Expansion or Upgrades for Reliability and Power Quality	$40.9	$38.7	$55.4	$76.4	$201.2	$328.0	$139.9
Other	$70.8	$74.1	$55.1	$54.8	$56.4	$63.4	$60.7
Metering	$5.3	$4.1	$4.4	$4.7	$4.6	$4.5	$4.5
Grid Modernization and Pilot Projects	$115.4	$111.3	$56.3	$40.9	$33.5	$10.8	$50.6
Non-Investment	($2.1)	($4.0)	($4.0)	($4.0)	($4.0)	($4.0)	($4.0)
Electric Vehicle Programs	$9.3	$8.9	$1.4	$18.4	$36.9	$71.8	$27.5
TOTAL	$491.7	$556.5	$548.5	$671.2	$867.2	$1,070.7	$742.8

Xcel Energy (MN) 2023 IDP Capital Expenditure Categories

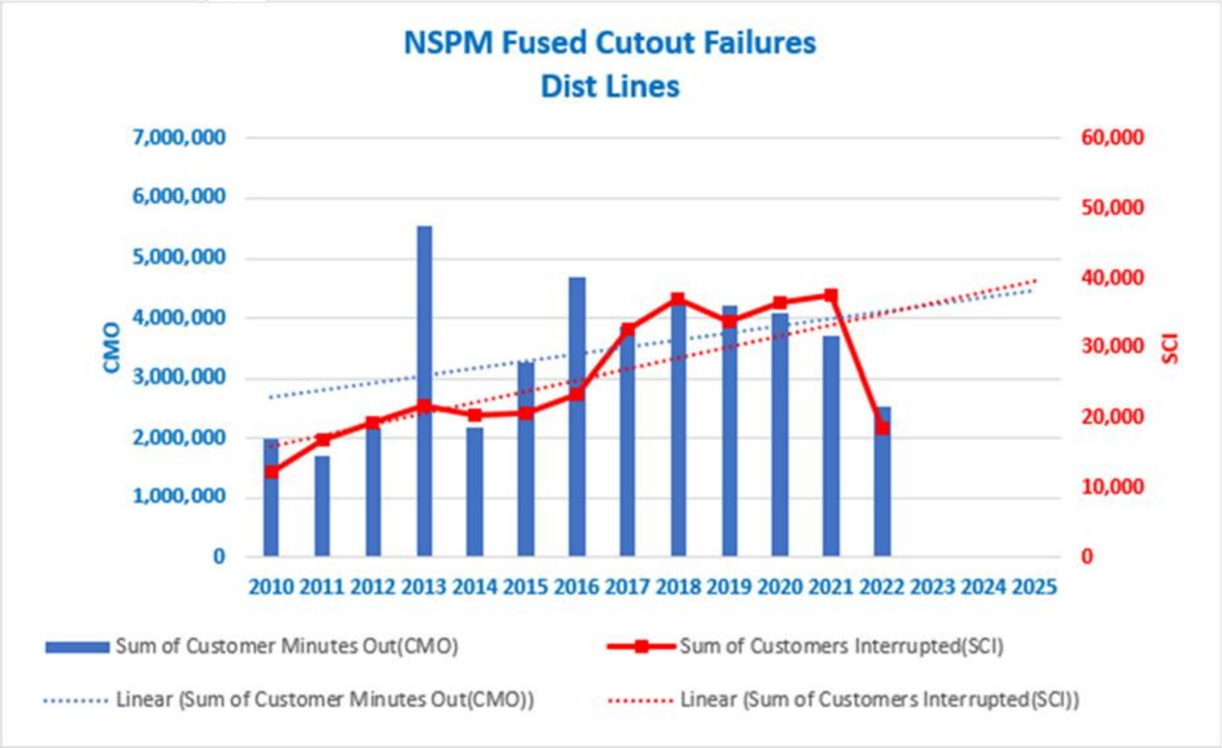
Asset management strategy

Leading practices for data sharing

- Clearly identify criteria used to assess asset condition and justify replacement

- For new programmatic investments
  - Provide data to demonstrate the need for investment (see graph)
  - Identify reportable data to assess program impact and effectiveness

- Share equipment selection and design practices, especially if they are impacted by changing grid conditions



Xcel Energy (MN) 2023 IDP Cutout Failure Reliability Impact Data

Hosting capacity analysis

Data reported and impacts on planning

- Utilities determine the amount of DERs that can interconnect at a specific point on the grid without infrastructure upgrades or adversely impacting power quality or reliability under existing control and protection systems.

Data category	Type of data reported	Impact of data on planning
Analytical framework	Criteria for updating hosting capacity analysis and key methodological decisions	Provides transparency and enables regulators to validate utility decisions and propose alternatives
Distribution system infrastructure attributes	Locational, technical, and operational information on substations and feeders	Informs siting of DERs and loads absent power flow simulations
Load characteristics	Peak and minimum demand	Informs siting of DERs and loads
DER capacity	Installed and queued DER capacity	
Hosting capacity estimates	Generation, load, and storage hosting capacity	Informs siting, sizing, and operations of DERs and EV charging stations
Mitigation analysis	Options and costs for mitigating constraints	Provides transparency, enables validation of utility analyses, and provides insight into utility investment decisions and potential alternatives

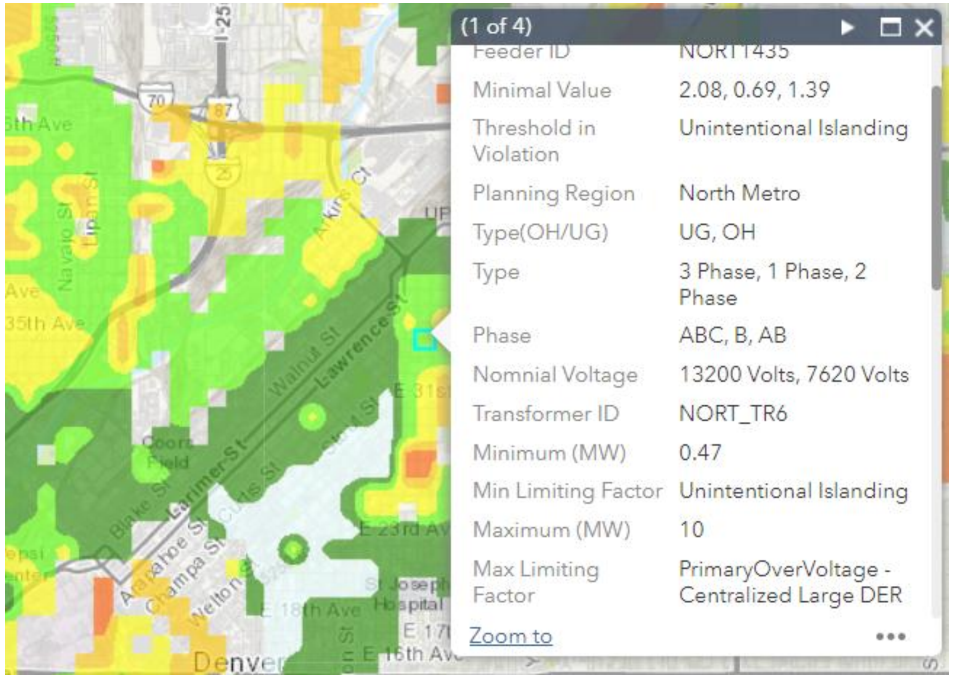
Hosting capacity analysis

Hosting capacity estimates

- Utilities can report hosting capacity for:
  - Generation (e.g., rooftop PV)
  - Load (e.g., EVs, building electrification technologies)
  - Storage

- Hosting capacity may be in ranges or values specific to distribution system equipment (e.g., transformers).
  - More geographically granular data supports better decision-making

- Hosting capacity published in publicly available maps, downloadable spreadsheets, and application programming interfaces can:
  - Reduce the volume of data requests to utilities
  - Help developers understand whether system upgrades will be necessary to enable DER projects



Source: [Xcel Colorado Hosting Capacity Map]

Hosting capacity analysis

Leading practices for data sharing

- Document the types of constraints considered and the threshold for each constraint
- Make node-level data publicly available (e.g., through maps)
- Identify strategies to mitigate hosting capacity constraints
- Describe the criteria and costs for updating modeling tools and capabilities

Category	Impacts	Mitigation
Voltage	Over-voltage	Adjust DER power factor setting, reconductor
	Voltage Deviation	Adjust DER power factor setting, reconductor
	Equipment Voltage Deviation	Adjust DER power factor setting, adjust voltage regulation equipment settings (if applicable), or reconductor
Loading	Thermal Limits	Reconductor, replace equipment
Protection	Additional Element Fault Current	Adjust relay settings, replace relays, replace protective equipment
	Breaker Relay Reduction of Reach	Adjust relay settings, replace relays, move or replace protective equipment
	Sympathetic Breaker Relay Tripping	Adjust relay settings, replace relays, move or replace protective equipment
	Unintentional Islanding	Installation of Voltage Supervisory Reclosing

Source: Xcel Energy 2024 Hosting Capacity Guidebook

Value of DERs

Data reported and impacts on planning

- Utilities can quantify the benefits of DERs to the distribution system to inform customer compensation and guide deployment.

Data category	Type of data reported	Impact of data on planning
Distribution system input data	Distribution growth expectations, capacity needs, and historical costs	Informs DER programs, which can affect future distribution system planning needs
DER input data	DER types and associated performance characteristics	
Distribution DER value drivers	Value drivers considered and corresponding quantification methodologies	

Value of DERs
Value drivers considered

- Scope of studies and reporting may include value drivers other than distribution value.
  - Generation – Energy, capacity, ancillary services
  - Transmission – Capacity, losses
  - Environmental – Emissions reduction
  - Societal/Other – Economic or community benefits

- Types of DERs considered can vary by jurisdiction or study goals.
  - Solar
  - Solar + storage
  - Standalone storage
  - Demand response and controllable loads
  - Energy efficiency
  - Technology-agnostic studies

Types of Distribution Value Utilities can Report for Value of DERs Studies and Distribution System Plans

Value driver	Definition
Distribution capacity	DERs delay or avoid the need for distribution capacity upgrades by reducing peak demand.
Loss reduction	When generated energy is consumed locally, DERs can reduce energy lost in electricity transmission and distribution.
Voltage support (power quality)	DERs can increase local voltages in low voltage areas and help modulate voltages using smart inverter functions.
Increased hosting capacity	DERs capable of acting as controllable loads can absorb excess solar generation, allowing for additional solar energy to be generated or additional distributed PV systems to interconnect.
Reliability, resilience, and outage reduction	Certain types and configurations of DERs can act as an alternate source during system outages, improving reliability and resilience.
Operations and maintenance (O&M) spending reduction	Utilities engage in a wide range of operations and maintenance activities that may be positively impacted by DERs.
Asset health	DERs can reduce the loading on equipment, which may increase equipment lifespan or reduce failure risk.
Other DER impacts	DERs may have positive impacts across nontechnical considerations including societal, environmental, and other benefit streams.

Value of DERs

Leading practices for data sharing

- Identify the types of DERs considered in the analysis and explain the DER performance assumptions used in the study

- Identify distribution values considered and document methodologies for quantifying values

- To the extent practical, capture variations in DER value due to locational differences in grid needs

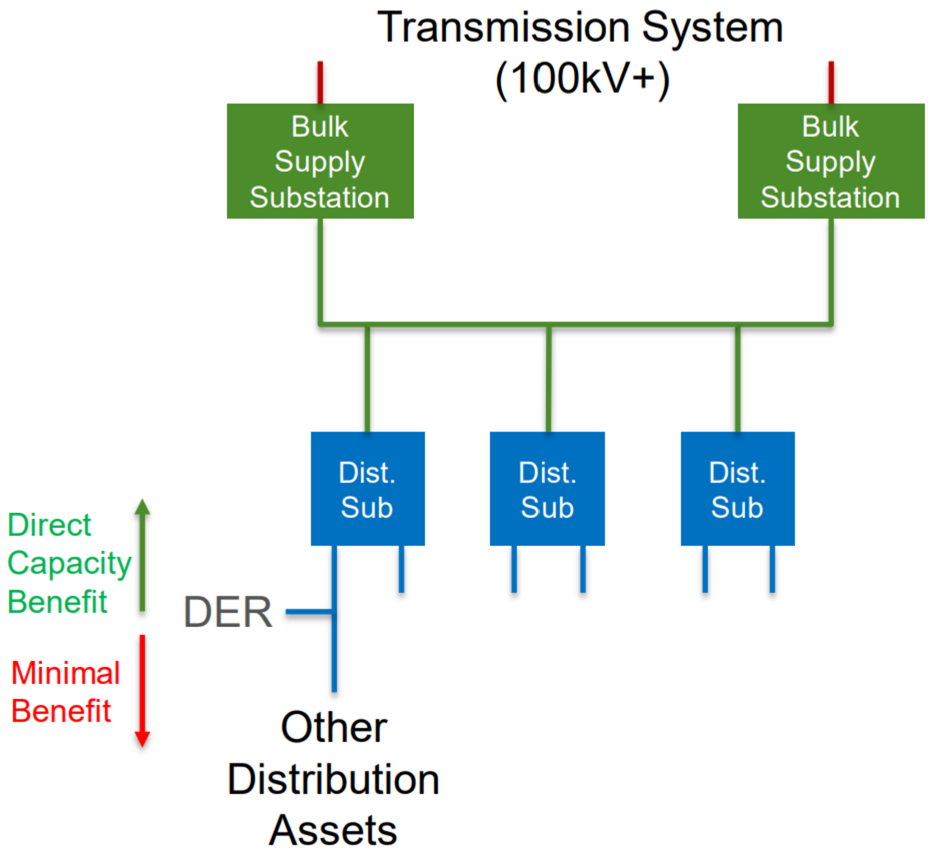


Illustration of Locational Capacity Impact of DER (Ameren Illinois)

Grid needs assessment

Data reported and impacts on planning

- Utilities identify specific grid deficiencies over a set period (e.g., 10 years). The assessment leverages utility data from other distribution system analyses, including load and DER forecasting and scenario analysis.

Data category	Type of data reported	Impact of data on planning
Scope	Objectives and regulatory compliance	Establishes the breadth and depth of the assessment and how it fits into the utility's distribution system planning strategy
Analytical approach	Methodology, limitations, and tools	Characterizes the approach implemented to identify grid needs
Grid needs identification	Asset characteristics, description of grid need, cost estimates, timing of grid need, and engineering characteristics	Identifies assets impacted by grid deficiencies
Grid needs selection	Grid needs prioritization and solutions	Selects grid needs for near-term investments and describes the approach that will be used to identify solutions

Grid needs assessment

Grid needs identification

- Utilities can provide data related to:
  - Asset characteristics
  - Cost estimates
  - Timing
  - Engineering characteristics of the grid needs

- Information on timing of grid needs can include the year, season, and time of day when the grid need is expected to occur.
  - This can inform regulators and stakeholders of when an asset will be impacted to inform planning and investment decisions

- Grid needs assessment data allows regulators and stakeholders to understand the processes and analyses the utility uses to identify investment needs, including robustness of approaches used.

Cost estimate data for O’ahu hosting capacity grid needs, 2023-2030

Parameter (Nominal $)	Base DER Forecast	High DER Forecast	Low DER Forecast
Number of grid needs	6	16	5
Cost summary (wires solutions)	$792,000	$3,895,000	$648,000

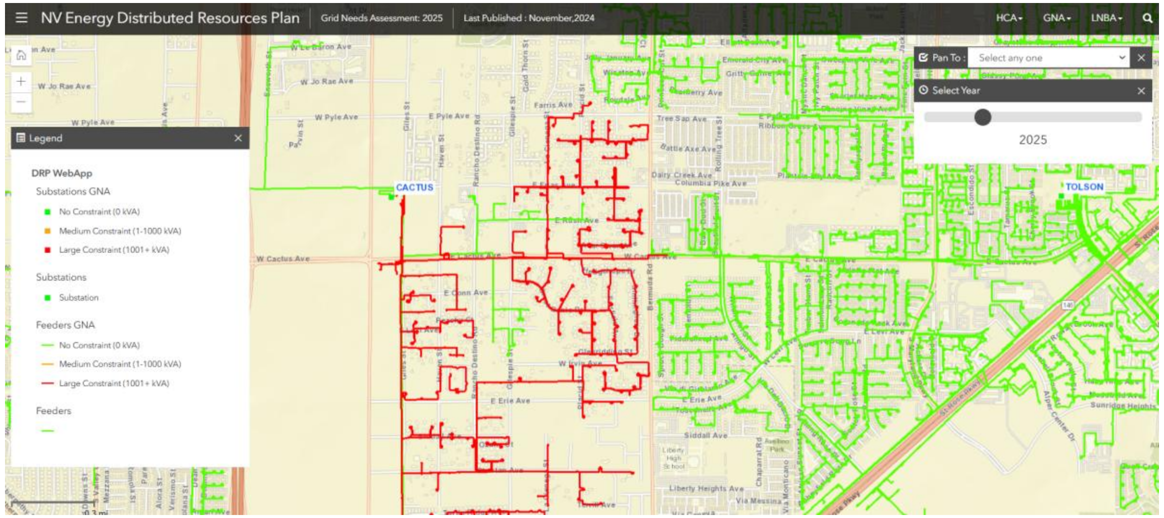
Source: Hawaiian Electric 2023 Integrated Grid Plan

Grid needs assessment

Leading practices for data sharing

- Provide data on analytical steps followed to identify grid needs
- Disclose commercial and utility-developed tools used and their role in the analysis
- Share comprehensive grid deficiency data to enable identification of cost-effective solutions
- Leverage data portals to facilitate access

NV Energy grid needs assessment online map and data portal



Source: NV Energy, Distributed Resources Plan Portal

Cost-effectiveness evaluation for investments

Leading practices for data sharing

- Utilities assess the benefits and costs of distribution system investments and qualitative factors to achieve established planning objectives to determine an optimal course of action.

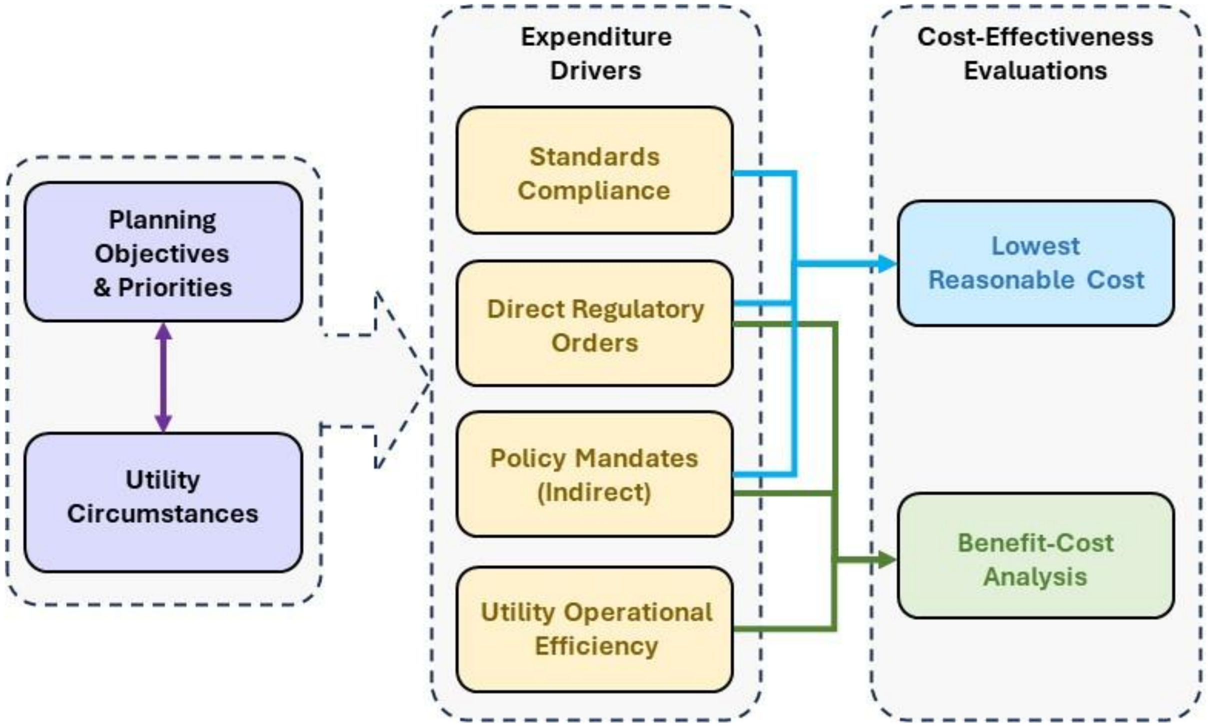
Data category	Type of data reported	Impact of data on planning
Solution justification data	Description of selected investments and other expenditures, expected outcomes, investment drivers (compliance with standards, regulations, or policies or enabling other new capabilities), and engineering analyses	Identifies alternatives considered, selected solutions, and rationale
Cost-effectiveness analysis screening	Scope of analysis (individual solution or integrated set of technologies), screening method, estimates of benefits and costs, uncertainty analyses, and ex-post results from prior distribution plans	Determines approach (lowest reasonable cost or benefit-cost analysis) the utility uses for initial economic evaluation of proposed expenditures based on investment drivers
Portfolio development	Scoring and ranking methods (e.g., multi-objective decision analysis, value-spend efficiency) and results, planned portfolio of expenditures	Prioritizes screened expenditures based on cost and potential contribution toward achieving planning objectives to create value for utility customers and society

Cost-effectiveness evaluation for investments

Solution justification data

- Utilities can provide data related to:
  - Selected capital investments and operating expenses
  - Drivers and engineering analysis supporting the investment
  - Investment alternatives considered, when applicable
  - Cost-effectiveness methodology
- Information on cost-effectiveness methodology includes a description of the method and its suitability
  - Allows regulators to assess the utility's rationale and whether it matches regulatory priorities
- Solution justification data enables regulators to understand how planning objectives translate into specific grid needs and investment proposals

Investment drivers and cost-effectiveness evaluation methods



Source: De Martini, P., L. Schwartz, and J. Ball. 2025. [Economic Evaluation of Modernization Expenditures for Electric Utility Distribution Systems: A Guide for Utility Regulators]. Lawrence Berkeley National Laboratory

Cost-effectiveness evaluation for investments

Leading practices for data sharing

- Provide data to characterize distribution system expenditures evaluated for cost-effectiveness
- Ensure transparency between expenditures and their contribution to achieving distribution planning objectives and requirements
- Ensure that utility cost-effectiveness considerations align with distribution system planning objectives and criteria
- Provide information on the distribution expenditure prioritization method used

Multi-objective prioritization for distribution system investments

Source: Portland General Electric's 2022 Distribution System Plan

Distribution system investment strategy and implementation

Data reported and impacts on planning

- Utilities establish long-term strategic plans to achieve distribution system objectives in an affordable way over the planning horizon.

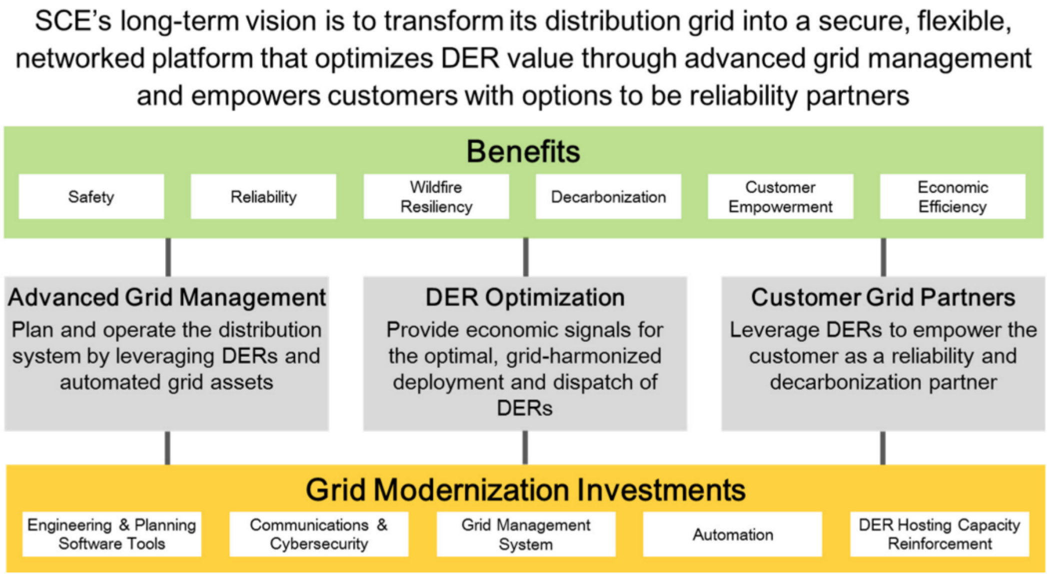
Data category	Type of data reported	Impact on planning
Strategy development	Vision, objectives, strategy and investment drivers, capabilities and functionalities, grid architecture, and strategic roadmap	Characterizes the long-term evolution of the distribution system and enables regulators to assess alignment with state policy goals and objectives, as well as planning requirements
Strategy implementation	Progress to date, future implementation, investments planned, costs and financing, and risks and mitigation	Connects long-term strategic plans with near-term actions, allowing regulators to understand progress and assess the adequacy of proposed investments in relation to the utility's long-term strategy

Distribution system investment strategy and implementation

Strategy development

- Utilities can provide information related to:
  - Vision statement
  - Objectives
  - Strategy and investment drivers
  - Strategic roadmap
- The utility's vision establishes its long-term ambition for the distribution system over a defined time frame.
  - Regulators can use this information to assess the proposed investments and determine if they advance the utility's vision, and state policy goals
- The data adds transparency to planning processes by demonstrating how the utility translates planning objectives into expenditure decisions.

SCE's 10-year grid modernization vision



Source: [SCE, 2021 General Rate Case, Grid Modernization Plan]()

Distribution system investment strategy and implementation

Leading practices for data sharing

- Provide data to communicate the proposed distribution system evolution effectively
- Include information on near-term capabilities and functionalities needed to modernize the distribution system
- Provide information on completed, ongoing, and future projects and initiatives necessary to achieve the long-term vision
- Report on progress and future investment needs

Summary of progress on strategic investments

Investment	Progress
Technology and Automation	• Opened the new Electric System Operations Center (eSOC) in 2022 • Launched the Outage Management System (OMS) and Distribution Management System (DMS) components of Advanced Distribution Management System (ADMS) in February 2023
Pole Top Maintenance and Modernization (PTMM)	• Replaced 5,553 poles (2021-2022) through the PTMM program and on track to replace 3,353 poles in 2023
4.8kV Hardening	• Hardened 677 miles of overhead circuits in the city of Detroit and on track to harden 345 additional miles by the end of 2023
Tree Trim	• 80% of the system is now on a five-year tree trimming cycle and the company goal is to be 100% on cycle by the end of 2025
Conversion	• Energized two new 13.2kV substations in the city of Detroit (Corktown Substation and Island View Substation)

Source: DTE, 2023 Distribution Grid Plan

Geotargeted programs

Data reported and impacts on planning

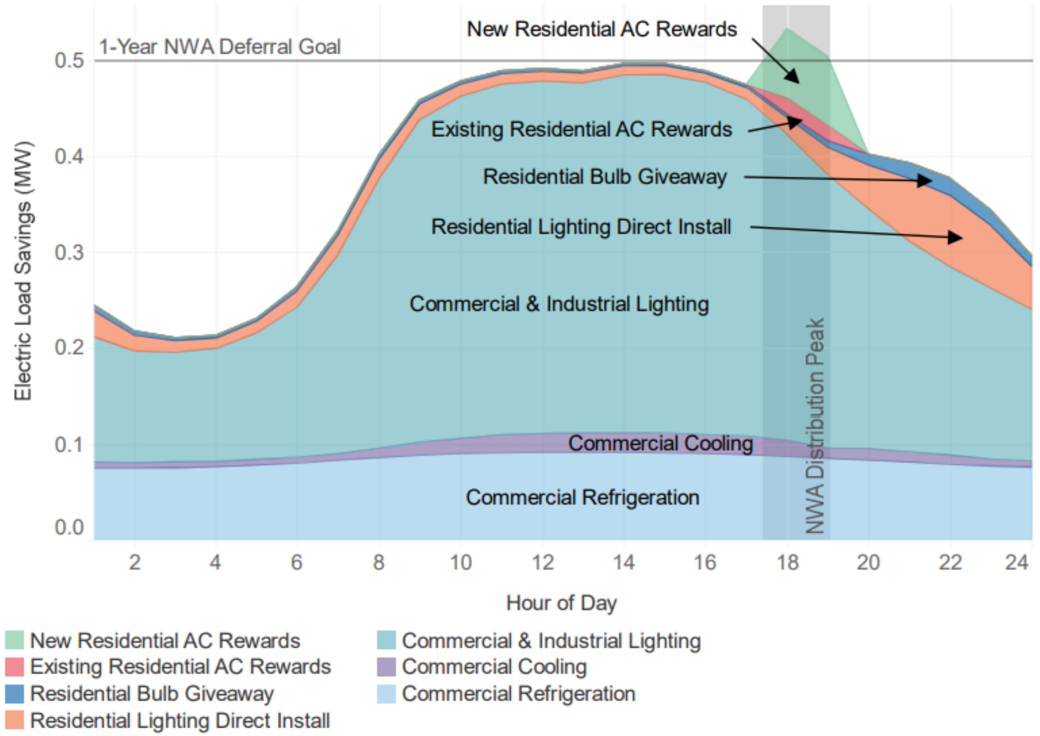
- Utilities deploy geotargeted programs to reduce load growth for specific locations on the distribution system and reduce the need for system upgrades. These programs typically provide utility customers incentives to adopt DERs.

Data category	Type of data reported	Impact of data on planning
Program needs	Program goals, locational characteristics, and operational and technical requirements	Defines suitability and technical characteristics of geotargeted programs to meet grid needs
Program design and deployment	Eligible measures, program duration, customer participation, and marketing, education, and outreach	Identifies program elements and deployment activities
Evaluation of program performance	Technologies and measures deployed, program effectiveness, community engagement, program budget, and cost-effectiveness	Supports decision-making on continuing and refining program design and deployment

Geotargeted programs
Program design and deployment

- Utilities can provide information related to:
  - Measures eligible
  - Program duration
  - Customer participation
  - Incentive types
- Information on eligible measures can include data on qualifying technologies for each customer class as well as participation targets.
  - The data help regulators and stakeholders understand how the portfolio of selected measures contributes to program goals.
- Geotargeted program data can provide utility regulators and stakeholders with valuable information to understand and assess proposals for adapted or new DER programs.

Expected measure performance for geotargeted program



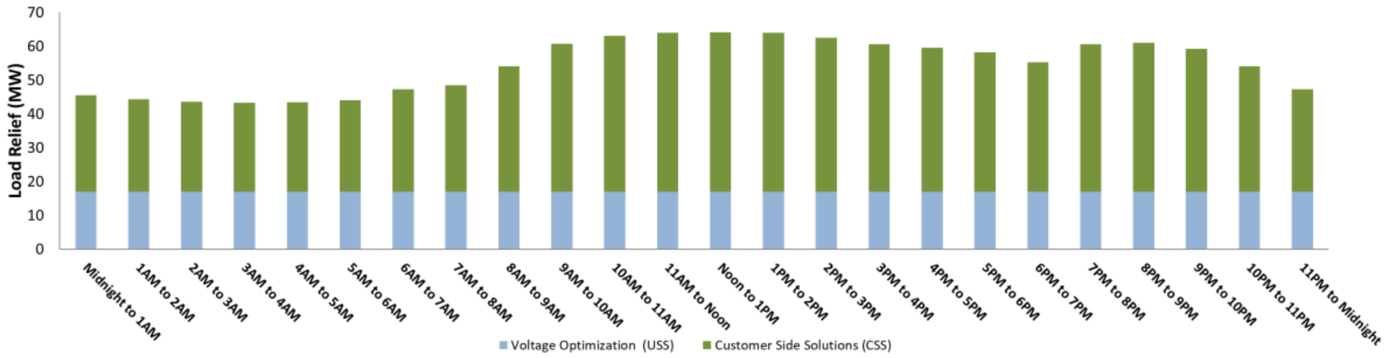
Source: Xcel Energy's Geotargeted Distributed Clean Energy Initiative

Geotargeted programs

Leading practices for data sharing

- Provide data that specifies program goals
- Share data on the locational and temporal characteristics of the targeted grid need and program operational requirements
- Report data on eligible measures and expected measure performance
- Regularly report on program effectiveness and progress

Brooklyn/Queens Demand Management Program load reduction data for Q2 2024



Source: [Consolidated Edison, BQDM Quarterly Expenditures & Program Report, Second Quarter 2024]

Non-wires alternatives procurements

Data reported and impacts on planning

- Utilities can use DERs to provide grid services at specific locations on the distribution system to reduce, defer, or avoid the need for upgrade projects that meet suitability criteria.

Data category	Type of data reported	Impact of data on planning
Suitability screening	Criteria for determining whether NWAs are eligible to meet a specific grid deficiency	Identifies whether NWA processes and technologies are practical for addressing a specific grid need
Technical and cost-effectiveness screens	Methods and input assumptions for determining whether NWAs can resolve a grid need cost-effectively	Determines whether NWAs qualify to compete against the utility's traditional solution to meet a specific grid need
NWA opportunities	Detailed descriptions of grid needs for NWA solicitations, including location, timing, and magnitude of grid need	Prescribes how NWAs must perform and informs their selection and operation
Procurement process	Timeline, review process including bid evaluation criteria, bidding rules	Sets expectations for NWA providers on how the utility procures NWAs
Performance evaluation	Data requirements, data cleaning, and performance metrics	Validates utility assessment for achieving expected outcomes

Non-wires alternatives procurements

Suitability, implementation, and cost-effectiveness screening

- Utilities identify distribution system needs suitable for NWAs using criteria such as:
  - Project type (e.g., type infrastructure)
  - Timing of grid need (e.g., min and max time to address grid need)
  - Cost of traditional solution

- Technical and cost-effectiveness screens help utilities determine whether to pursue NWAs for suitable grid needs.
  - Identify eligible technologies
  - Include assumptions on DER costs and performance

- Transparency in screening assumptions helps regulators and stakeholders:
  - Understand screening results
  - Propose alternative criteria

Criteria	Potential Elements Addressed	
Project Type Suitability	Project types include Load Relief or Load Relief in combination with Reliability.	
Timeline Suitability	**Large Project** (Projects that are on a major circuit or substation and above)	• 36 to 60 months
	Small Project (Projects that are feeder level and below)	• 18 to 24 months
Cost Suitability	**Large Project** (Projects that are on a major circuit or substation and above)	• No cost floor
	Small Project (Projects that are feeder level and below)	• Greater than or equal to $450,000

Source: Consolidated Edison, Distribution System Implementation Plan, June 2023

Non-wires alternatives procurements

Leading practices for data sharing

- Clearly describe criteria for NWA suitability
- Document methods and assumptions for technical and cost-effectiveness screening
- Use a technology-agnostic portfolio approach
- Present detailed information on NWA opportunities (e.g., location, timing, and magnitude of grid need)
- Provide adequate grid data to developers for competitive solicitations
- Use standard pro-forma agreements for NWAs
- Create a performance evaluation framework that includes data requirements and performance metrics

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