National perspective on state approaches to distribution system planning

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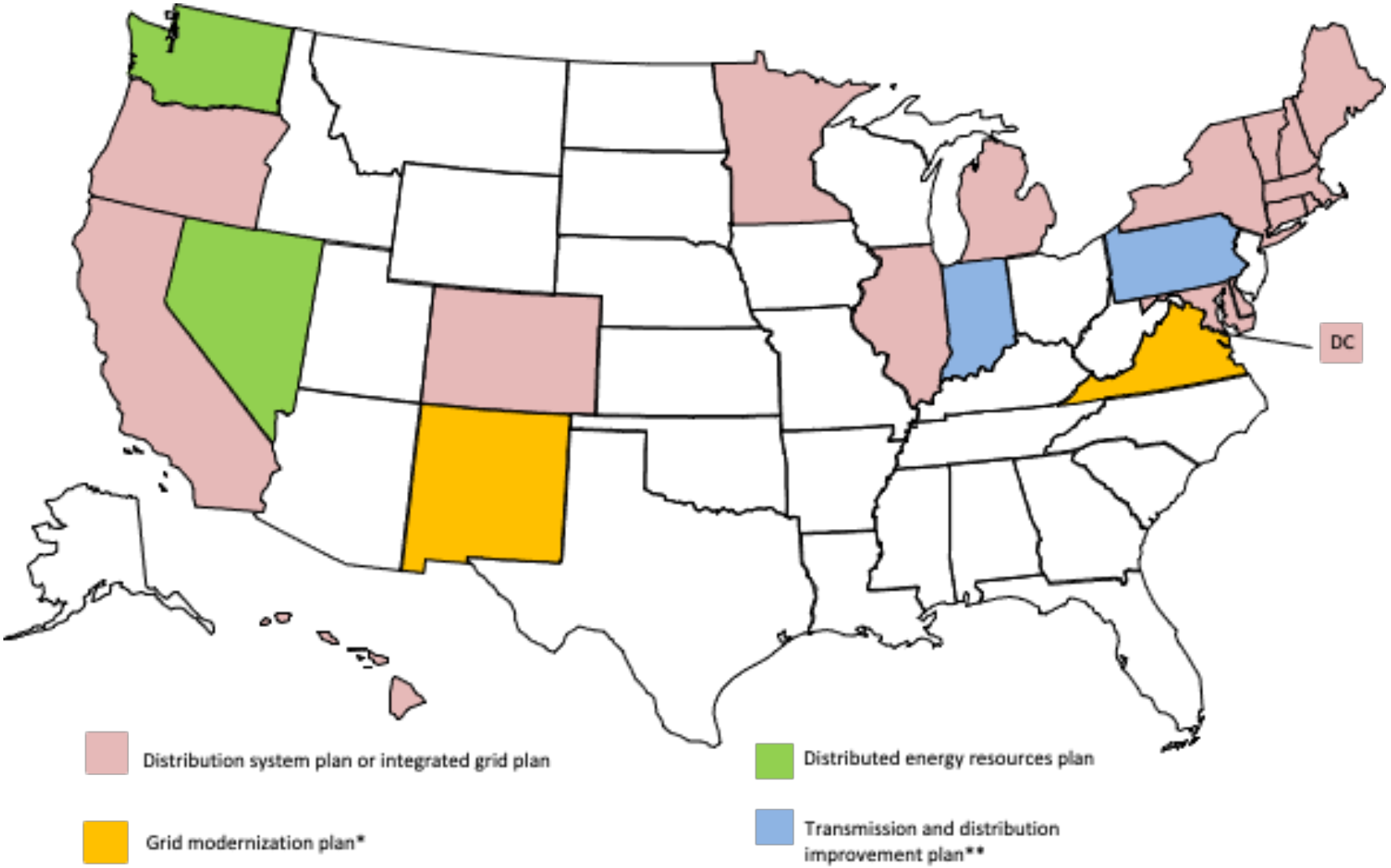
Types of Distribution System Plans

States requiring regulated utilities to file grid plans



*Some states that require distribution system plans also require grid modernization plans (e.g., Minnesota and California).
**Indiana also includes storage.

Types of distribution plans filed (1)

- **T&D improvement plan**
  Enables expedited cost recovery for certain system improvements
  - Indiana's Transmission, Distribution, and Storage System Improvement Charge can include new or replacement transmission, distribution, or utility storage projects for safety, reliability, system modernization, or economic development.

- **Distributed energy resources plan**
  Evaluates benefits and costs of DERs, considers ways to increase deployment of cost-effective DERs, and facilitates better integration of DERs in distribution planning
  - Regulated utilities in Nevada must submit a Distributed Resource Plan to the Public Utilities Commission every three years as part of their integrated resource plan.
    - Evaluate locational benefits and costs of DERs, including distributed generation systems, energy efficiency, energy storage, EVs, and demand response technologies
    - DER forecasting and hosting capacity analysis that inform grid needs assessment
    - Propose infrastructure upgrades & non-wires alternatives (NWA) for identified grid constraints

Types of distribution system plans filed (2)

- **Grid modernization plan**
  Reasoned strategy linking technology deployment roadmap to stated objectives
  - Examples: CA, MA, MN, NM, RI, VA
  - A primary focus is replacing aging infrastructure with advanced grid technologies.
  - Plans may include a request for approval of grid modernization investments and programs.
  - Some states allow for expedited cost recovery of grid mod investments.

- **Integrated distribution system plan**
  Systematic approach to satisfy customer service expectations and state objectives
  - Includes grid mod strategy & DER planning
  - May coordinate across planning domains (e.g., HECO's 2023 Integrated Grid Plan, Maine Integrated Grid Plan law)

Source: EPRI

States that require grid mod plans also may require distribution plans (1)

- **California**
  - AB 327 (2013) requires Distribution Resources Plans (P.U.C. § 769)
  - PUC Distribution Resources Plan Proceeding (R.14-08-013)
    - Initially focused on distribution planning and development of tools to facilitate DER integration (2014 decision)
    - Then required grid modernization plans, including a 10-year vision, to be filed with general rate cases (2018 decision)
  - High DER Grid Planning proceeding (R.21-06-017; 2021 order) focuses on distribution planning and grid modernization to support high levels of DERs, including transportation electrification
    - Utility roles and responsibilities and utility and aggregator business models
    - Near-term evolution and improvement of Distribution Resources Plan frameworks, analytic tools, and planning processes into a more holistic distribution planning process
    - Grid modernization investments in the near- and medium-term, operationalizing smart inverters for advanced functionality to provide grid services, and better alignment of general rate case filings with planned infrastructure investments identified during utility distribution planning

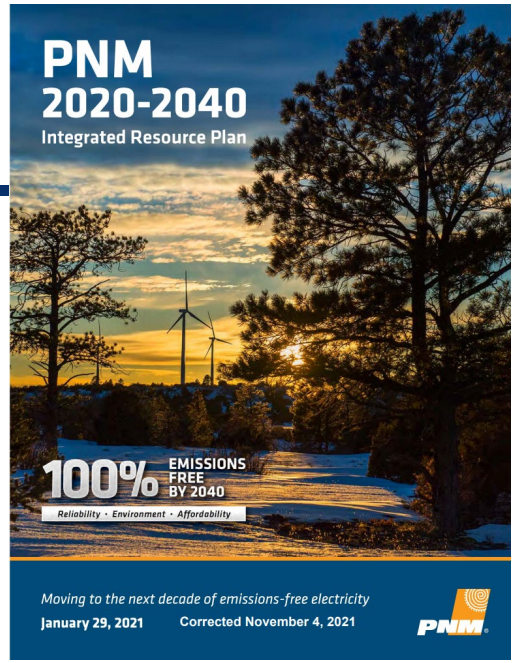
States requiring grid mod plans also may require distribution plans (2)

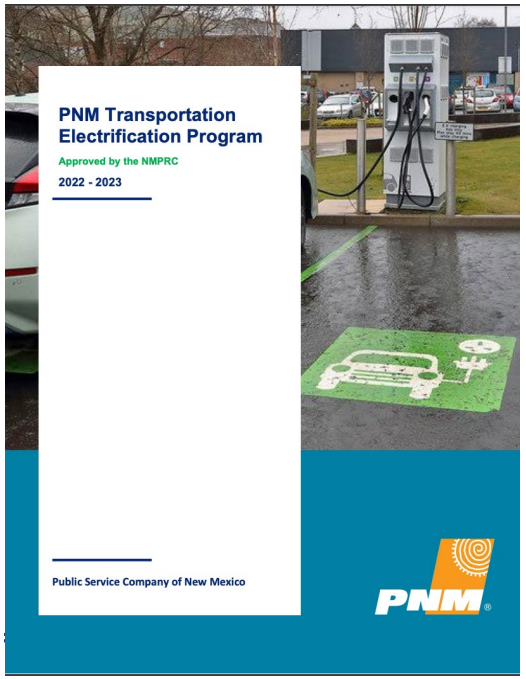
Minnesota

- Legislation (§216B.2425, 2015) requires Xcel Energy to submit biennial T&D plans to Public Utilities Commission
  - *"identify … investments that it considers necessary to modernize the transmission and distribution system by enhancing reliability, improving security against cyber and physical threats, and by increasing energy conservation opportunities …."*
  - Analyze hosting capacity for *small-scale distributed generation resources* and *identify necessary distribution upgrades to support continued development*
- Commission opened inquiry in 2015 on Electric Utility Grid Modernization focused on integrated distribution planning (IDP, Docket CI-15-556)
- Commission established IDP objectives and requirements in 2018 for Xcel Energy (Docket 18-251)
  - In 2019 for smaller regulated utilities (18-252, 18-253, 18-254)
- Since 2018, grid mod plan filed together with biennial IDP
- Transportation electrification plans filed with each IDP beginning Nov. 1, 2023

Other types of plans can feed into integrated distribution plans

- *Integrated resource plans* identify future investments to meet bulk power system reliability and public policy objectives at a reasonable cost.
- *Transmission plans* identify future transmission expansion needs and options.
- *Electrification plans* inform grid needs for EV charging or building electrification, or both.
- *Energy security plans* inform strategies for resilience from physical and cyber threats.
- *Demand-side management plans* specify capabilities that distribution technologies and systems need to provide to achieve multi-year targets for demand flexibility and energy efficiency.





Trend toward integrating grid mod planning with other types of planning

- NY Distributed System Implementation Plans support 2019 Climate Act and 2022 Scoping Plan
- CA rulemaking on Distribution Resources Planning (DRP) in part required grid mod plans filed with GRCs (2018 decision). New DRP rulemaking to support high levels of DERs (incl. managed EV charging):
  - Utility roles and responsibilities and utility and aggregator business models
  - More holistic planning process
  - Grid mod investments, smart inverters to provide grid services, and aligning GRC filings with infrastructure needs in DRP
- MN requires grid modernization plan and transportation electrification plan filed with Integrated Distribution Plan
- HI requires planning across domains (G, T, D) and across procurement, pricing and programs (e.g., HECO's 2023 Integrated Grid Plan)

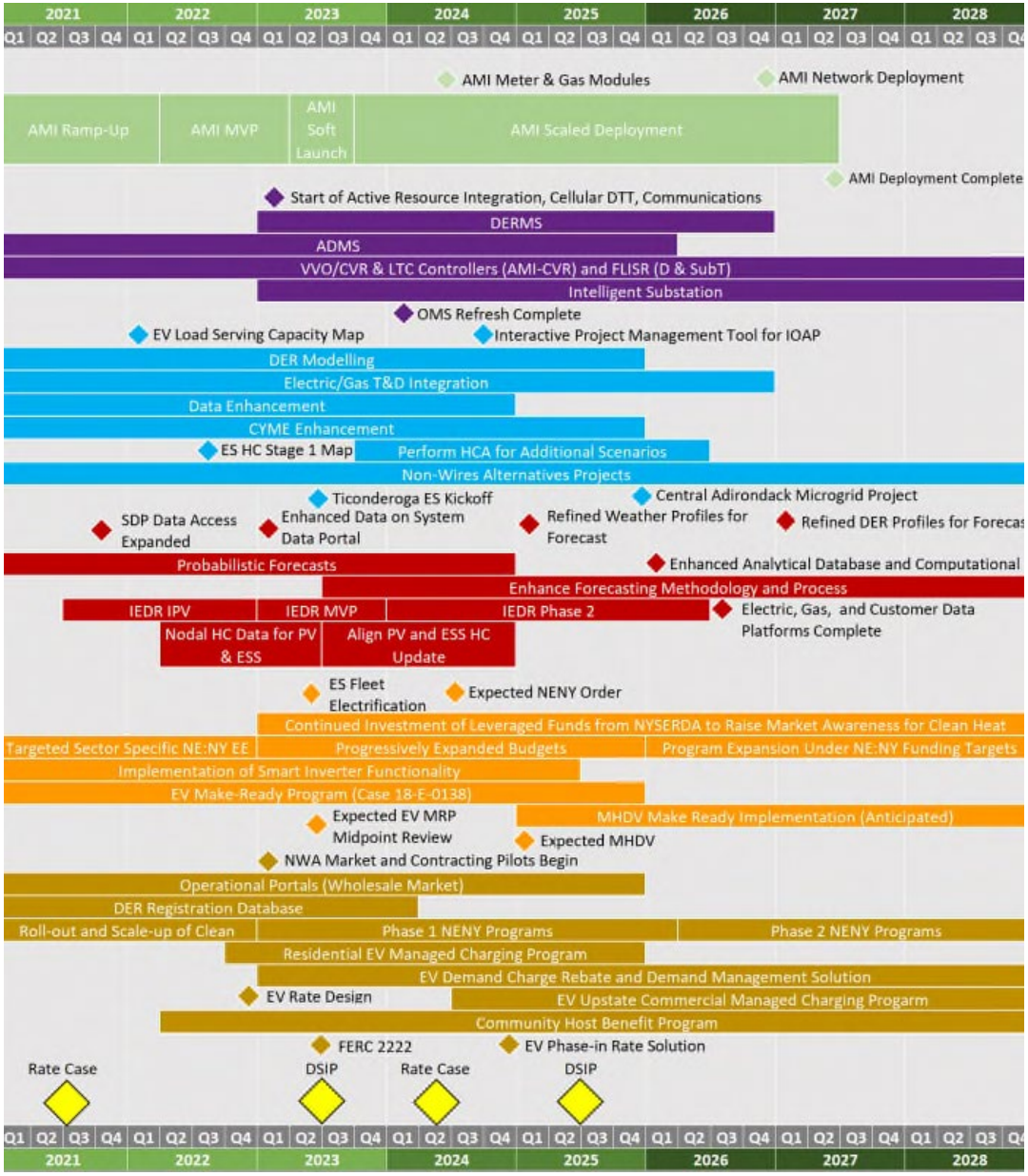


Figure source: National Grid Distributed System Implementation Plan (June 2023)

Procedural Requirements

Procedural elements (1)

Frequency of filing

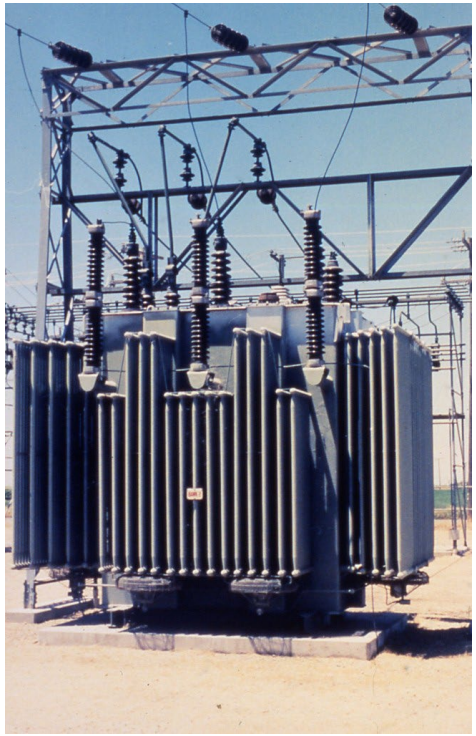
- Typically annual or biennial; every 3 years in some states (e.g., NV)
- *Considerations:* alignment with utility distribution capital planning, IRP filing cycle, workload, tracking progress on goals and objectives

Planning horizon

- Action plan – 2-4 years
- Long-term investment plan – 5-10 years

Confidentiality for security or trade secrets

- Level of specificity for hosting capacity maps
- Peak demand/capacity by feeder
- Contractual cost terms
- Bidder responses to NWA solicitations
- Proprietary model information

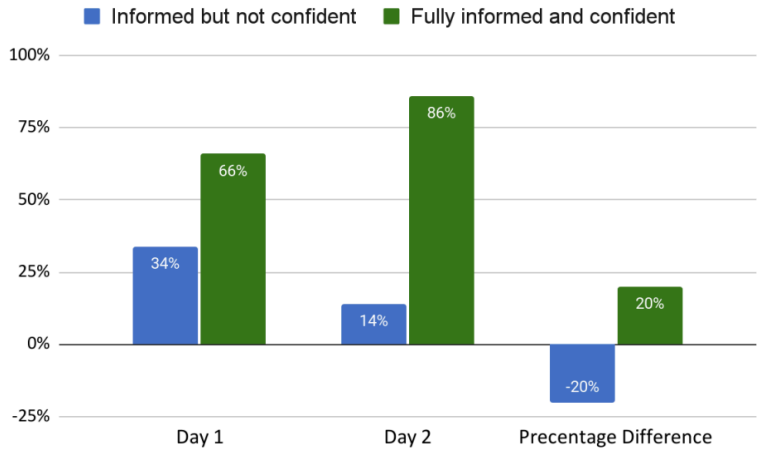


Procedural elements (2)

Stakeholder engagement

- Improve quality of proceedings and outcomes
- Develop solutions with broad support
- Build trust among parties

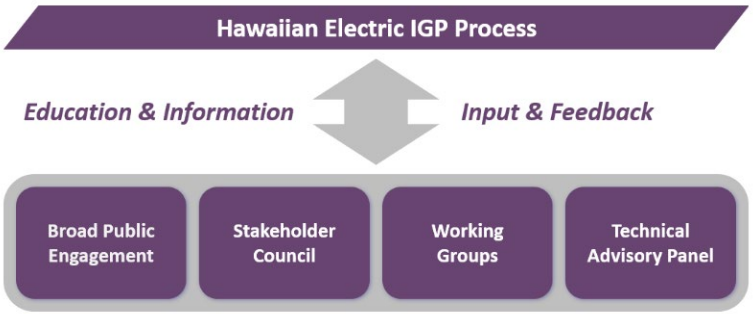
- Requirements
  - *Before plan is filed:* Can include significant input through working groups (e.g., CA, DC, HI, MI, NH, NY) and stakeholder meetings
  - *After plan is filed:* Stakeholders file comments, utility provides periodic updates
- Stakeholder engagement for distribution planning is nascent. Opportunities for improvement:
  - Including non-traditional stakeholders
  - Intervenor compensation
  - Considering equity in identifying and assessing grid solutions
  - Community engagement in resilience strategies



PGE Community Meeting Participant Feedback

Procedural elements (3)

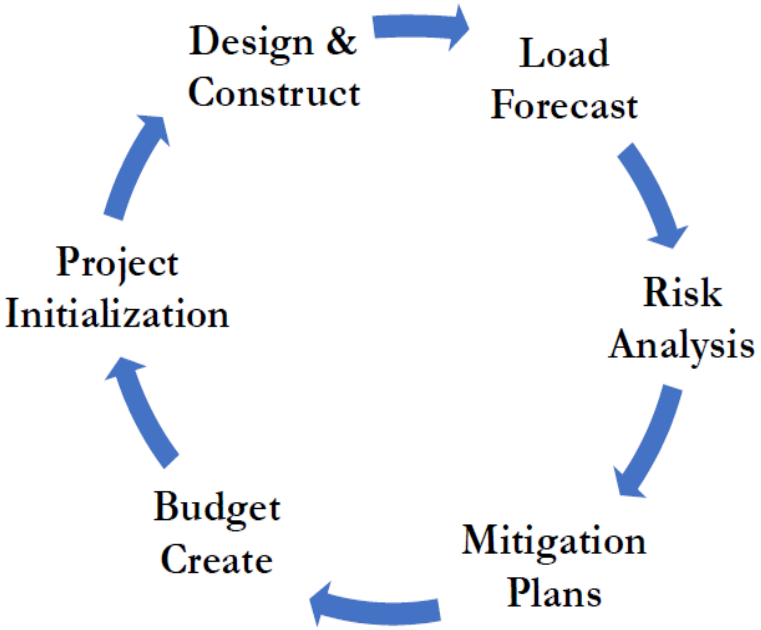
- Examples of stakeholder engagement
  - New York - Surveys, newsletters, webinars, meetings, and designated website
  - Oregon - Utilities must host at ≥4 stakeholder workshops before filing distribution system plan and file a community engagement plan. A technical working group holds regular meetings for stakeholders before and after plan filings.
  - Illinois
    - Before workshops begin, utilities file required information, including preliminary proposals on near-term capital investments — all posted on the Commission's website
    - ≥6 workshops run by independent facilitator encourage diverse stakeholder representation
    - Stakeholders can submit data requests to utility before each workshop on relevant topics, and utility must respond ≤14 days
    - Facilitator prepares draft report describing areas of consensus and disagreement and provides recommendations to Commission on utility's plan; stakeholders can comment on draft report
  - Hawaii



Substantive Requirements

Substantive requirements (1)

- Baseline information on current state of distribution system
  - Such as system statistics, reliability performance, equipment condition, historical spending by category
- Description of planning process
  - Load forecast
  - Risk analysis for overloads and plans for mitigation
  - Budget for planned capacity projects
    - System reinforcements
    - Upgrades for capacity, reliability, power quality
    - New systems and technologies
    - Ranking criteria (e.g., safety, reliability, compliance, financial)
- Distribution operations — vegetation management and reliability event management



Source: Xcel Energy 2021

Substantive requirements (2)

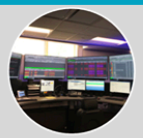
- DER forecast
  - Types, sizes, amounts and locations
- Hosting capacity analysis*
  - Maps showing where interconnection costs will be low or high; supporting data provide details
  - Use cases: guidance for DER developers, interconnection screens, distribution planning
- Geotargeting DER programs — efficiency, demand flexibility, distributed PV and storage, and managed EV charging — to meet location- and time-dependent distribution system needs
- Grid needs assessment and NWA** analysis to identify:
  - Existing and anticipated capacity deficiencies and constraints
  - Traditional utility mitigation projects
  - Subset of planned projects that may be suitable for NWA to defer or avoid some infrastructure upgrades — e.g., projects for load relief, voltage, to reduce power interruptions, for resilience

**Amount of DERs that can be interconnected without adversely impacting power quality or reliability under existing control and protection systems and without infrastructure upgrades*

***DERs that provide specific grid services at specific locations to defer some traditional infrastructure investments*

Substantive requirements (3)

- Grid modernization strategy and technology roadmap
- Long-term utility vision and objectives
- Near-term action plan
- Discussion of how distribution planning is coordinated with other types of planning
- Summary of stakeholder and community engagement
- Proposals for pilots
  - Resilience projects (e.g., solar+storage, community microgrids)
  - Time-varying pricing (e.g., for managed EV charging)

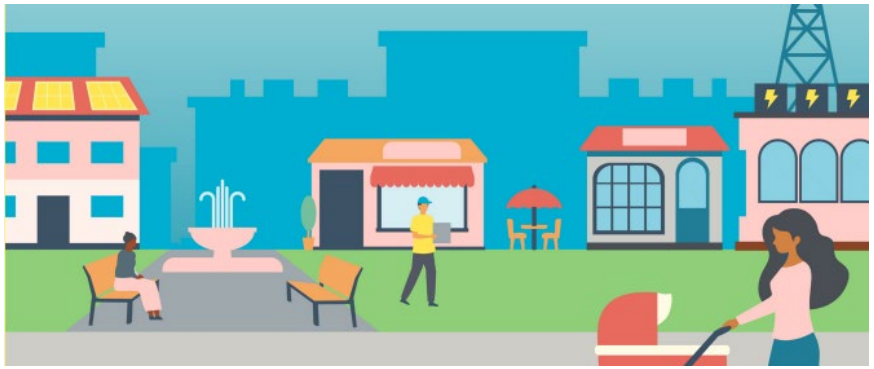
GRID VISIBILITY AND CONTROLS		Network	Meters
Advanced Distribution Management System (ADMS)	**Fault Location, Isolation and Service Restoration (FLISR)**	**Field Area Network (FAN) & Home Area Network (HAN)**	**Advanced Metering Infrastructure (AMI)**
			
• Advanced centralized software or the "brains," enhances the operation of the distribution grid • Enables improved reliability, management of DERs, and improved efficiency when operating the grid • Enables enhanced visibility and control of field devices (including customer meters via AMI)	• ADMS provides fault location prediction and the automatic operation of intelligent grid devices • Reduces outage durations and the number of customers impacted by an outage • Enabled by intelligent field devices, FAN, and ADMS	• Two-way communications network • Connects intelligent grid devices and smart meters with software • Enables enhanced remote monitoring and control of intelligent field devices and advanced meters	• Focused on the deployment of smart meters and software • Provides near real-time communication between software and meters • Data and AMI functionality enable new products and services and improves customer experience

Source: Xcel Energy 2021

Example State Practices for Developing Distribution Plan Requirements

Example state practices (1)

- Establish planning goals, objectives, and priorities w/stakeholder engagement
  - See Berkeley Lab presentation on state goals and objectives
- Build on work by other states, tailored to your state's interests
  - Forthcoming report and catalog of state distribution planning requirements
- Host presentations to increase stakeholders' understanding
  - Colorado, Illinois, Maine, Massachusetts, Michigan, New Mexico, Oregon
- Engage stakeholders and communities in the planning process
  - Joint Utilities of NY stakeholder plan and timeline
  - Oregon's community engagement plans – see Portland General Electric (PGE) distribution plan
- Ask utilities to respond to a questionnaire to gather baseline information on their distribution system and planning practices
  - Minnesota utilities; Oregon utilities and third-party energy efficiency administrator and stakeholders; New Jersey



Source: Portland General Electric

Example state practices (2)

- Determine whether any current filings can be integrated/consolidated in DSP filings
  - Oregon PUC suspended smart grid filings (e.g., order on PGE's DSP part two)
  - Minnesota PUC integrated grid modernization plans and transportation electrification plans into DSP
- Prepare a white paper to lay out PUC staff's vision for DSP processes and provide guidance for utility filings
  - Minnesota – Defined grid modernization for Minnesota, proposed a phased approach, and identified principles to guide it
  - New York – Proposed changes in filing requirements for effective interaction with the PSC's Coordinated Grid Planning proceeding to achieve the state's climate goals
  - Oregon – Outlined rationale and key drivers for opening a DSP investigation, desired outcomes and future planning process, near-term scope and schedule for investigation, and planning considerations

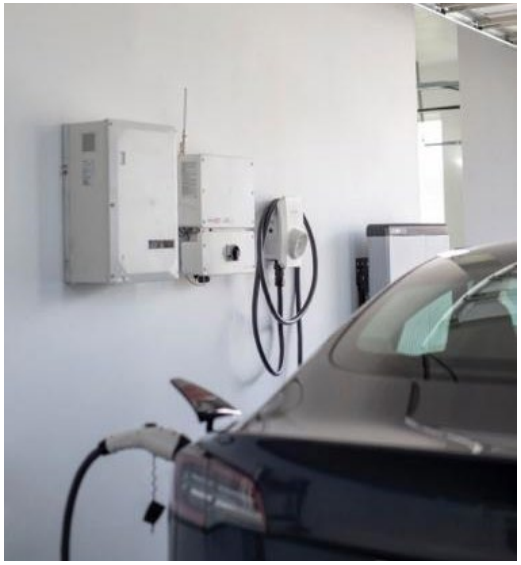


Photo courtesy of Sunrun

Example state practices (3)

- Host work groups to help develop and refine requirements — and address emerging planning issues
  - Hawaii – Stakeholder council, technical advisory panel, and working groups
  - Maine – Working groups on forecasting, solutions evaluation criteria, and data availability/collection
  - New Jersey – Facilitated working groups with electric distribution companies and stakeholders will make recommendations for integrated distributed energy resources (DER) planning — forthcoming
  - Oregon – DSP Work Group serves as a forum to identify, articulate, discuss and, when possible, resolve technical and other questions that arise. The primary objective is finding solutions to barriers that would otherwise inhibit completion of the utilities' plans.
- Consider pilots for new processes and technologies
  - Non-wires alternatives (Oregon)
  - Resilience — Resilient Minneapolis project (Minnesota)
  - Hosting capacity analysis — start with solar PV, expand to other DERs, and specify use cases*
  - Time-based rates — for general service rates and managed electric vehicle charging (e.g., Oregon, Minnesota, Hawaii, New York)

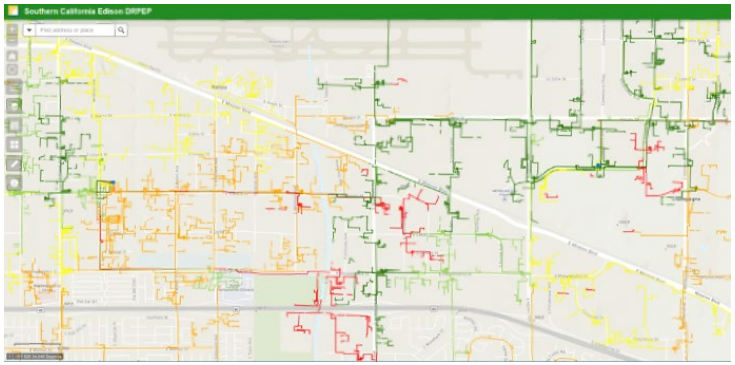


Figure source: Southern California Edison

*See Minnesota PUC orders in Docket Nos. 15-962, 18-684, 19-666, and 21-694

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