Distribution System Planning: Goals & Objectives

Presentation to Maine Public Utilities Commission
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Agenda

- Benefits of transparent planning and process overview
- Goals, objectives and priorities for grid planning in other states
- State procedural and substantive requirements
- Putting all the pieces together – Minnesota example

Benefits of Transparent Planning and Process Overview

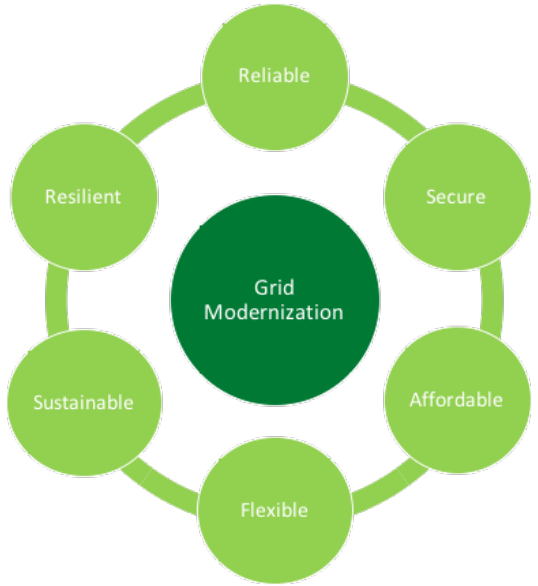
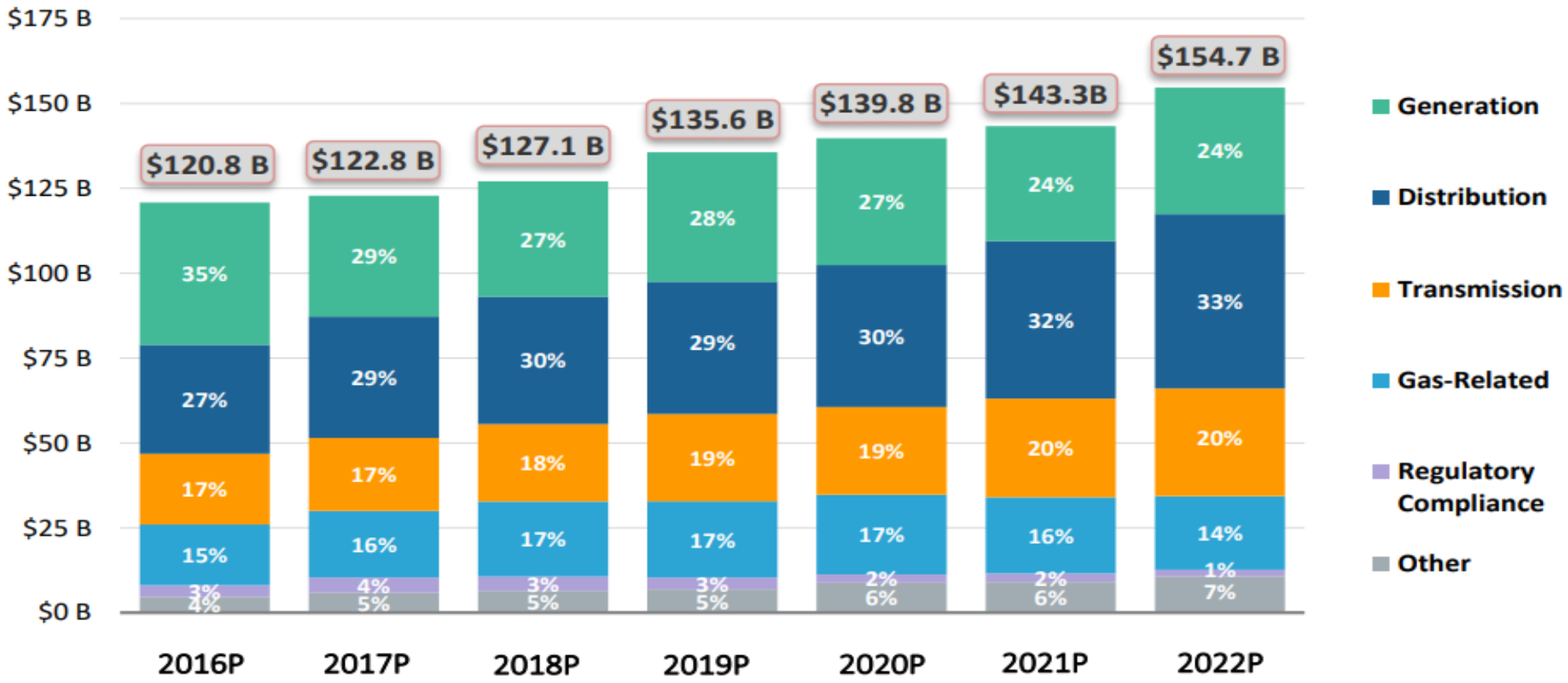


Figure source: U.S. Department of Energy's *Grid Modernization Multi-Year Program Plan*

Distribution system costs are rising steadily.



Source: EEI (updated Sept 2022)

Potential benefits from improved distribution planning processes

- Makes transparent utility plans for distribution system investments holistically, before showing up individually in general rate cases
- Provides opportunities for meaningful regulatory and stakeholder engagement
  - Can improve outcomes — more data, community input, review
- Considers uncertainties under a range of possible futures (scenarios)
- Considers all solutions for least cost/risk (including DERs)
- Motivates utility to choose least cost/risk solutions
- Enables consumers and 3rd party providers to propose grid solutions and participate in providing grid services

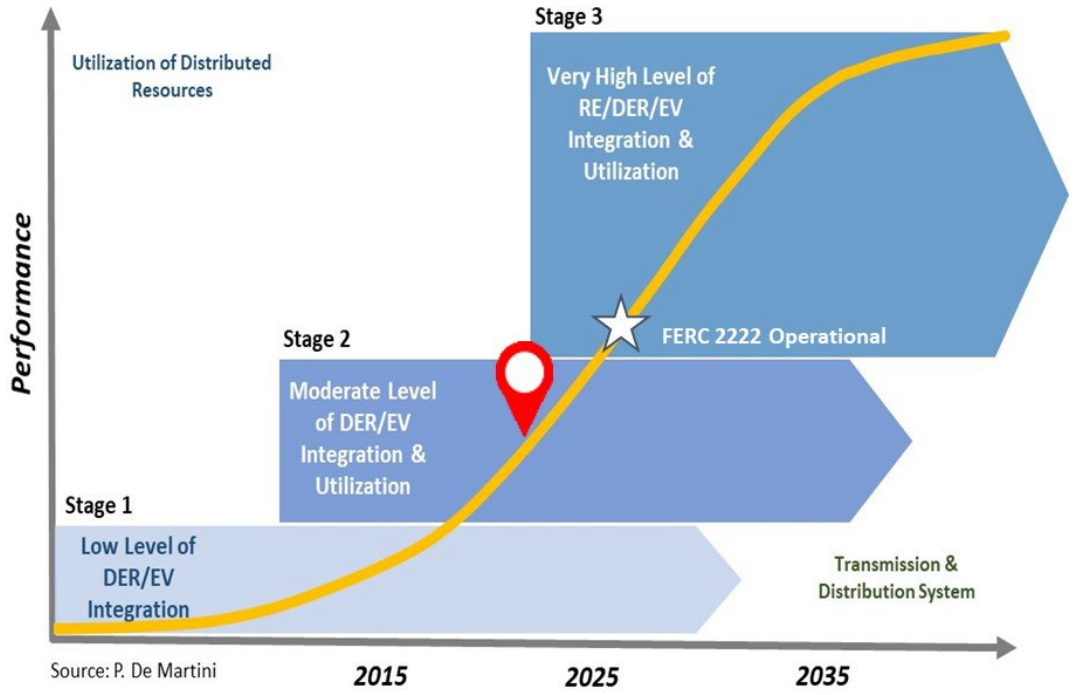
Distribution planning addresses higher levels of DER adoption

DER integration & utilization and electrification are expanding across the U.S. at different rates.

Stage 1: *Low DER adoption (<5% of peak)*. DER levels can be accommodated within existing distribution systems without material changes to infrastructure, planning and operations. Grid modernization addresses reliability, resilience, safety, and operational efficiency and enabling DER integration and utilization at low levels.

Stage 2: *Moderate adoption of DERs (5-20% of peak) including for wholesale & distribution services.* DERs — individually and in aggregations — are increasingly used as load-modifying resources for both distribution non-wires alternatives (NWAs) and wholesale capacity and ancillary services. Integrated distribution system planning and grid modernization are needed to enable real-time observability and operational use of DERs.

Stage 3: *Large-scale adoption of DERs (>20% of peak*), including for wholesale & distribution services, plus community microgrids.* Utilization of DER aggregations (virtual power plants) is optimized to support grid service requirements for distribution and transmission systems. Multi-use/community microgrids help support local energy supply and resilience. Ultimately, distribution system level energy transactions are enabled. This stage of DER utilization requires coordination across jurisdictions (e.g., FERC Order 2222) and infrastructure to support both grid and market operations.



Source: Paul De Martini, Newport Consulting

*Installed DER capacity as a percent of distribution system peak

Start with state principles and objectives instead of picking technologies

- Planning starts with state principles and objectives — and priorities. Then you can determine the capabilities needed to achieve them, as well as functionality and system requirements.
- Holistic, long-term planning — in the context of integrated grid planning:
  - Supports state goals — e.g., accountability; safe, reasonable and adequate service at just and reasonable rates; addressing the expected effect of climate change (LD 1959)
- Addresses interdependent technologies and systems, including core components (e.g., Advanced Distribution Management System, Geographic Information System, Outage Management System) and applications to enable other grid modernization projects.*
  - Considers proactive grid upgrades to facilitate customer choice

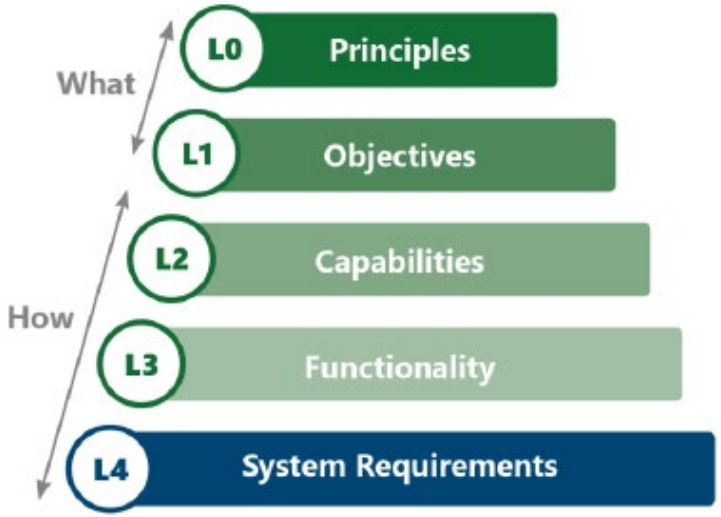


Figure: DOE 2020

- Other types of plans feed into integrated grid plans:
  - *Transmission plan* identifies future transmission expansion needs and options
  - *Electrification plan* informs grid needs for EV charging and building electrification
  - *Energy security plan* informs strategies for resilience from physical and cybersecurity threats
  - *Demand-side management plan* specifies the capabilities that distribution technologies and systems should provide to achieve multi-year targets for demand flexibility and energy efficiency

* See "Layering of Core Components and Applications" in *Extra Slides*.

Goals, Objectives, and Priorities for Grid Planning in Other States

Development of goals and priorities

- Many states have established requirements for grid planning, by legislation or regulation.
  - Regulatory commissions develop goals and objectives that reflect state policies and commission priorities.
- States set goals, objectives, and priorities that define long-term, high-level outcomes for grid planning and steps to achieve them.
- Goals for grid planning include traditional regulatory aims (e.g., safety, reliability, and affordability) as well as newer policy goals (e.g., transportation electrification, more renewable resources, and emissions reductions) and related outcomes such as greater asset utilization and improved integration and utilization of distributed energy resources (DERs).
- Several commissions set IDSP requirements in response to lack of information provided by regulated utilities.
- Grid planning objectives reflect the importance of transparency and stakeholder engagement.

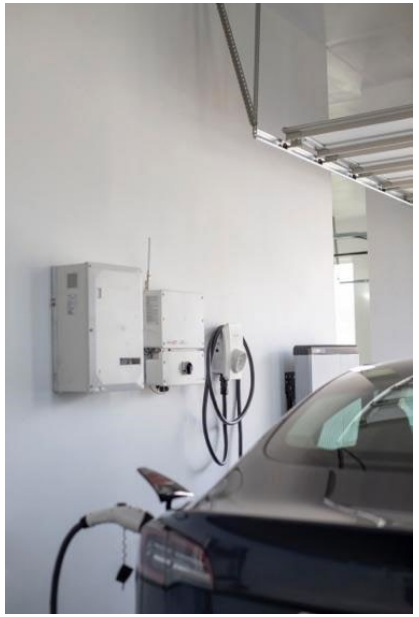
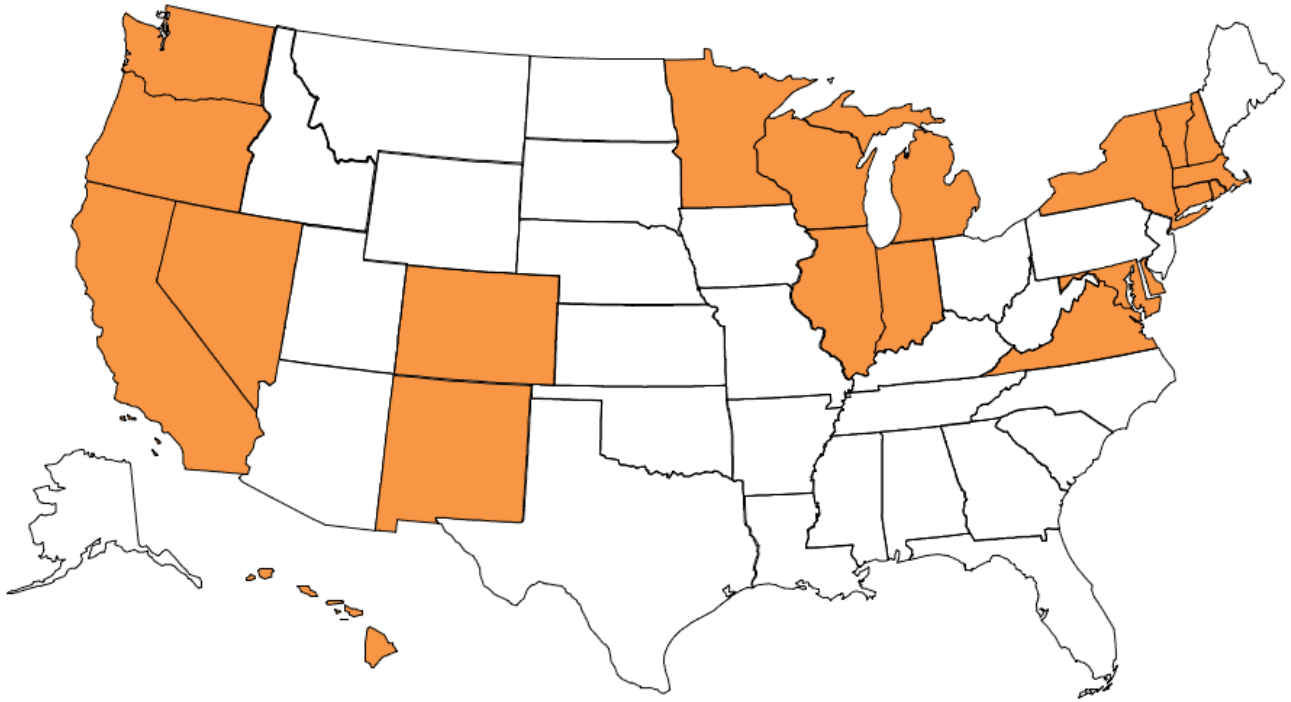


Photo courtesy of Sunrun

Common themes in grid planning goals and objectives

- We reviewed goals and objectives for grid planning for 20 other states and DC.
- Common themes emerge
  - Improve grid reliability and resilience
  - Increase customer choice and engagement in energy services
  - Support DER integration and utilization for grid services
  - Reduce greenhouse gas (GHG) emissions and support the clean energy transition
  - Accelerate deployment of new technologies and services to optimize grid performance and minimize electricity system costs
- Several of the themes overlap.



Improve grid reliability and resilience

- 15 states and DC have goals or objectives related to reliability or resilience.
  - 9 states and DC have an goal or objective related to reliability (CA, DC, DE, HI, IN, MA, NV, RI, VA, VT).
  - Five states have reliability *and* resilience goals or objectives (CT, MI, MN, NH, NM).
  - Resilience and reliability are always discussed together – there are not examples of resilience specific goals.
- Many states have goals to improve, enhance, or promote reliability or resilience (CA, CT, HI, IN, MA, MI, MN, NH, NM, VA). A few states and DC have a general goal of maintaining a reliable or resilient electricity system as the grid modernizes and/or more DERs are added to the grid (DC, DE, MN, RI).

- In **Colorado**, the IDP rules specify that the PUC will review and evaluate whether the regulated utilities' distribution system investments support reliability and resilience.
- The **Nevada** PUC requires the utilities to address reliability benefits in their DER plans.
- The **New Hampshire** PUC's first objective for a modernized distribution system is to "Improve reliability, resiliency, and operational efficiency."
- The goal of **Indiana's** grid modernization legislation is to "promote safety, reliability and economic growth by encouraging cost-effective modernization of utity infrastructure."

Increase customer choice and engagement in energy services

- 10 states identify customer choice and engagement in energy services as an objective or goal (CA, CT, HI, IL, MA, MN, NH, NY, RI, VT).
- Two states identify objectives related to compensating customers for the value of their DERs (WA, RI); DC and NH requires access to data.
- Two of the three grid modernization objectives for **Rhode Island** include customer choice, and one of the objectives in the distribution system planning docket is to "prioritize and facilitate increasing customer investment in their facilities… where that investment provides recognizable net benefits."
- The **Vermont** Commission described objectives and outcomes in terms of potential benefits. It identified one of the benefits of a smart grid as the potential to "increase energy efficiency, thereby reducing environmental impacts of energy consumption, and empower consumers to manage their energy choices."
- The **New York** PUC identified three distribution system implementation plan goals. The first is to "Serve as a source of public information regarding distribution service provider plans and objectives, including specific system needs allowing market participants to identify opportunities."

Photo credit: Marcela Gara, Resource Media

Support DER integration and utilization of grid services

Photo courtesy of Sunrun

- Eight states and DC have goals or objectives that support DER integration and utilization of grid services (CA, CO, DC, HI, IL, MA, MN, OR, VA).
- Legislation in **Virginia** requires that "any plan for electric distribution grid transformation projects shall include both measures to facilitate integration of distributed energy resources and measures to enhance physical electric grid reliability and security."
- The **Massachusetts** Department of Public Utilities set forth a vision for grid modernization. They identified four objectives to achieve the vision, including "To facilitate the interconnection of distributed energy resources and integrate these resources into the Companies' planning and operations."

- Some states discuss DER integration more broadly — e.g., achieving renewable energy goals, sustainability.
  - Utilities that are required to file Multi-year Integrated Grid Plans in **Illinois** must design their plans to meet multiple objectives, including to ensure coordination with the state's goal on renewable energy, support the achievement of the state's environmental goals, and support state policies that promote investments in renewable energy resources.
  - One of the goals of the **District of Columbia's** grid modernization effort is to create a more sustainable energy delivery system.

Reduce greenhouse gas emissions and support the clean energy transition

- Seven states (CA, CO, HI, IL, NH, RI, OR) and DC identify objectives or goals that relate to *reducing GHG emissions*.
  - Several jurisdictions link their goals or objectives to state emissions reduction goals (CO, HI, IL, OR) or climate action goals (DC). For example, in **Illinois**, one of the objectives of the Multi-Year Integrated Grid Plan is to achieve or support state environmental goals, including emissions reductions.
  - **Rhode Island** seeks to address "the challenges of climate change and other forms of pollution."
  - The **New Hampshire** PUC's grid modernization objectives include reducing "environmental impacts and carbon emission" in the state.
- Four states include supporting a *clean energy transition* as an objective or goal (CT, IL, MA, MI).

- One of the objectives of **Connecticut's** Equitable Modern Grid Framework is to enable a cost-effective, economy-wide transition to a decarbonized future.
- The MI Power Grid is a "multi-year stakeholder initiative to maximize the benefits of the transition to a clean, distributed energy resources" in **Michigan**. Distribution system planning is one piece of the initiative.

Accelerate deployment of new technologies and services to optimize grid performance and minimize electricity system costs

- Five states have a goal or objective to accelerate the deployment of new technologies and services to optimize grid performance and minimize electricity system costs (CA, CT, IL, MI, MN).
  - In **Illinois**, an objective of the Multi-Year Integrated Grid Plan is to “support efforts to bring the benefits of grid modernization and clean energy, including, but not limited to, deployment of distributed energy resources….”
  - Legislation in **California** required utilities to file distribution resource plans that “identify optimal locations for the deployment of distributed resources” and “identify barriers to the deployment of distributed resources."
  - In an order, the **Hawaii** Public Utilities Commission provided guidance on an integrated grid planning process which will “Evalute and optimize resource and T&D solutions…”

Other themes

- Stakeholder engagement and transparency are explicitly mentioned as objectives or goals in few states (e.g., MI). However, these aims are included in several state distribution system planning requirements (*see slides later in this presentation*).
- Affordability is mentioned in objectives or goals for several states (CO, CT, DC, IL, MI, NH and RI). Typically, the purpose is to maintain an affordable system for all customers.
- Equity is included in goals or objectives for grid planning for some states (CO, IL, OR) — as well as in Commission orders (MN) (*see slides later in this presentation*).

State Procedural and Substantive Requirements

Procedural elements*

- Frequency of filing
  - Typically annual or biennial
  - In some states, every 3 years (e.g., NV) or 5 years (MA)
- Planning horizon
  - 2-4 year action plan – OR (+ 5-10 year roadmap for investments, tools and activities)
  - 3 year action plan — NV (+ 6-yr forecasts), DE (+ 10-yr long-range plan)
  - 5 years – NY, CA (+ 10-yr grid modernization vision), HI (+ plan to 2045), MI (+ 10-15 yr outlooks), MN (+ 10-yr Modernization & Infrastructure Investment Plan)
  - 5-7 years – Indiana T&D and storage system improvements
- Stakeholder engagement

*See “Confidentiality” in Extra Slides

Stakeholder engagement (1)

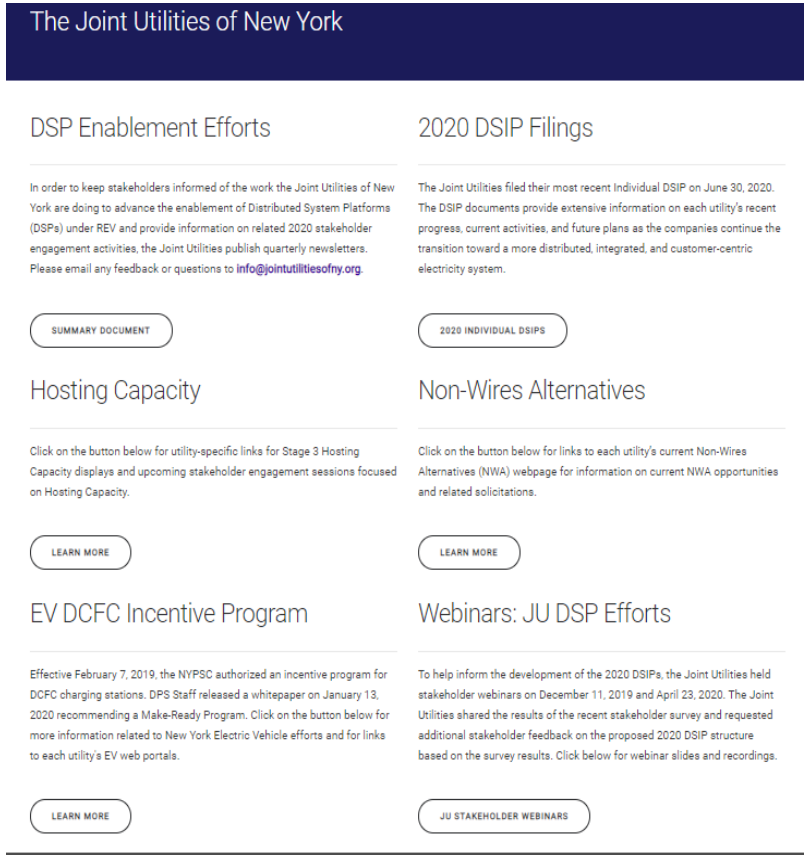
- Of all electricity system infrastructure, people and communities are closest to distribution systems. This local system also is the source of most outages.
- Stakeholder engagement can:
  - Provide a venue for open discussion
  - Improve the quality of proceedings and their outcomes
  - Develop solutions with broad support
  - Build trust among parties
- Stakeholder engagement for distribution system planning is relatively nascent. Among opportunities to improve it:
  - Make the stakeholder process inclusive
  - Provide compensation, particularly for non-traditional stakeholders
  - Consider equity in identifying and assessing grid solutions

…"the Commission has repeatedly pushed Hawaiian Electric to employ best practices, focusing on stakeholder engagement, developing appropriate scenario and sensitivities, and pursuing complete transparency to enable effective review." HI PUC Order 37730

…"the Commission notes that many of the engagement mechanisms described in the Filing appear to be more geared towards the dissemination of utility information…the level of impact of stakeholder information has on the planning process is unclear. " NY PSC Order, September 2021, Case 20-E-197

Stakeholder engagement (2)

- Requirements
  - *Before plan is filed:* Can include significant input through working groups (e.g., CA, DC, HI, MI, NH, NY)
  - *After plan is filed:* Stakeholders can file comments, utility provides periodic updates
- Examples
  - New York - Surveys, newsletters, webinars, meetings, and designated website with links to various sources of information
  - Oregon - Utilities must host at least four 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.
  - Hawaii - Stakeholder council, technical advisory panel, working groups (*next slide*)

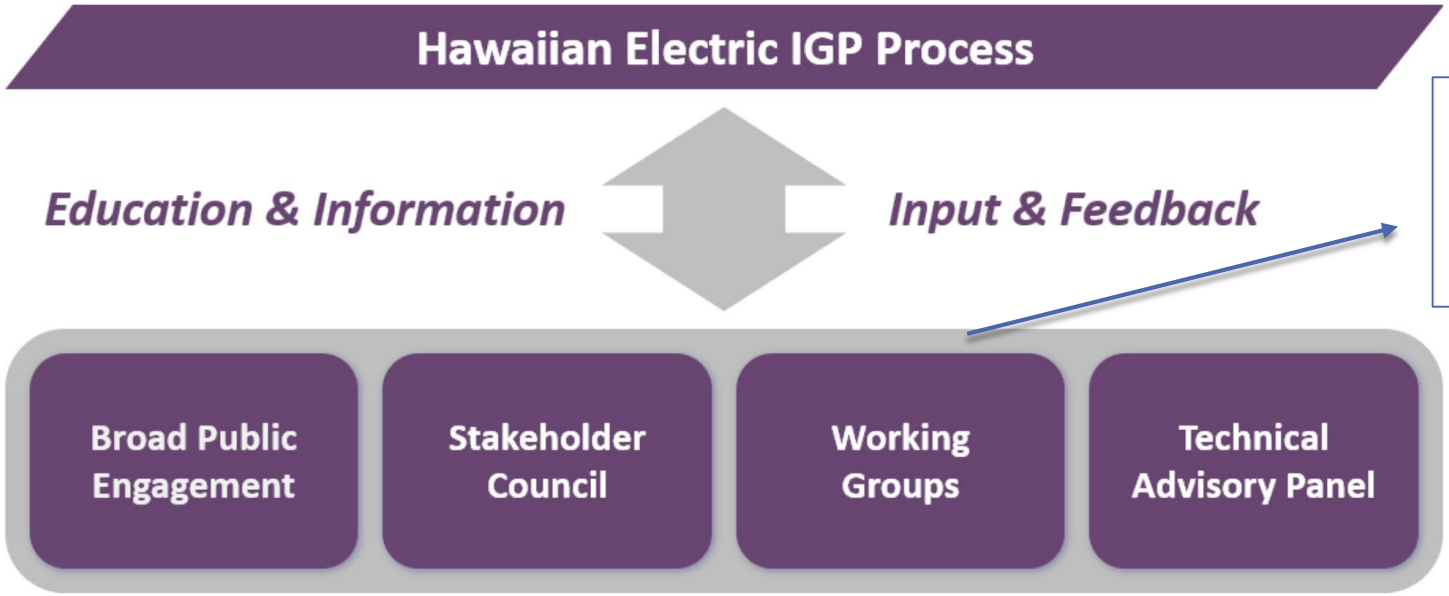


*See *Extra Slides* for Illinois

Hawaii – Integrated Grid Planning
Stakeholder Engagement

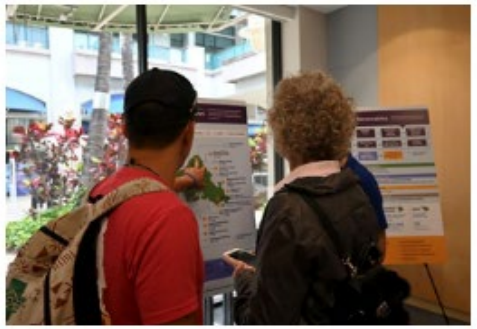
Integrated Grid Planning Stakeholder Council - Industry peer group of experts participating voluntarily to advise on processes, methodologies and technologies

Example meeting slides



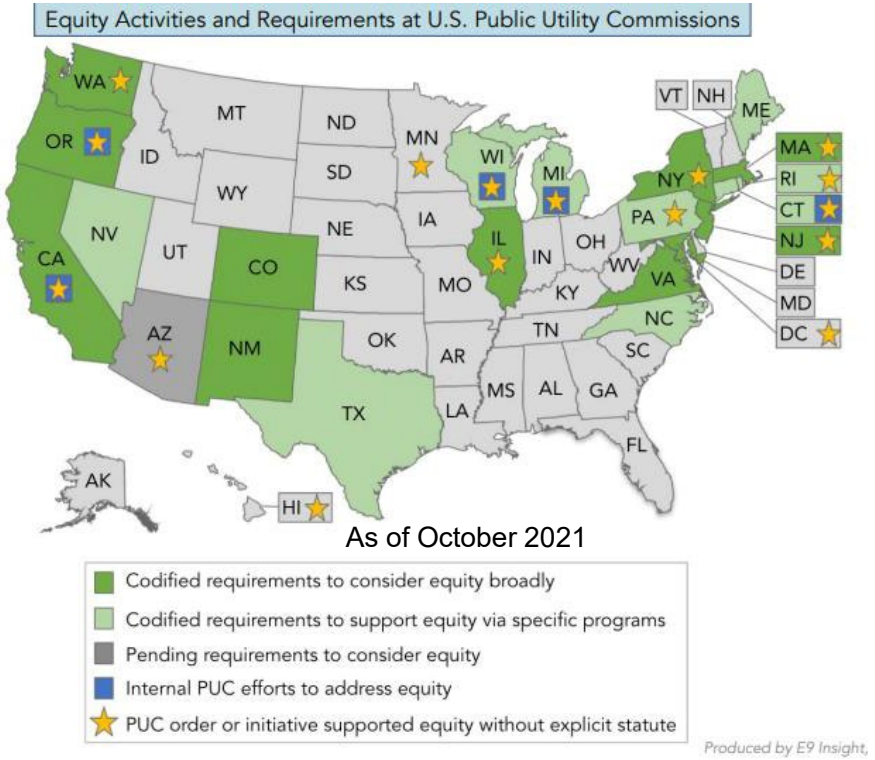
- **Forecasting assumptions**
- **Resilience**
- **Distribution planning**
- **Market***

*** To develop standardized contracts and agreements, define grid services, evaluate and optimize grid solutions, and define competitive procurement process**

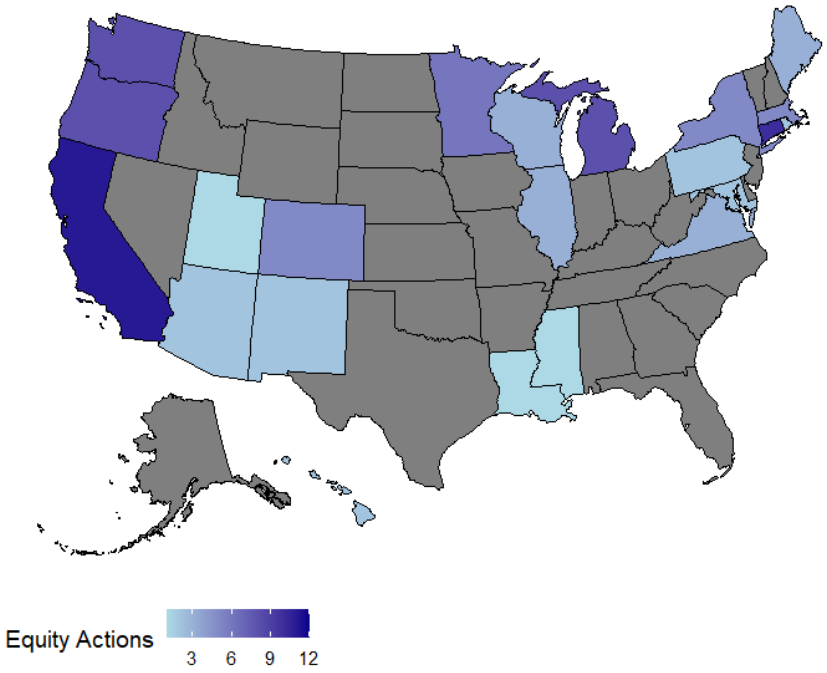


Energy equity and justice (1)

- Many states are adopting energy equity and justice provisions that apply to utility regulation, including planning.
  - To address social, economic and health disparities
  - Through legislation, governor's executive orders, PUC orders, or actions by other agencies*



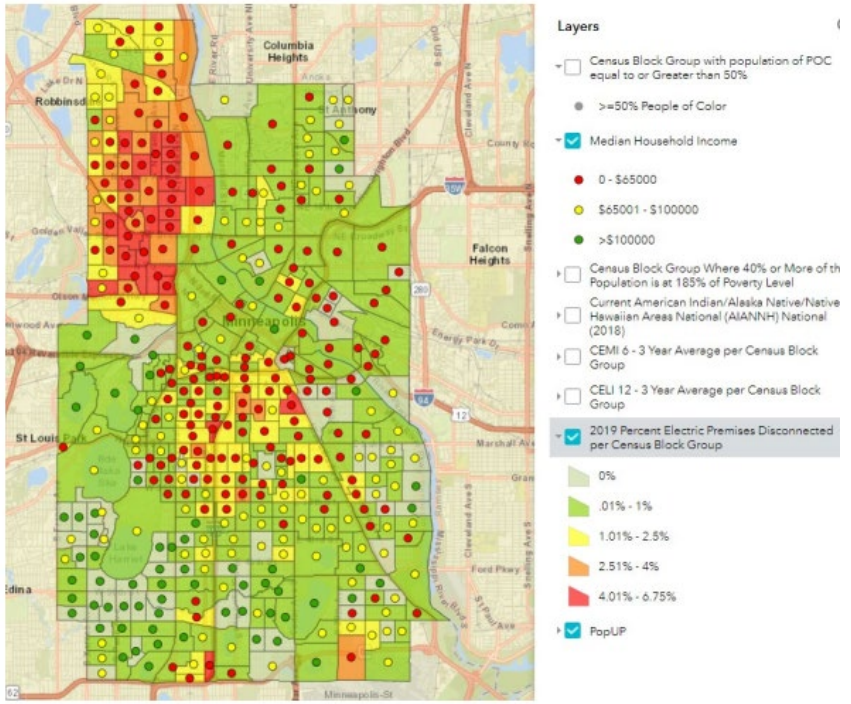
Almost half of U.S. states took action on energy equity between January 2020 and July 2022.



*See Farley et al. 2021, McAdams 2023, Hanus et al. 2023

Energy equity and justice (2)

- OR – Staged approach to stakeholder engagement in distribution planning
  - Order 20-485 initially requires consultation with community-based organizations (CBOs) before plan filing, plus a community engagement plan.* It evolves to active collaboration with CBOs and environmental justice communities so community needs (energy burden, customer choice, resilience) inform distribution projects.
  - Portland General Electric hired CBOs to recruit for and convene community workshops, develop educational materials, and conduct research for PGE's first distribution plan.
  - OR HB 2475 (2021) provides OPUC authority to provide financial assistance to organizations that represent broad customer interests, including environmental justice organizations, in regulatory proceedings.
- MN – PUC required Xcel Energy to map reliability and service quality metrics and demographic data to reveal any equity issues (Dec. 18, 2020, order in Docket 20-406).
- ME – Integrated grid planning law requires "An assessment of the environmental, equity and environmental justice impacts of grid plans."



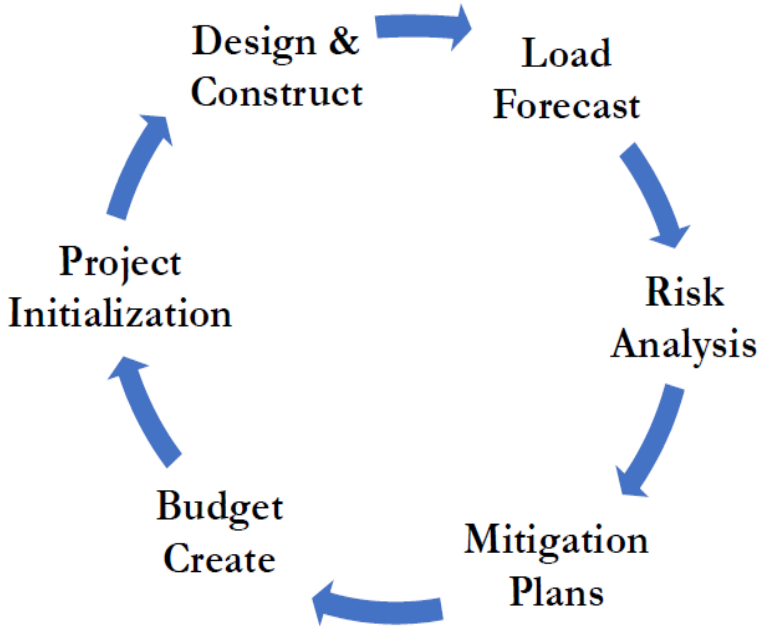
Source: Xcel Energy, Oct. 1, 2021, filing, Docket 20-406

*For example, see section 3.4 in PGE's 2021 Distribution System Plan.

See *Extra Slides* for Washington

Substantive elements (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 – projected peak demand for feeders and substations
  - Risk analysis for overloads and plans for mitigation
  - Budget for planned capacity projects
    - Asset health analysis and system reinforcements
    - Upgrades needed for capacity, reliability, power quality
    - New systems and technologies
    - Ranking criteria (e.g., safety, reliability, compliance, financial)
- Distribution operations — vegetation management and event management



Source: Xcel Energy 2021

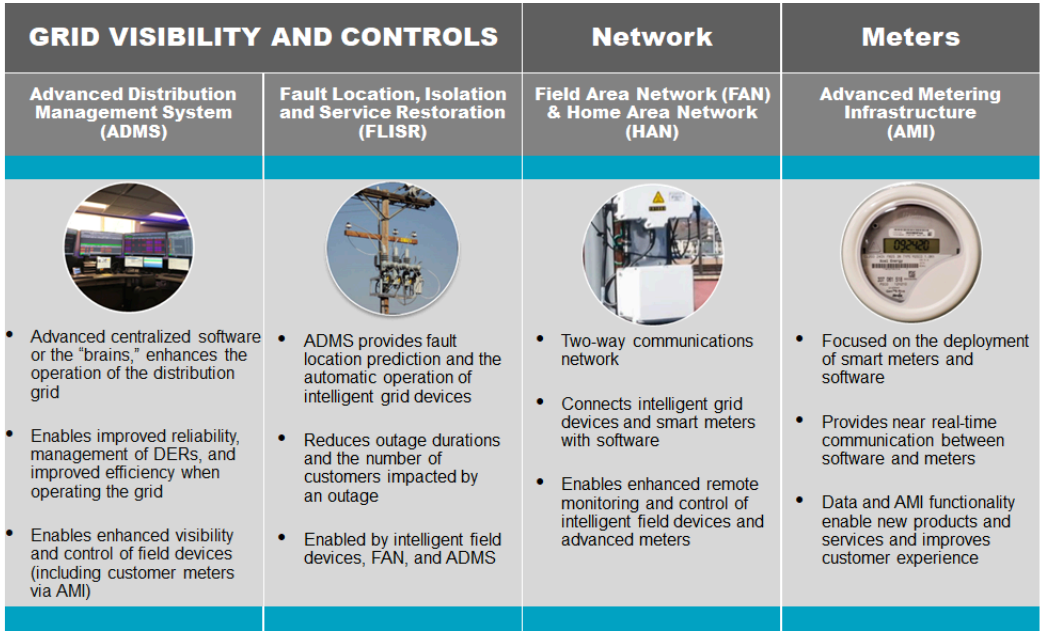
Substantive elements (2)

- DER forecast
  - Types, amounts and locations
- Hosting capacity analysis
  - Including maps
- Grid needs assessment and analysis of non-wires alternative (NWA)* to identify:
  - Existing and anticipated capacity deficiencies and constraints
  - Traditional utility mitigation projects
  - A subset of these planned projects that may be suitable for NWA to defer or avoid infrastructure upgrades for load relief, voltage, reducing interruptions, resilience

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

Substantive elements (3)

- Grid modernization strategy
  - Technology roadmap
  - Financial forecast associated with grid modernization plans
  - May include request for certification for major investments
- Action plan
- Additional elements
  - Long-term utility vision and objectives
  - Ways distribution planning is coordinated with transmission planning or integrated resource planning
  - Customer engagement strategy
  - Summary of stakeholder and community engagement
  - Proposals for pilots



Source: Xcel Energy 2021

Substantive elements (4)

- Data access
  - **Customer usage data** - AMI interval data for customers and third parties
  - Some states are requiring utilities to use or evaluate feasibility of the Green Button framework* (e.g., CA, CO, CT, DC, HI, IL, MI, NH, NY and TX).
    - Download My Data – standard enables customer to download their data
    - Connect My Data – data exchange protocol allows automatic transfer of data from utility to third party on customer authorization
  - Some states require specific aggregation levels for data sharing to protect privacy.
  - **System level data** – To support customer and third-party solutions
  - NY, NH, MN, OH, CA and DC are examples of jurisdictions with detailed system data sharing requirements.

Green Button

*The Green Button initiative is an industry-led effort to provide utility customers with easy and secure access to their energy usage information in a consumer-friendly and computer-friendly format.

Minnesota Example

Principles and planning objectives for DSP in Minnesota

- Maintain and enhance the safety, security, reliability, and resilience of the electricity grid, at fair and reasonable costs, consistent with the state's energy policies.
- Enable greater customer engagement, empowerment, and options for energy services.
- Move toward the creation of efficient, cost-effective, accessible grid platforms for new products and services, with opportunities for adoption of new distributed technologies.
- Ensure optimized use of electricity grid assets and resources to minimize total system costs.
- Provide the Commission with the information necessary to understand Xcel's short-term and long-term distribution system plans, the costs and benefits of specific investments, and a comprehensive analysis of ratepayer cost and value.

These objectives are repeated in all DSP orders and other commission communications.

Source: Minnesota Public Utilities Commission Staff Report on Grid Modernization, March 2016

How one state put together the pieces: Minnesota (1)

- Minn. Stat. §216B.2425 (2015) requires the largest utility (Xcel Energy) to submit biennial transmission and distribution plans to the Public Utilities Commission
  - To *"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** …."*
  - May ask Commission to **certify priority projects and approve costs through a rider** — a finding that the project is consistent with requirements of statute, not a prudency determination
  - Analyze hosting capacity for *small-scale distributed generation resources* and *identify necessary distribution upgrades to support [their] continued development*
- Xcel Energy 1st grid modernization report (Docket 15-962)
- Xcel Energy 2nd grid modernization report (Docket 17-776)

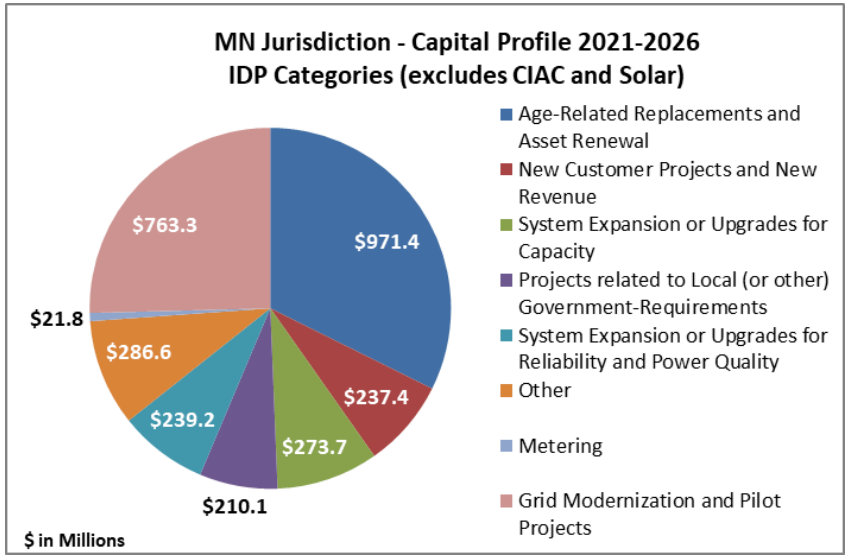
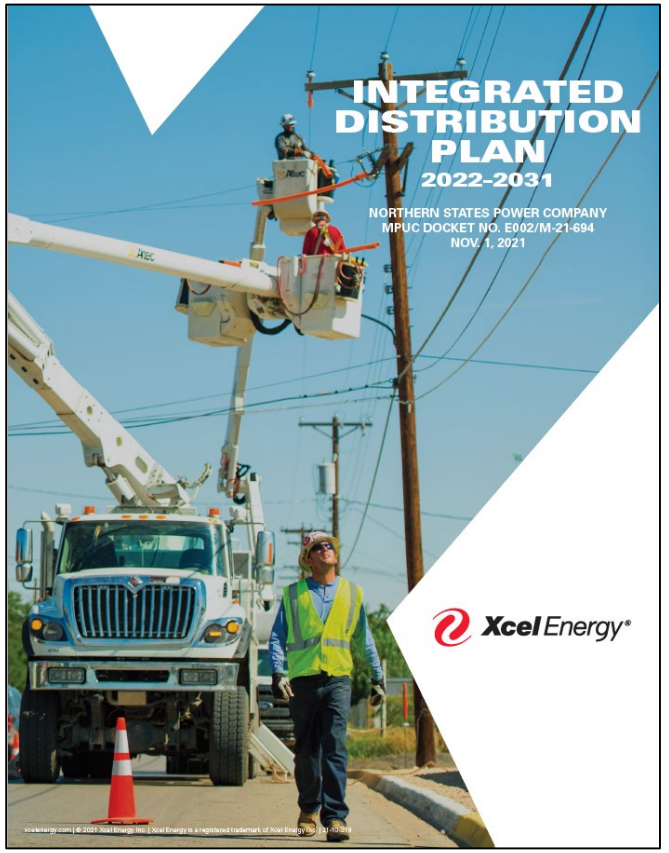


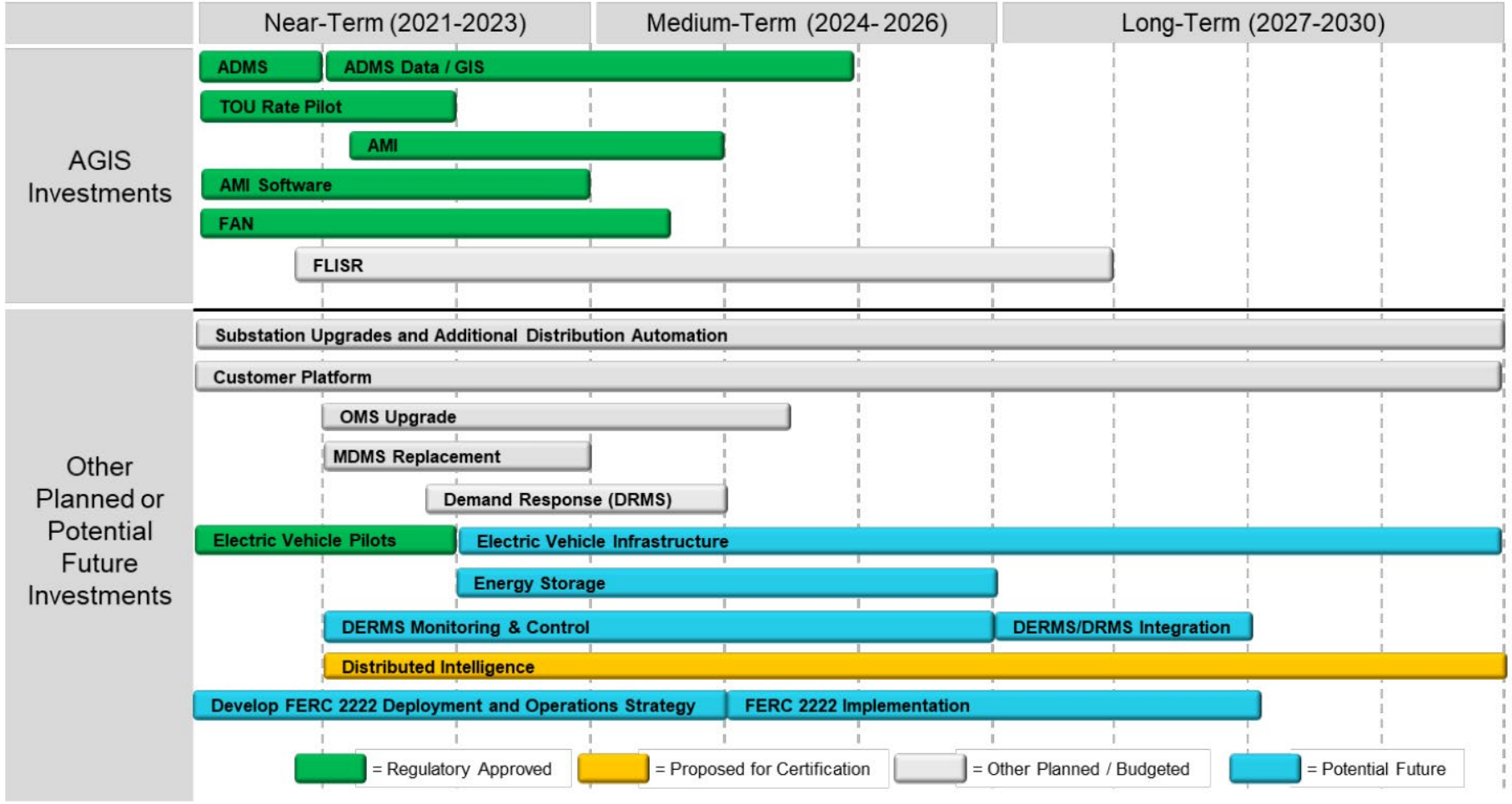
Figure: Xcel Energy 2021

How one state put together the pieces: Minnesota (2)

- Commission inquiry on Electric Utility Grid Modernization focused on integrated distribution planning (Docket CI-15-556)
  - Series of stakeholder meetings
  - Questionnaire to utilities on utility planning practices and stakeholder comments
  - Staff report defined grid modernization, proposed a phased approach, and identified principles to guide it
- The Commission established Integrated Distribution Planning (IDP) requirements for Xcel Energy (Docket 18-251) and smaller regulated utilities (Dockets 18-253, 18-254 and 18-252) — and principles.
- Xcel Energy filed its 1st IDP in 2018 (Docket 18-251), a 2nd IDP in 2019 (Docket 19-666), and a 3rd IDP in 2021 (Docket 21-694).
  - Grid modernization plan is now filed *with* biennial IDP filing.
  - Transportation electrification information and data will be filed in each utility's IDP beginning Nov. 1, 2023.



Illustrative Distribution System Investment Plan



Source: Xcel Energy 2021

AGIS – Xcel Energy's Advanced Grid Intelligence and Security initiative, ADMS – Advanced Distribution Management System, GIS – Geographic Information System, AMI – Advanced Metering Infrastructure, FAN – Field Area Network (visibility and control), FLISR - Fault Location, Isolation, and Service Restoration, OMS – Outage Management System, MDMS – Meter Data Management System, DERMS – DER Management System

Resources for more information

U.S. Department of Energy's (DOE) *Modern Distribution Grid*, Vol. IV, 2021

Berkeley Lab's integrated distribution system planning website: https://emp.lbl.gov/projects/integrated-distribution-system-planning

Berkeley Lab's research on time- and locational-sensitive value of DERs

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Questions?

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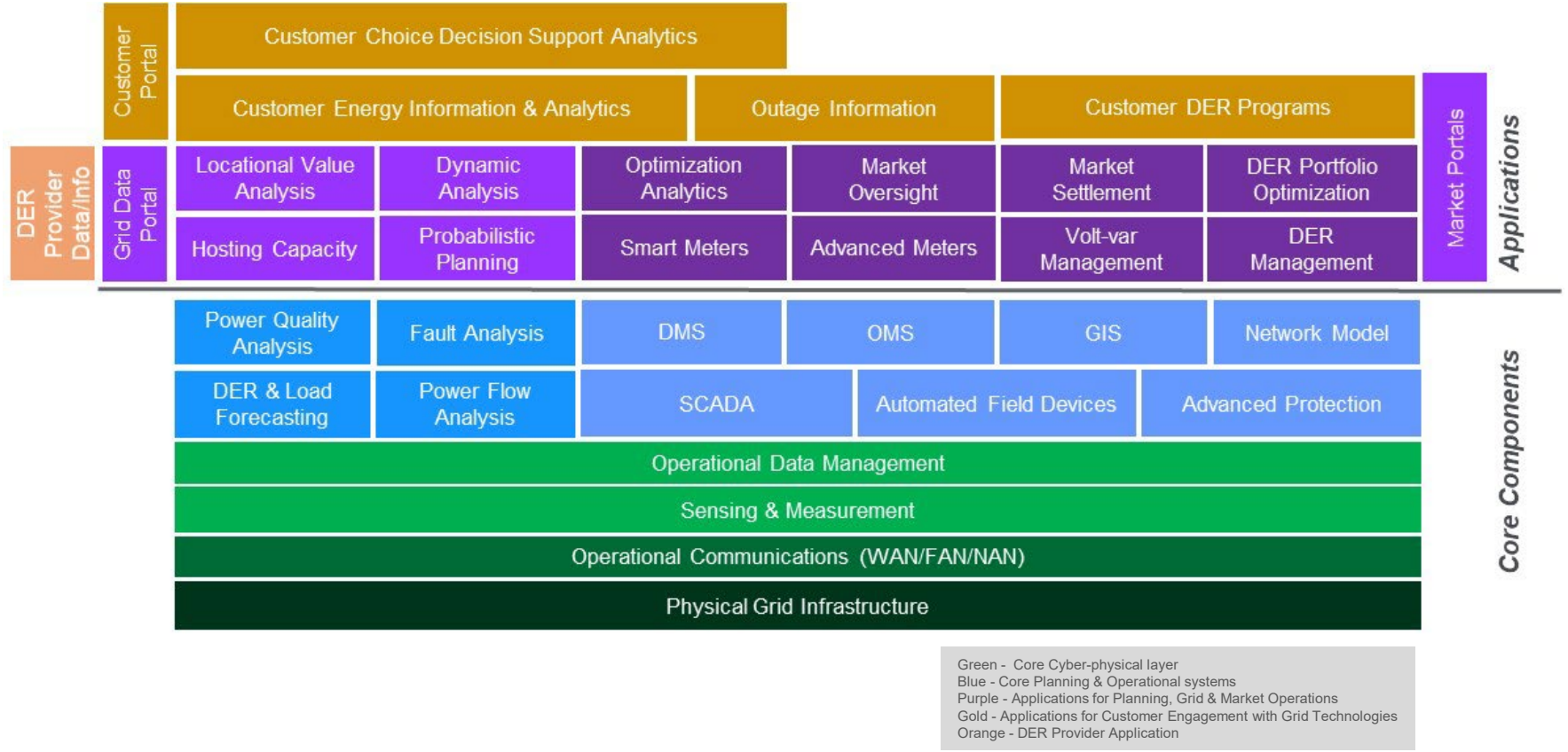
Extra Slides

Layering of core components and applications



Source: U.S. Department of Energy-Office of Electricity Delivery and Energy Reliability, 2017. *Modern Distribution Grid, Volume III: Decision Guide*.

Procedural elements - Confidentiality

- Confidentiality for security or trade secrets — for example:
  - Level of specificity for hosting capacity maps
  - Peak demand/capacity by feeder
  - Values for reliability metrics
  - Contractual cost terms
  - Bidder responses to solicitations for non-wires alternatives
  - Proprietary model information

Illinois – Stakeholder engagement in multi-year Integrated Grid Plans

- The Illinois Commission adopted multi-year integrated grid plan rules in December 2021 that apply to Ameren and ComEd (state's two largest utilities). A significant stakeholder engagement process informs the utility grid plans.
  - Before the workshops begin, utilities must provide the Commission with prescribed information, including preliminary proposals on capital investments the utility plans to make in the near future. The Commission will make the information publicly available on their website.
  - Workshops are designed to encourage diverse stakeholder representation, held during day and evening hours in a variety of locations and allow for remote access.
  - The workshop process should allow stakeholders to effectively and efficiently provide feedback and input to the utility. Stakeholders can submit data requests to the utility prior to each workshop on the topics addressed in the workshop, and the utility must respond within 14 days.
  - Minimum of six workshops administered and run by an independent facilitator
- At the conclusion of workshops, the facilitator prepares a draft report describing the process and areas of consensus and disagreement and provides recommendations to the Commission regarding the utility's plan. Stakeholders can comment on the report.

Energy equity and justice - Washington

- Washington's Clean Energy Transformation Act (SB 5116, 2019) requires utilities to file Clean Energy Implementation Plans that, in part, ensure equitable distribution of energy and non-energy benefits of the transition to clean energy.
  - The plans must include customer benefit indicators to demonstrate the utility's progress toward meeting this requirement in the following categories:
    - Energy benefits, non-energy benefits, reduction of burdens for highly-impacted communities and vulnerable populations, public health, environment, reduction in cost, reduction in risk, energy security, resilience
  - Utilities also must file multiyear rate plans that include equity performance measures.
  - The Act defines "vulnerable populations" and "highly impacted communities" — collectively "named communities" — and the process utilities must follow to map and engage with them.
    - Each utility has convened an Equity Advisory Group of CBOs and, in consultation with its advisors, listed specific characteristics for mapping and defining named communities.

Highly impacted communities and vulnerable populations
(named communities)

Energy benefits
- Improved participation in clean energy programs from named communities

Reduction of burdens
- Improved participation in clean energy programs from named communities
- Improved affordability of clean energy
- Increase in culturally- and linguistically-accessible program communications for named communities

Non-energy benefits
- Improved participation in clean energy programs from named communities
- Increase in quality and quantity of clean energy jobs
- Improved home comfort

Source: PSE 2021. Also see Avista's Plan.