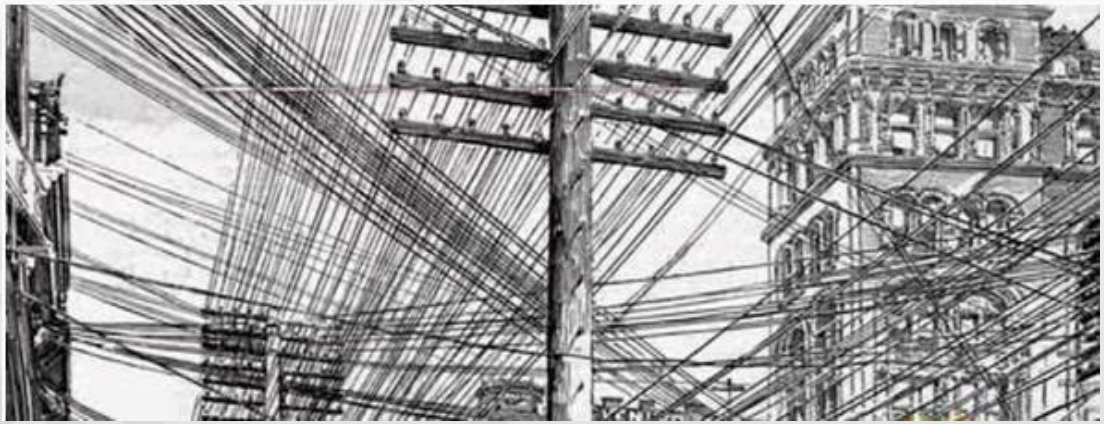


Overview of Integrated Distribution Planning Concepts and State Activity

Lisa Schwartz, Lawrence Berkeley National Laboratory

Mid-Atlantic Distributed Resources Initiative
March 13, 2018

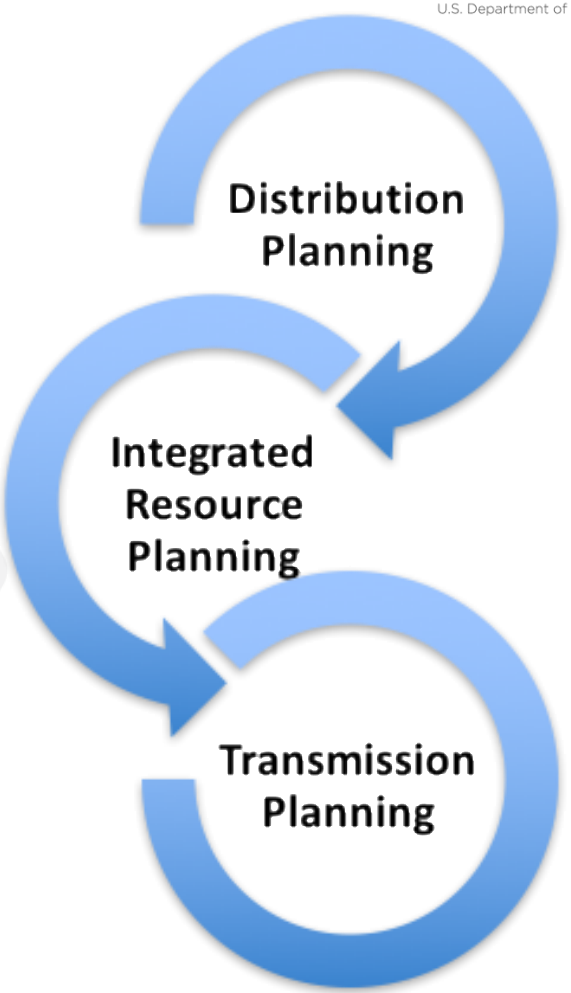
In this presentation

- Grid planning
  - Electric grid planning activities
  - Integrated distribution system planning
  - Emerging distribution planning elements
- Increasing state engagement in distribution system planning
  - Drivers for improved distribution planning and potential benefits
  - Considerations for establishing a regulatory process
  - Overarching principles and options for distributed energy resources planning
- Variety of state approaches
- Non-wires alternatives
- Possible places to start
- Some takeaways
- Resources for more information
  - Training, technical assistance, publications
- Extra slides
  - State-by-state summaries with links (more in new report)

Grid planning

Electric grid planning activities

- *Distribution planning* is focused on assessing needed physical and operational changes to local grid.
  - Can support growth of distributed energy resources (DERs) and grid modernization
- *Integrated resource planning* (in vertically integrated states) is focused on identifying future investments to meet bulk power system reliability and public policy objectives at a reasonable cost.
  - Can consider scenarios for DERs and impacts on need for, and timing of, utility investments
- *Transmission planning* is focused on identifying future transmission expansion needs and options for meeting those needs.
  - Can begin anticipating operational challenges at transmission-distribution interface* and solutions

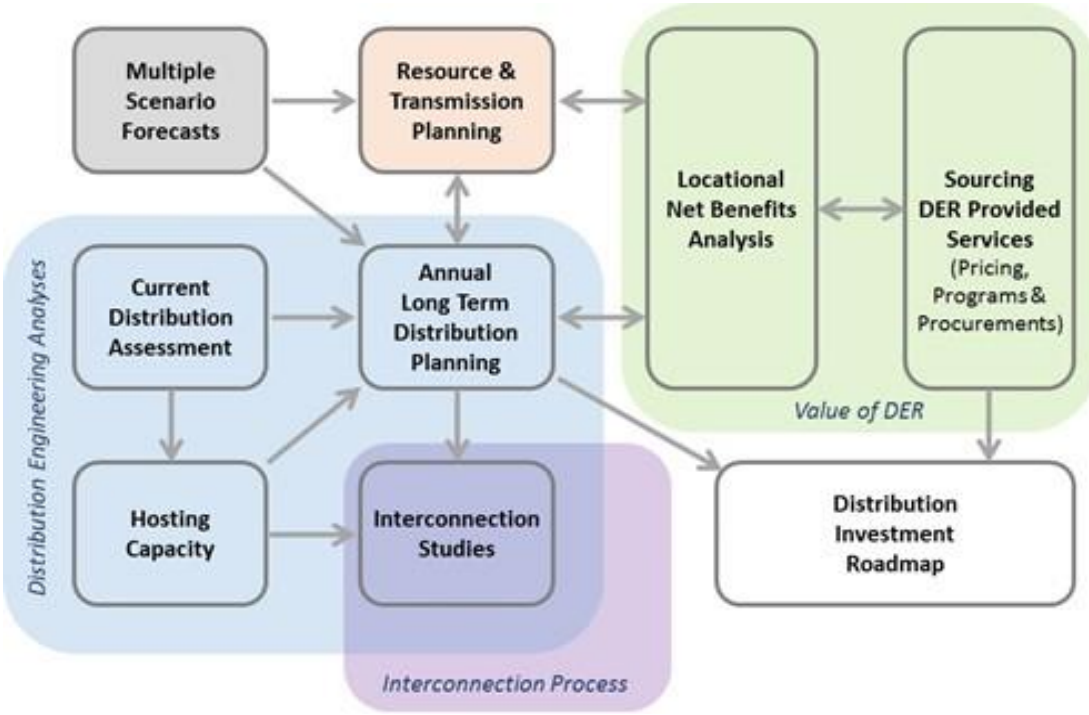


**Boundary between wholesale & retail markets; meshed high-voltage network & radial, lower-voltage feeders; and federal & state regulatory jurisdiction*

Emerging integrated distribution planning

- Assess physical and operational changes to grid necessary for safe, reliable and affordable service *that satisfies customers' changing expectations and use of DERs, includes stakeholder-informed planning scenarios, is coordinated with other types of planning, and identifies:*

1. Necessary distribution investments to enhance safety, reliability and security, *including replacement of aging infrastructure and grid modernization*
2. Changes to interconnection processes and integration investments to support DER adoption
3. Value of DERs and opportunities to realize net benefits for all customers through use of DER-provided services



[Integrated Distribution Planning](), by Paul De Martini, ICF, for Minnesota Public Utilities Commission, August 2016

Integrated planning and analysis within and across the transmission, distribution and customer/3rd party domains

Emerging distribution planning elements

- Projecting loads and DERs in a more granular way
- Analyzing hosting capacity — amount of DERs that can be interconnected without adversely impacting power quality or reliability under existing control and protection systems and without infrastructure upgrades
- Assessing locational value of DERs
- Analyzing non-wires alternatives (NWAs) to traditional investments
- Increasing visibility into distribution
- Accurately representing distributior operations
- Engaging stakeholders

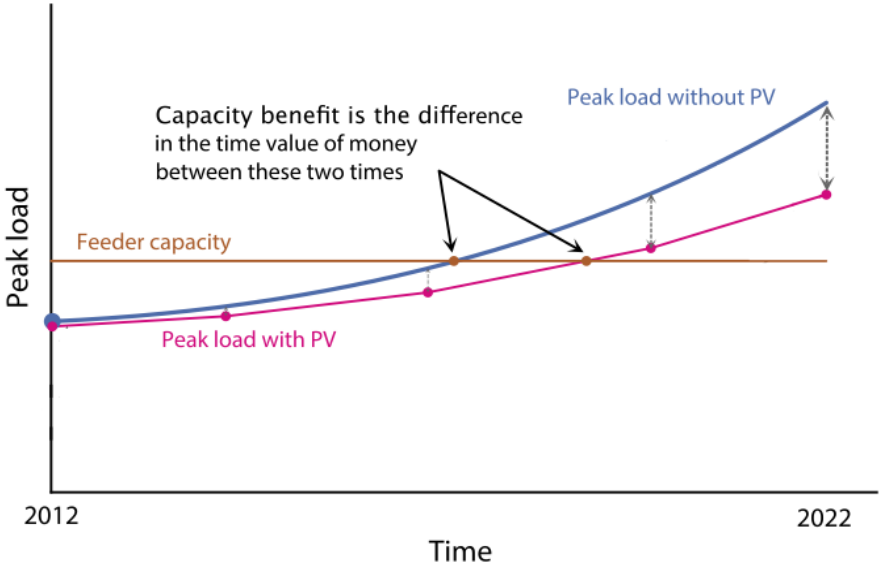


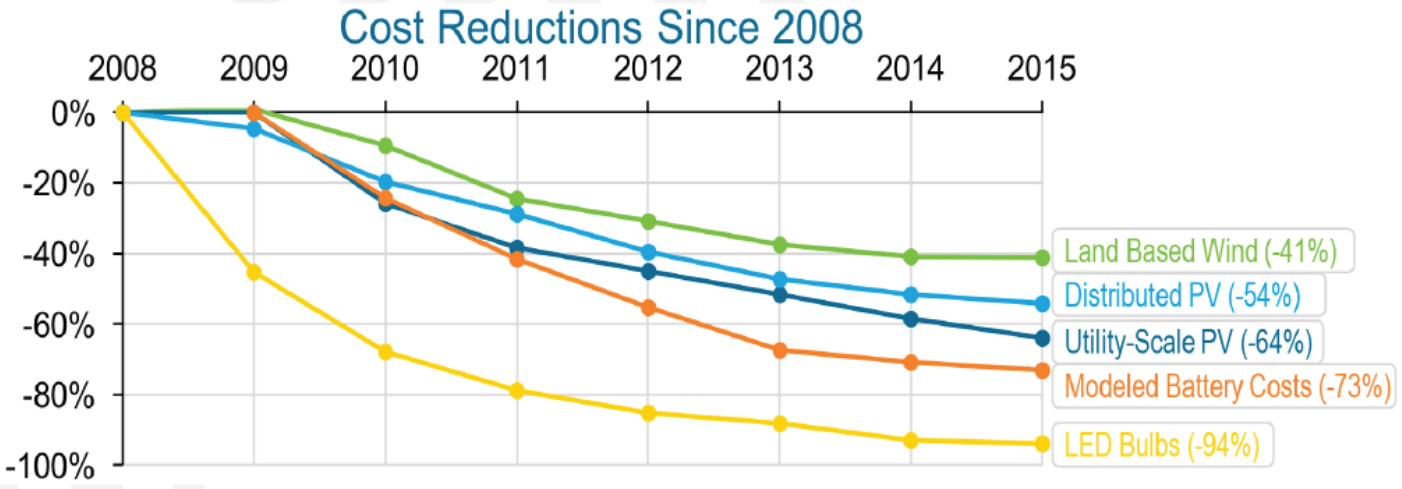
Figure adapted from Cohen, M.A., P.A. Kauzmann, and D.S. Callaway. 2016. "Effects of Distributed PV Generation on California's Distribution System, Part 2: Economic Analysis." *Solar Energy*, Special Issue: Progress in Solar Energy, 128(April): 139–152.

Increasing state engagement in distribution system planning

State drivers for improved distribution planning

- More DERs — cost reductions, policies, new business models, consumer interest
- Resilience and reliability
- More data and better tools to analyze data
- Aging grid infrastructure and utility proposals for grid investments
- Need for greater grid flexibility in areas with high levels of wind and solar
- Interest in conservation voltage reduction and volt/VAR optimization*
- Alternatives to traditional solutions that may provide net benefits to customers

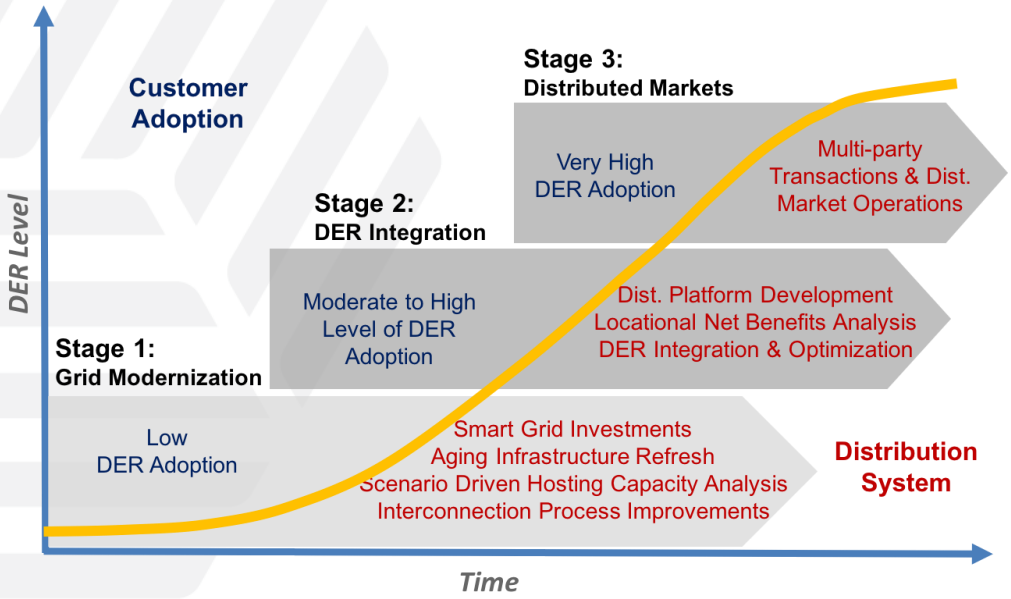
**Majority of utilities are currently not considering end-use efficiency as a distribution system resource (see ACEEE report in "Publications")*



DOE, Revolution Now

State benefits from improved distribution planning

- Makes transparent utility plans for distribution system investments before showing up individually in rider or rate case
- Provides opportunities for meaningful PUC and stakeholder engagement
  - Can improve outcomes
- Considers uncertainties under a range of possible futures
- Considers all solutions for least cost/risk
- Motivates utility to choose least cost/risk solutions
- Enables consumers and service providers to propose grid solutions and participate in providing grid services



Graph from DeMartini and Kristov, for Berkeley Lab (see "Publications")

Overarching principles for DER planning for distribution systems - Washington UTC report

- **Transparency**: DER planning should *fairly consider both wire-based and non-wires resource alternatives* for meeting distribution system needs. Planning should *optimize the investment decisions of customers and third parties by identifying points on the grid where distributed resources have greatest value*.
- **Coordination**: Distribution plans should *inform and interact with other utility planning processes*,* including capital budget plans.
- **Flexibility**: The planning *process needs to improve over time and adapt* to changing grid conditions, new technologies, and improved modeling capabilities.
- **Reliability and Security**: DER planning should *ensure that reliability, physical security, and cybersecurity are maintained* as the distribution grid changes.
- **Inclusion**: *All customers should have opportunities to participate in grid modernization* through tariffs and programs that compensate customers for the value of their distributed resources, with particular consideration given to low-income customers.

From Washington Utilities and Transportation Commission, *Report on Current Practices in Distributed Energy Resource Planning*, report to Washington Legislature, Dec. 31, 2017 (emphasis added)

* In WA, a vertically integrated state, this includes integrated resource plans.

Best practices for DER planning for distribution systems – Washington UTC report

GRID MODERNIZATION LABORATORY CONSORTIUM
U.S. Department of Energy

1. Identify *data gaps* that impede planning process and any *upgrades needed* to obtain data
2. Propose *monitoring and metering upgrades w/biz case* identifying net benefits
3. Identify programs and tariffs to *compensate customers* for DER value and optimal usage
4. Use *probabilistic models to forecast DER growth* on the utility's system
5. Identify all major, planned investments for next 10 years and *analyze non-wires alternatives*
6. *Competitively procure DERs* identified in plan through detailed requests for proposals, specifying locations
7. Use identified *DERs as inputs to integrated resource plans**
8. Discuss how utility is *adapting cybersecurity and data privacy practices* to changing distribution grid
9. Discuss lessons learned from current planning cycle plus *process and data improvements for next cycle*
10. Use transparent approach for *stakeholder input and feedback*

* Not relevant to restructured states.

Some considerations for establishing a regulatory process for distribution planning

GRID MODERNIZATION LABORATORY CONSORTIUM
U.S. Department of Energy

- Statutory requirements, regulatory precedent
- Priorities, phasing, related proceedings
- What's worked elsewhere, tailored to your state
- Recognize differences across utilities
- Regulatory clarity with flexibility built-in
- Quick wins, early benefits for consumers
- Long-term, cohesive view to achieve goals
- Pilots vs. full-scale approaches (including economy of scale, rate impacts)
- Utility distribution investments are large
  - $32B nationally among Edison Electric Institute members in 2016

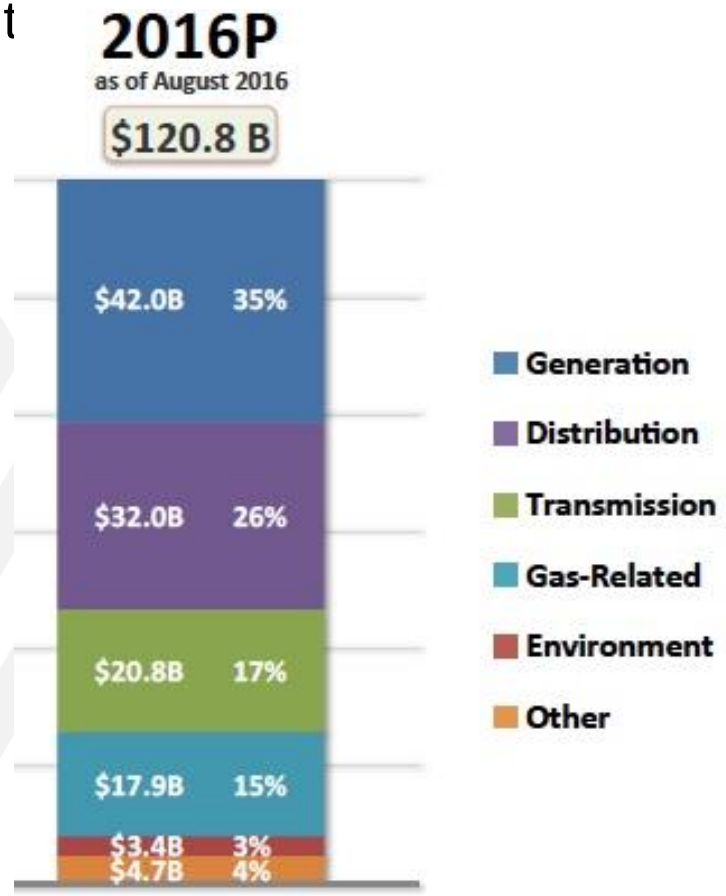


*Figure from EEI, *Delivering America's Energy Future, 2/8/17*. Source: EEI Finance Department, company reports, S&P Global Market Intelligence (August 2016)

Variety of state approaches

State Engagement in Distribution System Planning

GRID MODERNIZATION LABORATORY CONSORTIUM
U.S. Department of Energy

New report: *State Engagement in Electric Distribution Planning*, Pacific Northwest National Laboratory, Berkeley Lab, and National Renewable Energy Laboratory, December 2017

	States with advanced practices					Other state approaches										
	California	Hawaii	Massachusetts	Minnesota	New York	D.C.	Florida	Illinois	Indiana	Maryland	Michigan	Ohio	Oregon	Pennsylvania	Rhode Island	Washington
Statutory requirement for long-term distribution plans or grid modernization plans[(a)]	✓			✓					✓							
Commission requirement for long-term distribution plans or grid modernization plans[(a)]		✓	✓		✓					✓	✓					
No planning requirements yet, but proceeding underway or planned						✓							✓		✓	✓
Voluntary filing of grid modernization plans								✓				✓		✓		
Non-wires alternatives analysis and procurement requirements	✓				✓										✓	
Hosting capacity analysis requirements	✓	✓		✓	✓											
Locational net benefits analysis required	✓				✓											
Smart grid plans required													✓			
Required reporting on poor-performing circuits and improvement plans							✓	✓				✓		✓	✓	
Storm hardening requirements							✓			✓						
Investigation into DER markets		✓														

(a) For one or more utilities.

States are advancing distribution system planning in a variety of ways. Here are some examples.

GRID MODERNIZATION LABORATORY CONSORTIUM
U.S. Department of Energy

- Requirements for utilities to file distribution system or grid modernization plans (CA, HI, IN, MA, MN, NY)
- Ad hoc directive to file a distribution system plan (MD, MI)
- Requirements to conduct hosting capacity analysis (CA, HI, MN, NY)
- Consideration of cost-effective non-wires alternatives (CA, NY, RI)
- Locational net benefits analysis for DERs (CA, NY)
- Investigations into DER procurement strategies (CA, HI, NY)
- Requirements for utilities to report on poor-performing circuits and improvement plans (many states — e.g., FL, IL, OH, PA, RI)
- Storm hardening and undergrounding requirements (MD, FL)
- Smart grid reporting (OR)
- Investigation into DER markets (HI)

Example* state approaches - 1

GRID MODERNIZATION LABORATORY CONSORTIUM
U.S. Department of Energy

► New York

- Utilities file Distribution System Implementation Plans with stakeholder engagement
- Non-wires alternatives
  - Incorporating NWA criteria into T&D capital planning – Utilities must routinely identify candidate projects for NWA solutions (load relief, reliability) and post information to websites
  - Utilities issue requests for proposals for NWAs
- Value Stack tariff
  - Location-specific relief zones
  - Payments to DER projects based on energy, capacity, environmental, demand reduction and locational system relief value
- Hosting capacity maps for all circuits ≥12 kV

**See new report and Extra Slides for details and links, plus information on other states.*

Example state approaches - 2

GRID MODERNIZATION LABORATORY CONSORTIUM
U.S. Department of Energy

► California

- Utilities file Distribution Resource Plans
- Locational Net Benefits Analysis - Net benefits DERs can provide at any given location, using an avoided cost calculator as framework for system-level values plus PUC-required, location-specific methods for avoided T&D costs
  - Locational benefits demonstration projects
- Integration Capacity Analysis – Hosting capacity analysis to identify how much generation can be installed on a line section w/o distribution upgrades
- Annual process for third party-owned DERs to defer or avoid traditional capital investments in distribution systems
- Utility incentive mechanism pilot for DERs – Utilities earn 4% on customer or third party-owned DER projects that cost-effectively defer distribution system investments

Example state approaches - 3

► Minnesota

- Biennial Distribution Grid Modernization Reports (Minn. Stat. §216B.2425)
  - Utility identifies projects it considers necessary to modernize T&D systems
    - May ask Commission to certify grid modernization projects as priority projects in order to recover costs through a rider (outside general rate case)
  - Utility identifies interconnection points for small-scale distributed generation (DG) and distribution system upgrades to support continued DG development
  - To date, Xcel Energy has filed 2 grid modernization reports and 2 hosting capacity analyses
- Staff report on grid modernization (2016) asks 3 questions
  - Are we planning for and investing in the distribution system we will need in the future?
  - Are planning processes aligned to ensure future reliability, efficient use of resources, maximize customer benefits and successful implementation of public policy?
  - What commission actions would support improved alignment of planning and investment?
- Electric Utility Grid Modernization docket focuses on distribution planning
  - To develop a distribution system planning framework for utilities across state
  - Series of stakeholder workshops
  - Utility questionnaire on current practices, planning status and possible improvements; stakeholder comments

Example state approaches - 4

► Illinois

- Utilities file annual reliability reports, ICC assesses report ≤3 years
- Investment plans under Energy Infrastructure Modernization Act
  - Distribution infrastructure: smart meters, distribution automation, cyber-secure data communication networks, substation microprocessor relay upgrades, and grid hardening
  - Utilities file annual Grid Modernization Action Plans with formula rates for approval
- NextGrid initiative
  - Consumer-focused study — leveraging energy markets, investment in smart grid technology, and recent law expanding renewable resources and energy efficiency
  - Series of workshops to kick off 18-month process
  - 7 working groups:
    - New technology deployment and grid integration
    - Electricity markets
    - Customer and community participation
    - Regulatory, environmental, and policy issues
    - Metering, communications, and data
    - Reliability, resiliency, and cybersecurity
    - Ratemaking

Example state approaches - 5

► Maryland

- Distribution planning is one of six topics addressed in PC 44 - Transforming Maryland's Electric Grid proceeding.
- Consultant studying benefits & costs of distributed solar in IOUs' service areas
- Orders in BGE and Pepco rate cases required each utility to file a five-year distribution investment plan within 12 months.
  - BGE plan filed in June 2017
  - Pepco plan filed in November 2017

Example state approaches - 6

► Michigan

- In early 2017 orders in rate proceedings, PSC directed Consumers Energy and DTE Energy to file draft 5-yr distribution investment & maintenance plans
  - "to increase visibility into the needs of maintaining the state's system and to obtain a more thorough understanding of anticipated needs, priorities, and spending"
- Utilities filed draft plans last summer; staff reviewed and parties commented
- Final plans required to address aging infrastructure and defining risk assessments needed to prioritize investments, known safety concerns, improving resilience and mitigating weather-related safety and financial issues, and objectives and performance metrics to guide strategy for addressing Governor's reliability goals
  - DTE Energy final plan filed Jan. 31, 2018
  - Consumers Energy final plan filed March 1, 2018

Example state approaches - 7

► Ohio

- PowerForward initiative reviewing technological and regulatory innovation that could enhance consumer electricity experience
  - Workshops with industry experts “to chart a path forward for future grid modernization projects, innovative regulations and forward-thinking policies”
  - Topics include benefits for customers, data integration and interoperability, enabling technologies, integrating DERs, grid and communications architecture, standards
  - Duke’s electric security plan includes a rider for “new offerings designed to advance programs, services, and initiatives reflective of … PowerForward”
- Distribution Modernization Riders - FirstEnergy and Dayton Power & Light
- AEP gridSMART – expand AMI, Distribution Automation, Volt/VAR optimization
- FirstEnergy Grid Modernization Business Plan includes 3 scenarios with full deployment of AMI and ADMS, plus Distribution Automation and Integrated Volt/VAR Control to varying degrees
- Distribution system reliability code, distribution circuit performance codes and annual reliability compliance filings

Non-wires alternatives (NWAs)

Natalie Mims and Lisa Schwartz, Berkeley Lab

New York Joint Utilities NWA Criteria

- The Joint Utilities provided suitability criteria for NWA projects in March 2017 and described how the criteria will be applied to projects in their capital plans in a supplemental filing on May 8, 2017.
- Similar criteria provided by ConEd, O&R Utilities and Central Hudson

Criteria	Potential Elements Addressed	
Project Type Suitability	Project types include Load Relief and Reliability*. Other categories currently have minimal suitability and will be reviewed as suitability changes due to State policy or technological changes.	
Timeline Suitability	**Large Project**	36 to 60 months
	Small Project	18 to 24 months
Cost Suitability	**Large Project**	≥ $1M
	Small Project	≥ $300k

*Reliability projects entail projects for remote single source regions or customer-requested enhanced reliability projects. Source: Central Hudson NWA Opportunity website

Examples of NY NWA RFPs

- The Joint Utilities' May 8, 2017, supplemental filing stated they would use their own procurement process to award contracts for NWAs. Information on the Joint Utilities NWA process is here and on the REV Connect website.

Utility	Project Name	Project Type	Project Size	Project status and procurement and development timeline
Central Hudson	Philips Road/ Substation	Load relief	Large (5 MW)	RFP issued: 11/2014 Timeline: 42 mo. Project status: Targeted DSM underway
Central Hudson	Coldenham/ Distribution Feeder Upgrade	Load relief	Small (1 MW)	RFP issued: 3/2017 Timeline: 34 mos. Project status: RFPs are being evaluated
NYSEG	Java 2nd Transformer and 12 kV Conversion	Load relief and reliability	Not provided	RFP issued: 2016 Timeline: 3/2019 Project status: none provided
Con Ed	West 42nd St Load Transfer	Load relief	42 MW	RFP issued: 12/2017 Responses due: 3/16/2018 Timeline: 12 MW needed by May 2021 Project status: Active RFP

ConEd NWA RFPs

- ConEd has two open RFPs and four closed RFPs for NWA projects.
  - Bids for the four closed RFPs are currently under evaluation.
  - Also, one NWA project has been deferred due to reduced growth projections, and another NWA project will not proceed.
- ConEd webinar in November outlined the status of its NWA projects and provided information on expectations with the RFP process
- RFP response requirements include:
  - Proposed solution description
  - Project schedule and acquisition plan
  - Detailed costs associated with proposed solution
  - Risks, challenges and community impacts
  - Professional background and experience with the proposed solutions
- Underperformance: “Failure to deliver load relief committed as part of any solution may result in liquidated damages to ConEd as provided by the contract.”

Oregon

- Pacific Power and Energy Trust of Oregon (ETO)* are using targeted energy efficiency to possibly defer a substation upgrade.
- 2-year pilot (Q3 2017 to Q2 2019) targets efficiency measures for 3,000 customers to reduce substation load. Goals of the pilot:
  - Measure and quantify peak demand savings
  - Document and evaluate ability to replicate the strategies in other regions served by Pacific Power and ETO
  - Develop processes for coordinated implementation between Pacific Power and ETO
  - Determine if any changes need to be made to improve targeted deployment of efficiency for deferral of traditional distribution system upgrades

Commercial	Industrial	Residential
• Lighting direct installation for commercial, multifamily • Standard incentives	• Lighting • Operations & maintenance • Standard incentives	• Energy Saver Kits • Smart thermostats • Online Home Energy Reviews

*ETO is the third-party administrator for energy efficiency programs.

California

- CPUC Distribution Investment Deferral Framework (DIDF) Staff Proposal (6/30/17) - Part of a rulemaking to establish policies, procedures and rules to guide IOUs in developing Distribution Resource Plan Proposals
- CPUC order 2/15/18
  - "The central objective of the DIDF is to identify and capture opportunities for DERs to cost-effectively defer or avoid traditional IOU investments that are planned to mitigate forecasted deficiencies of the distribution system."
  - IOUs implement DER growth scenarios and Integration Capacity Analysis (hosting capacity analysis) in existing and new distribution planning processes.
  - IOUs file annually detailed Grid Needs Assessment and Distribution Deferral Opportunity Report. General rate case applications must match these filings.
  - Distribution Planning Advisory Group – Stakeholder feedback on IOU reports
  - Annually by Dec. 1, each IOU recommends distribution deferral projects for solicitations via the Competitive Solicitation Framework Request for Offers.

Rhode Island - 1

- Rhode Island's Investigation Into the Changing Electric Distribution System (Docket No 4600) produced a Guidance Document in October 2017 on how the PUC will consider distribution system investments in National Grid regulatory proceedings.
- PUC created Least Cost Procurement Standards in July 2017 (Docket 4684) with guidelines for incorporating NWAs into utility System Reliability Procurement (SRP) plans. NWA implementation costs are recovered in SRP. (SRP also includes other types of expenditures.)
- In August 2017, National Grid filed its Efficiency and System Reliability Procurement Plan. The SRP plan highlighted the use of NWAs for:
  - Highly utilized distribution systems
  - Areas where construction is physically constrained
  - Areas where the utility anticipates demand growth
- RI System Data Portal, including a Heat Map to identify opportunities where NWAs can be used to reduce or manage load for these use cases

Rhode Island - 2

- Power Sector Transformation Initiative - The PUC, Office of Energy Resources, and Division of Public Utilities and Carriers developed a new framework for RI's electric system, at the request of the Governor.

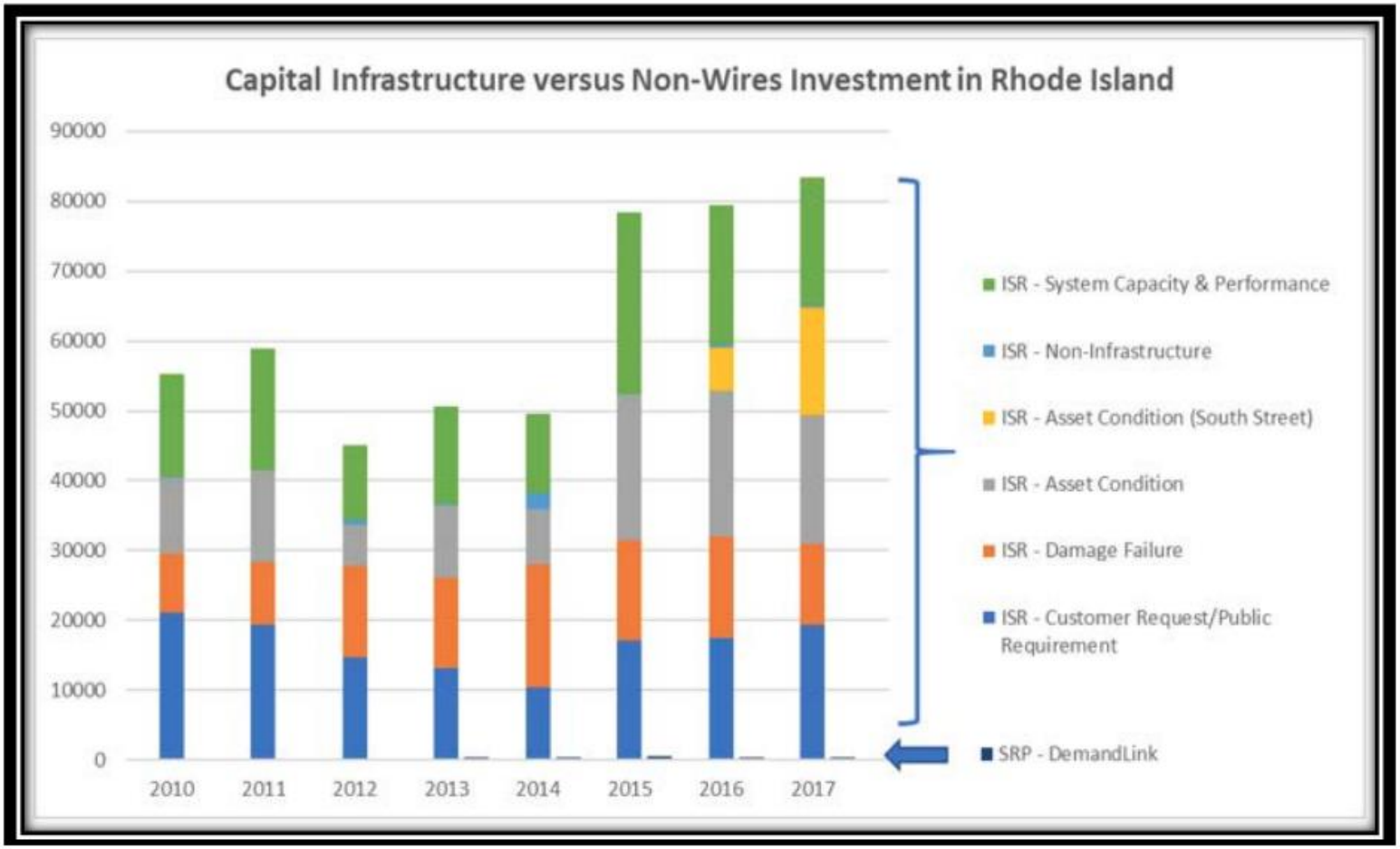


Figure 12: Infrastructure Versus Non-Wires Investment in Rhode Island (2010 to 2018). Source: OER, 2017

Blue bars (bottom) represent investment in SRP plans

Rhode Island - 3

- Initiative's Phase I report, November 2017 (pp. 45-46)
  - Report states that National Grid indicated NWAs have been limited in the state due to:
    - Reduced need - successful energy efficiency programs & flat load growth
    - Inability to use NWAs for asset condition need — when there is the "susceptibility of distribution infrastructure equipment to failure, malfunction or otherwise compromised performance…."
  - At the same time the report notes that "significant capital investment persists to address system capacity issues (i.e., circuit peaks driven by load growth)."

- Among the principles to guide distribution system planning reforms:
  - "…should achieve consistency across all programs and policies. For example, operationalization of heat maps and locational incentives should be implemented uniformly across all energy efficiency, DER, NWA and capital planning and procurement processes."

Possible places to start

Haven’t yet begun? Possible places to start

- *Take early integration steps* - Consistency in inputs (e.g., assumptions, forecasts) and scenarios — updated in time — across distribution planning, capital planning, transmission planning and, in vertically integrated states, integrated resource planning
- *Account for all resources* – Consider energy efficiency, demand response (including direct load control, smart thermostats and time-varying pricing), distributed generation and storage alongside traditional distribution solutions where applicable
- *Specify DER attributes* – In order to meet identified distribution system needs
- *Test new sourcing and pricing methods* – e.g., competitive solicitations, tariffs, programs
- *Analyze multiple possible futures* – e.g., loads, DERs, markets

Possible places to start - 2

- *Phase in hosting capacity analysis* – To facilitate distributed generation integration and indicate better or more difficult locations
- *Pilot evaluation of locational impacts* – Identify where DERs might offer greatest benefits
- *Plan integration of utility systems in advance* – Specify how any proposed investments (e.g., advanced metering infrastructure, automated distribution management systems) will be used with other utility assets and systems, as well as providing data for distribution planning, for the benefit of consumers.
- *Education and training*

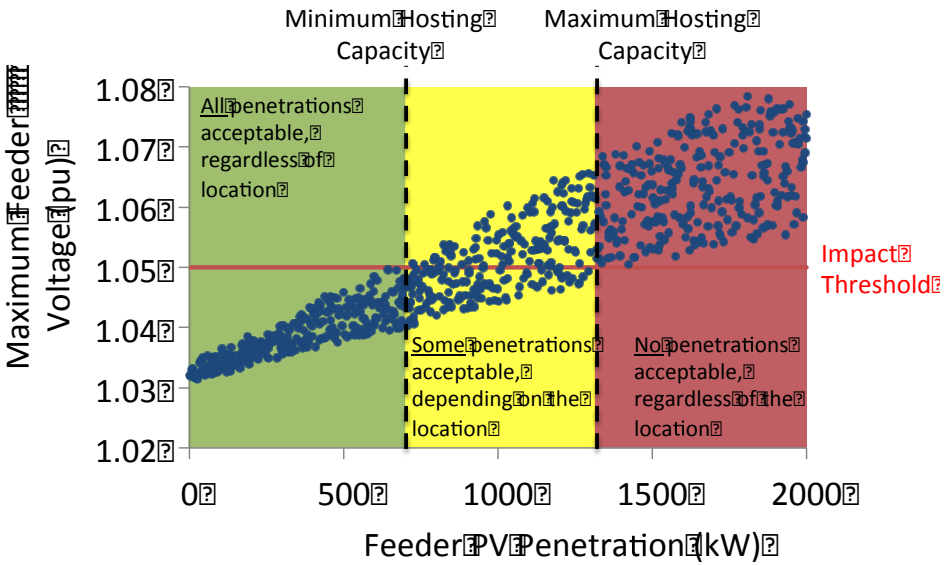


Figure adapted by Berkeley Lab from EPRI (2015), *Distribution Feeder Hosting Capacity: What Matters When Planning for DER?*

Some takeaways

Some takeaways

- Most states have not begun to directly engage in longer-term (5- to 10-year) utility distribution planning. States further down the path are still early in the process.
  - Approaches range from a cohesive set of requirements to ad hoc order in utility rate case
- Some PUC distribution planning processes are tied to greater utility assurance of cost recovery for distribution investments that are included in approved plans.
- Beyond universal interest in affordability and reliability, common state drivers for a state distribution system planning process include facilitating higher levels of DERs, harnessing them to provide grid services for customers, enabling greater consumer engagement, and improving review of utility distribution investments.
- Common *emerging* elements of distribution system planning include DER forecasting, hosting capacity analysis, DER locational value, and engaging stakeholders to help identify least-cost solutions.
- Some states are taking steps toward including non-wires alternatives in distribution planning and competitive procurements to meet certain grid needs.
- Integration of distribution planning with other types of planning is nascent.

Resources

Training for states on Distribution Systems and Planning

- Last year, Berkeley Lab and NARUC convened a PUC advisory group from diverse states (AR, CA, DC, HI, MA, MI, MN, NY, OH, RI, WA, UT) to help identify distribution planning needs and guide a training program.
- Two regional trainings for PUCs to date: in New England and the Midwest (MISO footprint) - *see hyperlinks for agenda and slides*
- NASEO asked to join future trainings
- Western region training May 2-3 (Salt Lake City) both for PUCs and SEOs
- State consumer representatives training – June 2018 NASUCA meeting and beyond
- Berkeley Lab plans to request funding for FY19 for additional training
  - Mid-Atlantic and South
  - State energy offices

Technical assistance for states

GRID MODERNIZATION LABORATORY CONSORTIUM
U.S. Department of Energy

- DOE's Solar Energy Technologies Office, in partnership with Berkeley Lab, Pacific Northwest National Laboratory and National Renewable Energy Laboratory, recently launched a three-year analytical support program for PUCs on topics related to distribution utility planning and regulatory, policy, programmatic and technology assessments of DERs. Applications for year 1 were selected in October 2017. Applications for the next round of support will be solicited late summer 2018.
- Berkeley Lab's Electricity Markets and Policy Group provides independent and unbiased technical assistance to state utility regulatory commissions, state energy offices, tribes and regional entities in these areas:
  - Energy efficiency (e.g., policy frameworks, implementation strategies, resource planning approaches, utility cost recovery, and evaluation, measurement and verification)
  - Renewable energy resources
  - Demand response (e.g., time-varying pricing)
  - Utility regulation (e.g., financial impacts to utilities and utility customers)
  - Grid modernization

Publications for more information

- Juliet Homer, Alan Cooke, Lisa Schwartz, Greg Leventis, Francisco Flores-Espino and Michael Coddington, *State Engagement in Electric Distribution Planning*, Pacific Northwest National Laboratory, Lawrence Berkeley National Laboratory and National Renewable Energy Laboratory, December 2017
- U.S. Department of Energy's (DOE) Modern Distribution Grid initiative and report (www.doe-dspx.org)
  - Volume I: Customer and State Policy Driven Functionality
  - Volume II: Advanced Technology Market Assessment
  - Volume III: Decision Guide
- *Integrated Distribution Planning*, by Paul De Martini, ICF, for the Minnesota Public Utilities Commission, August 2016
- *Summary of Electric Distribution System Analyses with a Focus on DERs*, by Y. Tang, J.S. Homer, T.E. McDermott, M. Coddington, B. Sigrin, B. Mather, Pacific Northwest National Laboratory and National Renewable Energy Laboratory, April 2017
- Berkeley Lab's Future Electric Utility Regulation report series — in particular:
  - *Distribution Systems in a High Distributed Energy Resources Future: Planning, Market Design, Operation and Oversight*, by Paul De Martini (Cal Tech) and Lorenzo Kristov (CAISO)
  - *The Future of Electricity Resource Planning*, by Fredrich Kahrl (E3), Andrew Mills (Berkeley Lab), Luke Lavin, Nancy Ryan and Arne Olsen (E3)
  - *Value-Added Electricity Services: New Roles for Utilities and Third-Party Providers*, by Jonathan Blansfied and Lisa Wood, Institute for Electric Innovation; Ryan Katofsky, Benjamin Stafford and Danny Waggoner, Advanced Energy Economy; and National Association of State Utility Consumer Advocates
- Brendon Baatz, Grace Relf and Seth Nowak, ACEEE, *The Role of Energy Efficiency in a Distributed Energy Future,* http://aceee.org/research-report/u1802

Contact

Lisa Schwartz, Deputy Group Leader/Energy Efficiency Team Leader
Berkeley Lab Electricity Markets and Policy Group
(510) 486-6315; lcschwartz@lbl.gov

https://emp.lbl.gov/

Click here to stay up to date on our publications, webinars and other events and follow us @BerkeleyLabEMP

Extra slides

State-by-State Details

From 9/27/17 presentation by Lisa Schwartz and Juliet Homer (with some updates by Berkeley Lab):
https://emp.lbl.gov/sites/default/files/4._schwartz-homer_necpuc_training_20170920.pdf

States advancing distribution planning - 1

- **New York** – Reforming the Energy Vision
  - Utilities file Distribution System Implementation Plans with stakeholder engagement
  - Expansion of non-wires alternatives (NWAs)
    - Brooklyn and Queens Demand Management project ($200M) enabled $1.2B deferral of traditional network upgrades (41 MW customer-side, 11 MW utility-side)
    - Focusing on NWA suitability criteria - Utilities incorporating NWA criteria into transmission and distribution capital planning – Must routinely identify projects that are candidates for NWA solutions (load relief, reliability, etc.) and post to websites with information including timing
    - Issue requests for proposals for NWAs

States advancing distribution planning - 2

NY, cont.

- Value Stack tariff
  - Demand relief values being calculated and location-specific relief value zones identified
  - Payments to be made to DER projects based on energy, capacity, environmental, demand reduction and locational system relief value
  - Hosting capacity maps for all circuits ≥12 kV
  - Future:
    - Updated marginal cost of service studies
    - Interconnection portal online for developers
    - Two energy storage projects per utility required by end of 2018

States advancing distribution planning - 3

► California

- AB 327 and PUC order on distribution planning
- Distribution Resource Plans
  - *Locational Net Benefits Analysis* - Specify net benefits DERs can provide at any given location, using E3's Distributed Resource Avoided Cost Calculator as framework for system-level values and PUC-required, location-specific methods for avoided T&D costs
  - *Integration Capacity Analysis* – "Streamlined" hosting capacity analysis to identify how much generation can be installed on a line section w/o distribution upgrades. 9 functional requirements for demos
  - DER Adoption and Distribution Load Forecasting methodology
  - Grid Modernization Investment Guidance (staff whitepaper)
  - Distribution Investment Deferral to establish annual process for third party-owned DERs to defer or avoid traditional capital investments in distribution systems
- Demo projects: Integrated capacity analysis, locational benefits, distribution operations with high DERs and microgrids

States advancing distribution planning - 4

CA, cont.

- Utility incentive mechanism pilot for DERs – Utilities earn 4% on customer or third-party DER projects that cost-effectively defer distribution system investments
  - Pilot - one to four projects for each IOU
  - Also addresses cost-effectiveness framework
- Integrated Resource Planning rulemaking to set GHG targets for load serving entities; CPUC staff to do initial modeling
- SCE Grid Modernization Plan – As part of 2018 rate case SCE proposed $1.9 billion to modernize grid for DERs; Commission decision Jan 2018
- Report on improving T&D coordination for high DERs from More Than Smart, CAISO, PG&E, SCE, SDG&E
- Energy storage mandate (AB 2514) - target of 1,350 MW of energy storage by 2020

States advancing distribution planning - 5

► Hawaii

- Clean Energy Initiative
  - 100% RPS by 2045
  - Reducing electricity consumption by 4,300 GWh by 2030, enough electricity to power every home for more than two years
- High penetration levels of distributed solar PV and isolated island grids
- Investigations into DERs including procurement. 3 tariff options:
  - Customer self-supply
  - Customer grid-supply (Smart Export tariff)
  - Time-of-use tariff
- HPUC rejected piecemeal investment proposals and required HECO to file a comprehensive Grid Modernization Plan
  - HPUC approved the plan in Order No. 35268 (Feb. 7, 2018)
- Demand response tariffs in process that will provide capacity, fast frequency response, regulating reserves and replacement reserves
- PUC inclinations on future of utilities
- Study on alternative utility and regulatory models - due December 2018

States advancing distribution planning - 6

- **DC** – Modernizing the Energy Delivery System, staff report issued in Jan 2017 included two draft NOPRs for Commission to consider
- **WA** – Rulemaking considering resource planning changes: consideration of DERs including energy storage; distribution system modeling; RFP, avoided costs; smart grid reporting (with sunset of earlier requirements); Dec. 2017 report to Legislature on distribution planning practices
- **OR** – Utilities must submit smart grid implementation plans biennially and annually report on projected construction budgets for T&D projects >$10 million; staff proposed Commission open investigation to adopt process for distribution system planning (5- to 10-year planning horizon)

States advancing distribution planning - 7

► Minnesota

- Biennial Distribution Grid Modernization Reports (Minn. Stat. §216B.2425)
  - ◆ Utility identifies projects it considers necessary to modernize its T&D systems
  - ◆ May ask Commission to certify grid modernization projects as priority projects, a requirement for utility to recover costs through a rider (outside of a general rate case)
  - ◆ Distribution study to identify interconnection points for small-scale distributed generation (DG) and distribution system upgrades to support continued DG development; no formal Commission action required
- Xcel Energy filed 1st Biennial Distribution Grid Modernization Report in 2015 (Docket No. E-002/M-15-962)
  - Commission order certified an advanced distribution management system (ADMS) and required initial hosting capacity analysis by 12/1/16 — analysis of each feeder for DG ≤1 MW and potential distribution upgrades necessary to support expected DG (based on utility's IRP filings and Community Solar Gardens process)
  - Staff issued briefing papers on 1st hosting capacity analysis filed by Xcel Energy
  - Commission decision requires hosting capacity analyses Nov. 1 each year and provided guidance for 2017 analysis: reliable estimates and maps of available hosting capacity at feeder level; details to inform distribution planning and upgrades needed for efficient DG integration; detailed information on data, modeling assumptions and methodologies
  - Xcel Energy filed 2nd hosting capacity analysis 11/1/17

States advancing distribution planning - 8

MN, cont.

- PUC initiated inquiry in May 2015 on Electric Utility Grid Modernization with a focus on distribution planning (Docket No. CI-15-556)
  - Series of stakeholder meetings that continued through fall 2016
  - DOE sponsored a consultant report on integrated distribution system planning for MN
  - Questionnaire on utility planning practices with stakeholder comments and responses
    - How do Minnesota utilities currently plan their distribution systems?
    - What is the status of each utility's current plan?
    - Are there ways to improve or augment utility planning processes?
- Staff Report on Grid Modernization (March 2016) included principles
  - 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, new services, and opportunities for adoption of new distributed technologies
  - Ensure optimized utilization of electricity grid assets and resources to minimize total system costs
  - Facilitate comprehensive, coordinated, transparent, integrated distribution system planning

More state approaches to distribution planning

GRID MODERNIZATION LABORATORY CONSORTIUM
U.S. Department of Energy

- **Colorado**
  - PUC approved an unopposed settlement agreement on Xcel Energy's grid modernization proposal, including Advanced Metering Infrastructure (AMI), Integrated Volt-VAr Optimization Infrastructure and associated components of an advanced communications network, including a Field Area Network and Home Area Network

- **Pennsylvania**
  - Utilities can propose a Distribution System Improvement Charge to recover reasonable and prudent costs to repair, improve or replace certain eligible distribution property by filing Long Term Infrastructure Improvement Plans
    - e.g., see FirstEnergy LTIIP
  - Distribution reliability code directs PSC to regulate distribution inspection & maintenance plans, requires utilities to report quarterly on worst-performing circuits and make annual compliance filings (see 2016 PA reliability report)

More state approaches to distribution planning - 2

GRID MODERNIZATION LABORATORY CONSORTIUM
U.S. Department of Energy

- **Illinois**
  - Utilities file annual reliability reports, ICC assesses utility report ≤3 years
  - Energy Infrastructure Modernization Act authorized investment plans for grid hardening and smart meters
    - Utilities file annual Grid Modernization Action Plans with formula rates for ICC approval — e.g., see ICC order on 2016 Ameren plan
  - ICC kicked off NextGrid initiative in March 2017, a consumer-focused study on topics such as leveraging Illinois' restructured energy market, investment in smart grid technology, and recent law expanding renewables and efficiency
    - ICC resolution invited stakeholders to comment on an independent facilitator and topics to be considered as part of the initiative
    - Series of workshops to kick off 18-month process; 7 working groups
- **Indiana**
  - In February 2017, Southern Indiana Gas & Electric filed a $500 million, 7-yr T&D modernization plan including AMI, distribution automation, and advanced distribution management system (ADMS)

More state approaches to distribution planning - 3

GRID MODERNIZATION LABORATORY CONSORTIUM
U.S. Department of Energy

- **Maryland**
  - Distribution planning is one of six topics* addressed in PC 44 - Transforming Maryland's Electric Grid proceeding.
    - RFP for consultant to study benefits & costs of distributed solar in IOUs' service areas
  - Orders in Case No. 9406 (BGE rate case) and Case No. 9418 (Pepco rate case) required a five-year distribution investment plan within 12 months
    - BGE distribution investment plan and Pepco plan filed
- **Michigan**
  - PSC ordered utilities (Consumers Energy - Case No. U-17990 and DTE Electric - Case No. U-18014) to file draft 5-yr distribution investment & maintenance plans "to increase visibility into the needs of maintaining the state's system and to obtain a more thorough understanding of anticipated needs, priorities, and spending."
  - DTE Energy and Consumers Energy filed draft plans and parties commented
  - DTE Energy final plan filed Jan. 31, 2018; Consumers Energy final plan filed March 1, 2018

*Other topics: rate design, EVs, competitive markets/customer choice, interconnection process and energy storage

More state approaches to distribution planning - 4

GRID MODERNIZATION LABORATORY CONSORTIUM
U.S. Department of Energy

- **Ohio**
  - PUCO's PowerForward initiative is reviewing technological and regulatory innovation that could enhance the consumer electricity experience.
    - Workshops with industry experts "to chart a path forward for future grid modernization projects, innovative regulations and forward-thinking policies"
  - Duke's electric security plan includes a rider for "new offerings designed to advance programs, services, and initiatives reflective of … PowerForward"
  - AEP's amended electric security plan includes installation of EV charging stations, microgrids and smart lighting controls
  - FirstEnergy – PUCO approved Distribution Modernization Rider (3/31/16; $132.5M/yr for 3 yr); Grid Modernization Business Plan filed 2/29/16 includes 3 scenarios with full deployment of AMI and ADMS, plus Distribution Automation and Integrated Volt/VAR Control to varying degrees
  - Distribution system reliability code, distribution circuit performance codes and annual reliability compliance filings