MI POWER GRID

Making the Most of Michigan's Energy Future

Integration of Resource, Distribution, and Transmission Planning

Advanced Planning Stakeholder Meeting

October 21, 2020

MPSC

Michigan Public Service Commission

Agenda Items		
1:00 PM	Welcome/Introductions/Review Feedback	Jesse Harlow (MPSC)
1:10 PM	Ways to Align DP and IRP- What should be aligned and why?	Jeff Smith & Jason Taylor (EPRI)
2:05 PM	Overview of NARUC NASEO Efforts	John Shenot (RAP)
2:30 PM	Break	
2:35 PM	The Importance of Aligning Planning Processes	John Shenot (RAP)
3:00 PM	Planning Alignment focused on Distribution Generation and Non-Wires Alternative	Juliet Homer (PNNL)
3:50 PM	Staff Straw Proposal (Executive Directive 2020-10)	Jesse Harlow (MPSC)
4:20 PM	Closing	Jesse Harlow (MPSC)
4:30 PM	Adjourn	Jesse Harlow (MPSC)

Workgroup Instructions

1. This meeting is being recorded
2. Please be sure to mute your lines
3. There will be opportunities for question/comments after each of the sections identified in the agenda
   - Please type questions into the chat function or use the “raise hand” function during this time
   - We will open it up to those on the phone after those using the chat function
   - We will be requesting comments after all of the meetings which will be posted to the webpage
4. The presentations for all the meetings are posted to the Advanced Planning webpage.

Summarized Stakeholder Comments from 9/24 Meeting

At the conclusion of the 9/24 meeting for the MPG Advanced Planning workgroup, Staff solicited comments from interested parties, asking the following questions:

1. Are there additional areas within the four subjects introduced on 9/24/2020 (Alignment of IRP/DP/TP, Forecasting, Transmission Planning, Valuing Generation Diversity) that need additional clarification?
2. Are there subtopics within these subjects that Staff did not mention, and you would like to see addressed during future meetings?
3. Do you believe Staff adequately introduced the items addressed in the August 20, 2020 order in Case No. U-20633 during the 9/24/20 meeting? If not, please explain.

Summarized Stakeholder Comments from 9/24 Meeting

1. Are there additional areas within the four subjects introduced on 9/24/2020 (Alignment of IRP/DP/TP, Forecasting, Transmission Planning, Valuing Generation Diversity) that need additional clarification?

    - Impact of FERC Order No. 2222, which allows for the aggregation of DERs, and its implication on the grid as a whole and on planning processes;
    - Does the Commission Staff intend to consider externalities not inside the “energy box” such as resource management, price hedging against commodity fuels, and other indirect economic impacts when considering diversity?

Summarized Stakeholder Comments from 9/24 Meeting

2. Are there subtopics within these subjects that Staff did not mention, and you would like to see addressed during future meetings?

   - Workgroup should discuss how to utilize the RTO's long-term transmission expansion planning processes to facilitate better integration of transmission planning with generation expansion and distribution system planning;
   - Encourage examination of financial incentives as a potential barrier to forward-looking resource planning, opportunity to encourage utilities to examine the full range of possible solutions on a level playing field;

Summarized Stakeholder Comments from 9/24 Meeting

3. Do you believe Staff adequately introduced the items addressed in the August 20, 2020 order in Case No. U-20633 during the 9/24/20 meeting? If not, please explain.

- Insufficient attention was given to the concept of resiliency; specifically focusing on the value of resiliency to the grid, and the ability of DERs to enhance resiliency.
  - Encourage the Commission to pursue methods to determine the value of the resiliency benefits different resources provide and that this value is captured in planning processes.

Summarized Stakeholder Comments from 9/24 Meeting

Additional topics addressed in Stakeholder comments:

- Consideration of Environmental Justice (EJ)/ Public health concerns as part of workgroup discussion and final recommendations;
- Involvement of EGLE, Michigan Advisory Council for Environmental Justice and other members of EJ and public health community in workgroup;
- Consideration of impact of “deep electrification” of the grid (i.e. conversion from gas to electric heating and wide-scale EV adoption);
- Is the fact that resource planning is very long-term and distribution planning relatively short-term a barrier to full integration of IRP and distribution planning goals?

Summarized Stakeholder Comments from 9/24 Meeting

Additional topics addressed in Stakeholder comments:

- The merits and challenges of using benefit-cost analyses to equitably compare resource, distribution and transmission alternatives should be considered;
- Consideration of the use of renewable energy zones for siting new renewables to address disconnect between identification of resource needs in IRPs without identifying specific locations;
- Growth of DERs and their ability to provide grid services, including NWAs, has implications for the entire grid and planning processes should reflect the flexible value of these resources.

Summarized Stakeholder Comments Feedback Request

Comment: Does the Commission Staff intend to consider externalities not inside the "energy box" such as resource management, price hedging against commodity fuels, and other indirect economic impacts when considering diversity?

→ Request: **What specific externalities do stakeholders think should be addressed that are not currently addressed in the Michigan Integrated Planning Parameters (MIRPP) document. What specific changes to the MIRPP would address these externalities?**

Comment: Insufficient attention was given to the concept of resiliency; specifically focusing on the value of resiliency to the grid, and the ability of DERs to enhance resiliency?

→ Request: **In what ways could resiliency be addressed in an IRP?**

Comment: Consideration of the use of renewable energy zones for siting new renewables to address disconnect between identification of resource needs in IRPs without identifying specific locations.

→ Request: **What are appropriate ways to address the disconnect between resource needs in an IRP and future unknown resource locations? Are there studies that need to be performed, communication channels that need to be established, or other possible solutions?**

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Making the Most of Michigan's Energy Future

Please send feedback responses to Danielle Rogers by October 28.

RogersD8@michigan.gov

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Making the Most of Michigan's Energy Future

Ways to align DP and IRP – What should be aligned and why?

Jeff Smith and Jason Taylor (EPRI)

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Ways to Align Distribution Planning and IRP

What Should be Aligned and Why?

Jason Taylor, jtaylor@epri.com
Jeff Smith, jsmith@epri.com

MI Power Grid Stakeholder Session: Integration of Resource/Distribution/Transmission Planning
October 21, 2020

EPRI | ELECTRIC POWER RESEARCH INSTITUTE

www.epri.com

Opportunities and Advantages with Aligning DP and IRP

- Planning for Renewable Targets
- Planning for Electrification
- Scenario Coordination
- Co-optimizing Mitigation Solutions
- Holistic Evaluation of Value Streams

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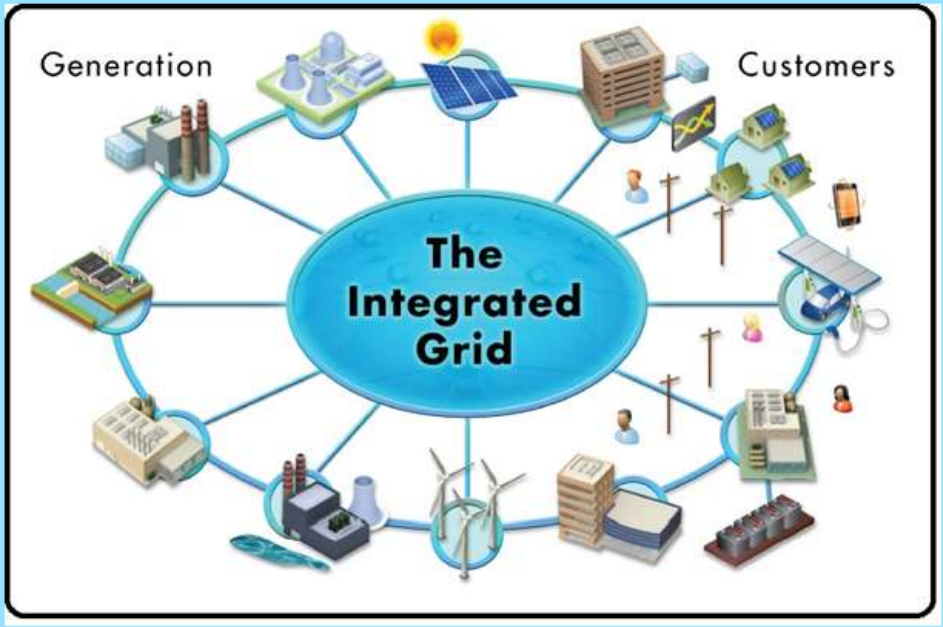


Opportunities and Advantages with Aligning DP and IRP

Planning for Renewable Targets

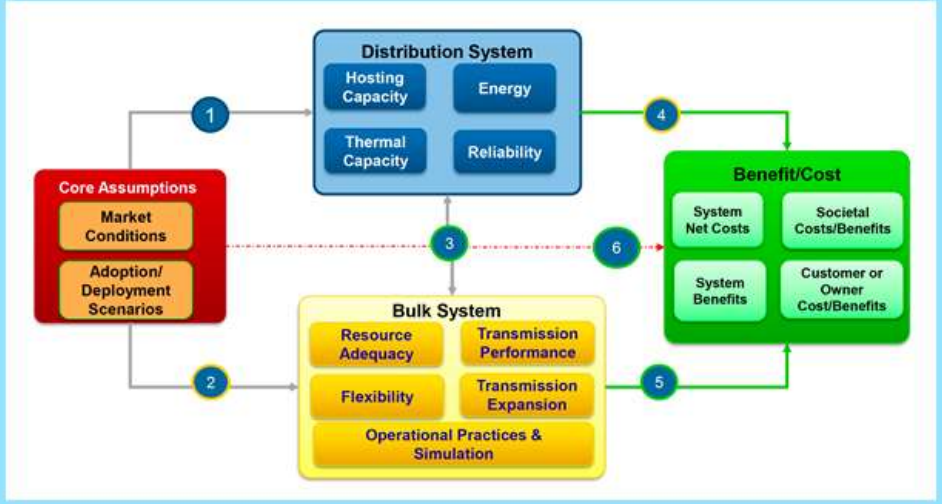
Planning for Electrification

Scenario Coordination

Co-optimizing Mitigation Solutions

Holistic Evaluation of Value Streams

Integrated Grid Benefic Cost Analysis Framework

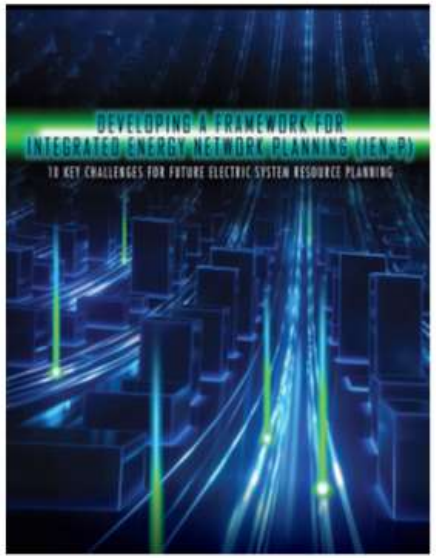


The Integrated Grid: A Benefit-Cost Framework. EPRI, Palo Alto, CA: 2015. 3002004878.

Modernizing Distribution Planning for Integrated System Planning

Key Planning Challenges

Category	Key IEN Planning Challenge
Modeling the Changing Power System	1. Incorporating operational detail 2. Increasing modeling granularity 3. Integrating generation, transmission, and distribution planning 4. Expanding analysis boundaries and interfaces 5. Addressing uncertainty and managing risk
Integrating Forecasts	6. Improving forecasting 7. Improving modeling of customer behavior and interaction
Expanding Planning Boundaries	8. Incorporating new planning objectives and constraints 9. Integrating wholesale power markets 10. Supporting expanded stakeholder engagement



Developing a Framework for Integrated Energy Network Planning (IEN-P), EPRI, Palo Alto, CA: 2018. 3002010821.

Distribution planning has a key role in integrated system planning

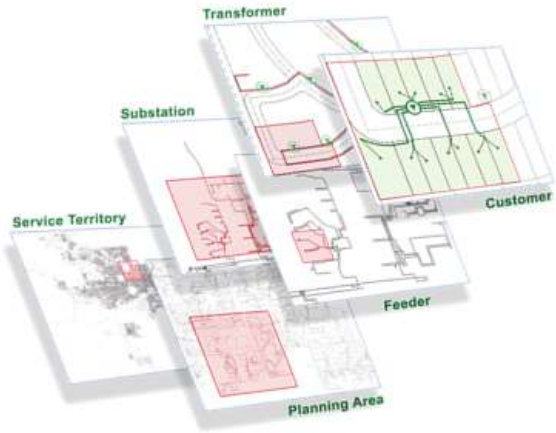
Increasing Model Granularity

Distribution Systems are "Immense" in Scale

Models of entire distribution area may not be available - some are developed on as-need basis

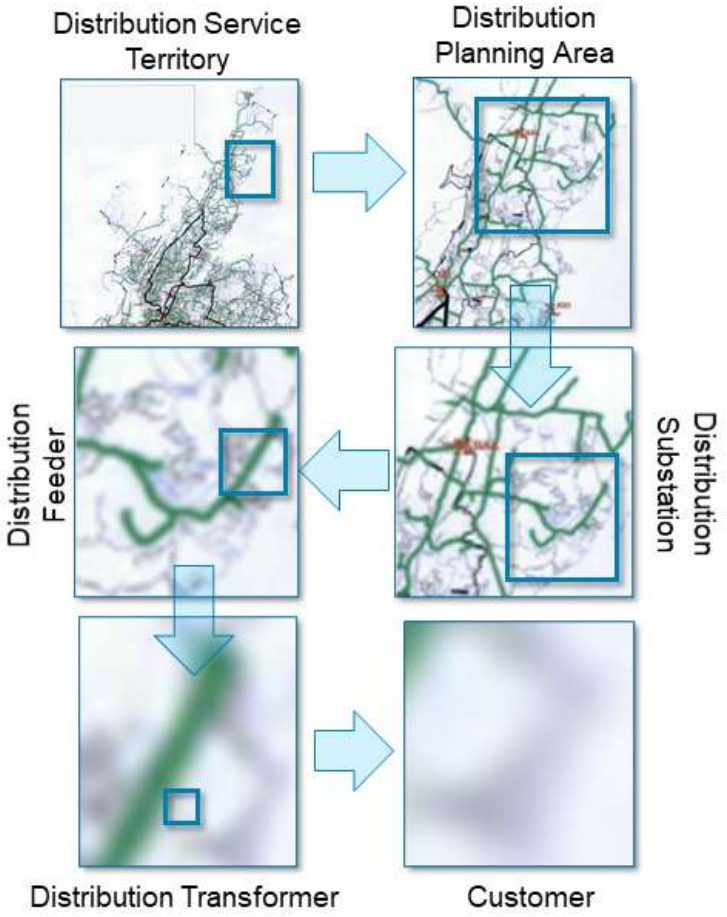
- Traditional planning techniques have been successful w/o models
- System-wide distribution models are difficult to develop and maintain

Typical Distribution Utility	Count
Service Territory	1
Planning Area	1's - 10's
Substations	10's - 100's
Feeders	100's -1000's
Transformers	1000s - 1,000,000's
Customers	100,000's - 1,000,000's



Informing IRP requires distribution system-wide evaluations that capture highly localized changes associated with the modern grid

Grid-Edge Modeling and Measurements



Depth

- "Edge" of grid is less known
- Models may not be available
- Metering/sensing data may not be available as well

Leveraging new data streams requires:

- Guidance on requirement for new data steams that can inform planning
- Data storage and processing capabilities to handle massive amounts of measurements and locational information
- Robust analytical methods and tools to address measurement errors and reconcile deviations from "system normal

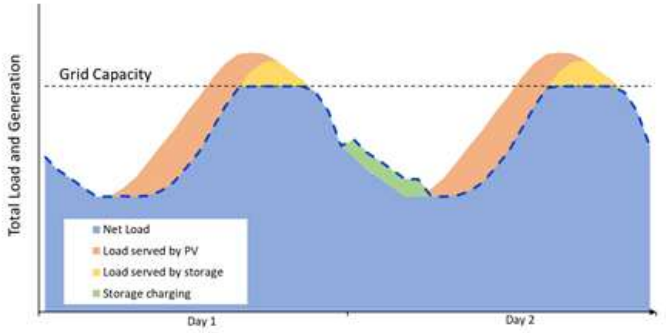
Modeling Temporal Granularity

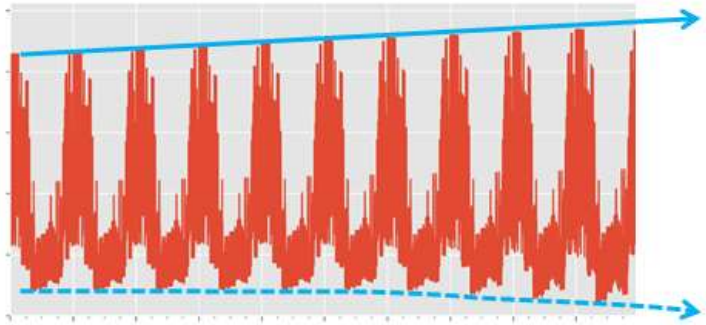
New dynamics and multiple time-scales

- Hourly and sub-hourly behaviors of active and variable resources

- Yearly changes associated with:
  - Adoption of DER
  - Changing customer behaviors
  - Short-term deferment of traditional reinforcements
  - Changing operational resource objectives

- Deriving how local system changes alter long-term projections

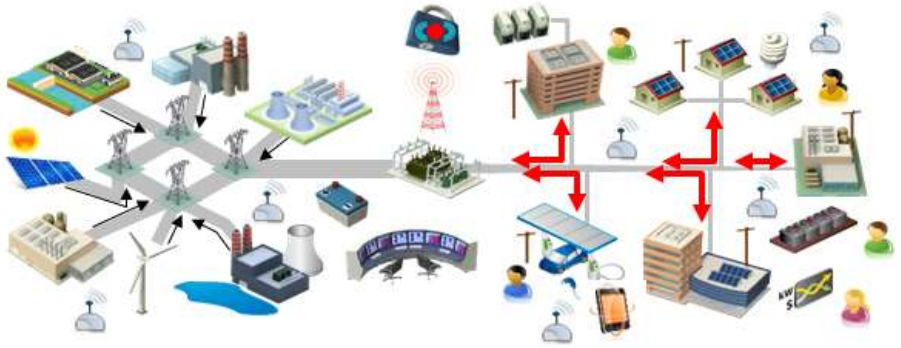




Integrating Generation, Transmission, and Distribution Planning

Coordination needs:

- Holistic evaluation of potential non-wires alternative applications and values
- Improve communications, visibility, and "handshakes" between planning functions
- DER valuation and targeting, including locational attributes
- Connections to other critical infrastructure (e.g., electrification of transportation)



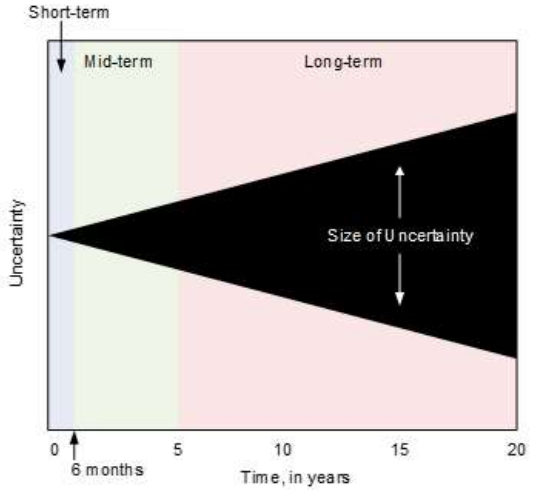
Addressing Uncertainty and Managing Risk

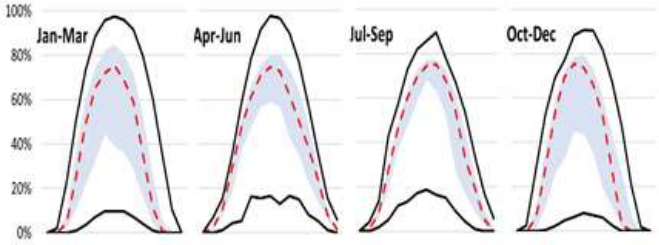
Variables Influencing Distribution Planning

- Changing supply- and demand-side resources
- Technology improvements
- Weather-related variability
- Changes in federal, state, and local regulatory policies

Need for:

- Representative probabilistic models on resource and system demands under multiple conditions and periods
- Scenario development & coordination practices
- Risk evaluation criteria and assessment methods





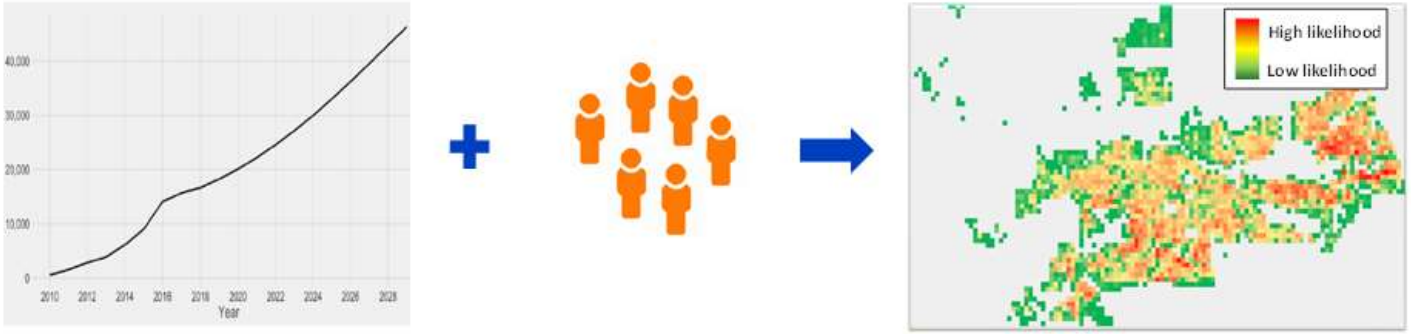
Integrating Forecasts

Improving Forecasting

- Characterize natural uncertainty and gain insights using computationally tractable methods
- Derivation of time-series projections for hourly and seasonal variations and appropriately inform distribution planning decisions
- Adoption and behavior of novel technologies can be difficult to accurately forecast

Modeling Customer Behavior

- Models for adoption and operational behaviors, including responses to potential programs and incentives
- New analysis capabilities and computational power to support related "big data" needs



Regional Forecasts | Customer Behavior Models | Local Projections

Helping to Bridge the Gap in Planning Tools

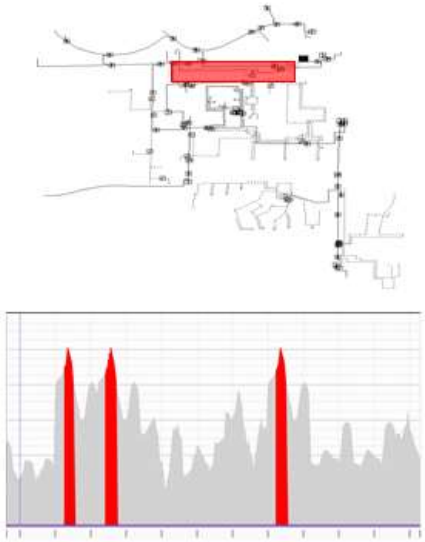
EPRI's Modernizing Distribution Planning Project

EPRI ELECTRIC POWER RESEARCH INSTITUTE

Automated Multi-Year Assessment and Mitigation

1 System-wide Screening

2 Local Constraint Analysis



3 Alternative Identification

Traditional Alternatives

- Load transfer
- Reconductoring
- Transformer upgrades
- Voltage regulation

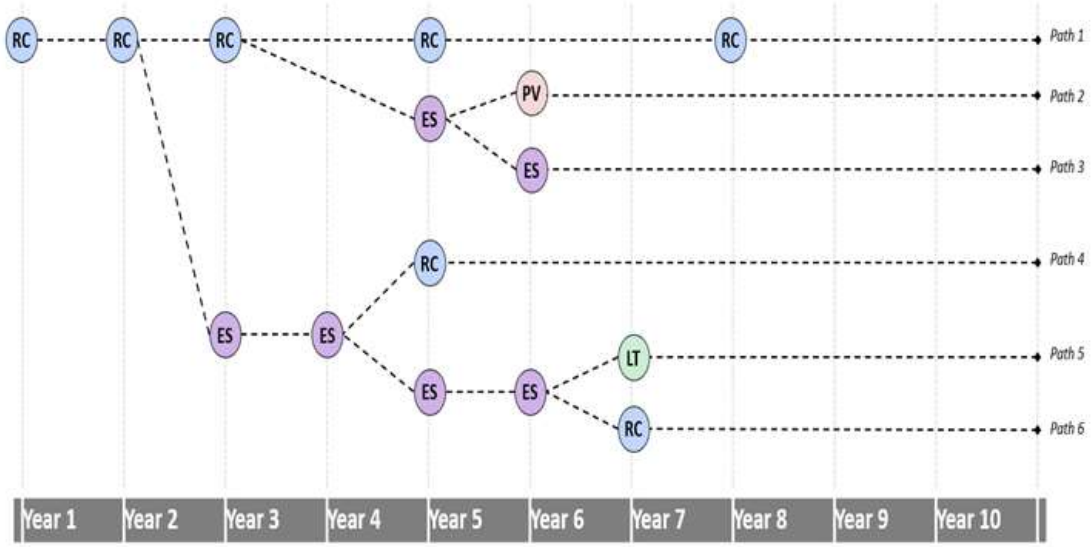
&

Non-wires Alternatives

- Storage
- Solar
- Wind
- Demand response

4 **Steps are repeated across multiple sequential years**

Evaluation of Alternative Deployment Options



Assess cost of deployment paths

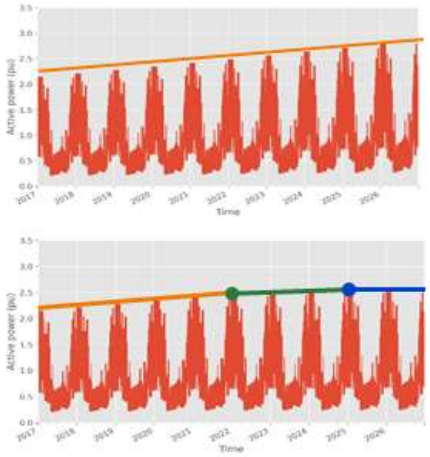
Holistic evaluation capturing:

- Capital cost of different assets
- O&M costs
- Asset cost escalation/de-escalation
- System losses
- Asset operational lifetimes
- Revenue sources
- Stacked benefits

ADAPT supports planners in evaluating and designing the modern grid

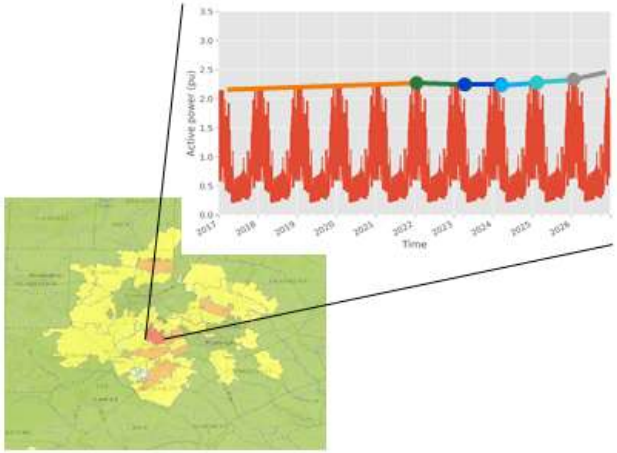
Supporting Integrated Planning

Multiple scenarios



ADAPT

Multi-year & multi-scenario plans



Scenarios can encapsulate:

- Uncertainties in future demand
- DER adoption
- Cost-sharing incentives
- Increasing/decreasing asset costs

Output informing:

- Modifications to forecasted 8760 profiles
- Projected NWA deployment levels and regional locations
- Planning scenario sensitivities

Helping to Bridge the Gap in Planning Tools

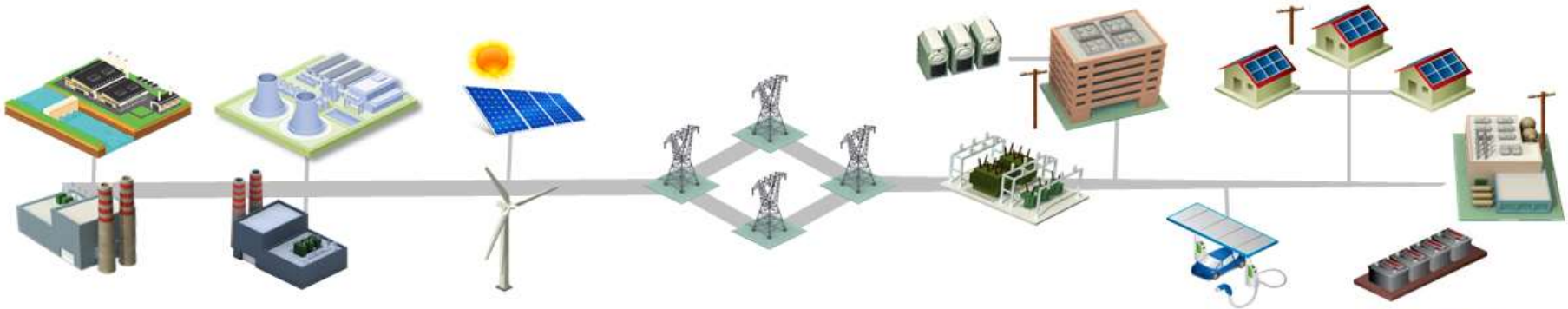
EPRI's Integrated Planning Initiative

Integrated Energy, Climate, and Resiliency Strategic Investment Analysis

What	Develop an industry-leading modeling framework/tool(s) to analyze system integration challenges the industry face.
Who	EPRI Staff from transmission, distribution, energy system climate analysis, and storage/DER + member engagement from all planning areas
How	Improve the integration of G/T/D planning tools including evolving climate Impacts and evolving customer considerations for comprehensive analysis
When	3-yr effort (2-yr R&D);
Funding	$1.8M
Deliverable	Tool and/or framework enhancements for EPRI and the industry to conduct assessment studies with comprehensive components ensuring robust solutions.

Example: Power Sector Planning for Climate Resiliency

	1 Global Climate Changes	2 Demand & Device Impact	3 Resource Assessments	4 Grid Evaluation	5 End User
Modeling and System Impact	Climate Projections & Extreme Events	Changes in Heating and Cooling Demand	Adequacy, Operations & Capacity Expansion	T&D Reliability and Resiliency	Consumers Impacts & Options (Microgrids & DERs)
			System Impact and Investment Option Assessment		
Infrastructure and Land Use Assessment	Land Use, Vegetation Mgmt. & Managed Ecosystems	Component Performance Impacts & Design Basis	Transmission & Distribution		End Use Devices
			Generation		



Q/A

Together…Shaping the Future of Electricity

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Making the Most of Michigan's Energy Future

Perspectives on Aligned Planning

John Shenot, The Regulatory Assistance Project

MPSC

Michigan Public Service Commission


RAP®
21 OCTOBER 2020
Perspectives on Aligned Planning
Michigan Public Service Commission
MI Power Grid Phase II
Advanced Planning Workgroup Meeting #2
Case No. U-20633
John Shenot
Senior Advisor
The Regulatory Assistance Project (RAP)®
Fort Collins, Colorado
United States
+1 802 595 1669
jshenot@raponline.org
raponline.org

Introduction

The Regulatory Assistance Project is a global, non-profit team of veteran regulators advising current regulators on energy sector issues. (***www.raponline.org***)

- Foundation-funded; some contracts
- Non-advocacy; no interventions

John Shenot joined RAP in 2011 after serving three years as policy advisor to the Public Service Commission of Wisconsin and 15 years with the Wisconsin Department of Natural Resources as an air pollution regulator and electric utility specialist.

1 Overview of NARUC/NASEO Efforts

NARUC

- The National Association of Regulatory Utility Commissioners (NARUC) is a non-profit organization founded in 1889.
- NARUC Center for Partnerships & Innovation (CPI) identifies emerging challenges and connects state commissions with expertise and strategies to support their decision making.
- Our members are the state regulatory commissioners in all 50 states & the territories. FERC & FCC Commissioners are also members. NARUC has associate members in >20 countries.
- NARUC member agencies regulate electricity, natural gas, telecommunications, and water utilities.

NASEO

NASEO
National Association of State Energy Officials

- Only national non-profit organization whose members include the 56 governor-designated energy officials from each state and territory.
- NASEO improves the effectiveness of state energy programs and policies; acts as a repository of information on issues of particular concern to the states and their citizens
- The Nation's 56 State and Territory Energy Offices:
- Advise State Legislators and Governors on policy development (e.g., smart grid, cybersecurity, energy security, energy efficiency)
- Engage with utilities (IOUs, Cooperatives, Municipals) on resiliency, planning, energy efficiency, economic development
- Conduct statewide energy planning and energy assurance planning

NARUC-NASEO TASK FORCE ON COMPREHENSIVE ELECTRICITY PLANNING

NARUC National Association of Regulatory Utility Commissioners

NASEO National Association of State Energy Officials

Purpose: Develop new pathways for aligned electricity planning

Announced Nov. 2018
Launched Feb. 2019

1. **Innovation**: Pioneer new tools and roadmaps for aligning planning to meet state needs
   - Participants are convening in multi-state cohorts with others operating in similar market, regulatory, and policy environments
2. **Action**: Apply insights to directly benefit state action
   - Each state will develop concrete steps / an action plan at the end of the initiative
3. **Replication**: NARUC and NASEO will publish templates and resources to support all members

Leadership

Task Force Co-Chairs

Hon. Jeff Ackermann
Chairman
Colorado Utilities Commission

Jennifer Richardson
Executive Director
Indiana Office of Energy Development

Task Force Co-Vice-Chairs

Hon. Beth Trombold
Commissioner
Public Utilities Commission of Ohio

Dr. Andrew McAllister
Commissioner
California Energy Commission

Main Contacts

Danielle Sass Byrnett
Director, Center for Partnerships & Innovation
NARUC
(202) 898-2217
dbyrnett@naruc.org

Kirsten Verclas
Program Director, Electricity
NASEO
(703) 299-8800
kverclas@naseo.org

Johanna Zetterberg
Senior Advisor
U.S. Department of Energy
(202) 288-7414
johanna.zetterberg@hq.doe.gov

www.naruc.org/taskforce

15 Participating States

States are Diverse and Representative:

- Geography
- Market models (e.g., retail competition, wholesale market)
- Planning approaches (e.g., state energy office roles, distribution system planning)
- State goals (e.g., grid mod, resilience, climate, clean energy, economic development)

Five State Teams ("Cohorts")

3 states per cohort

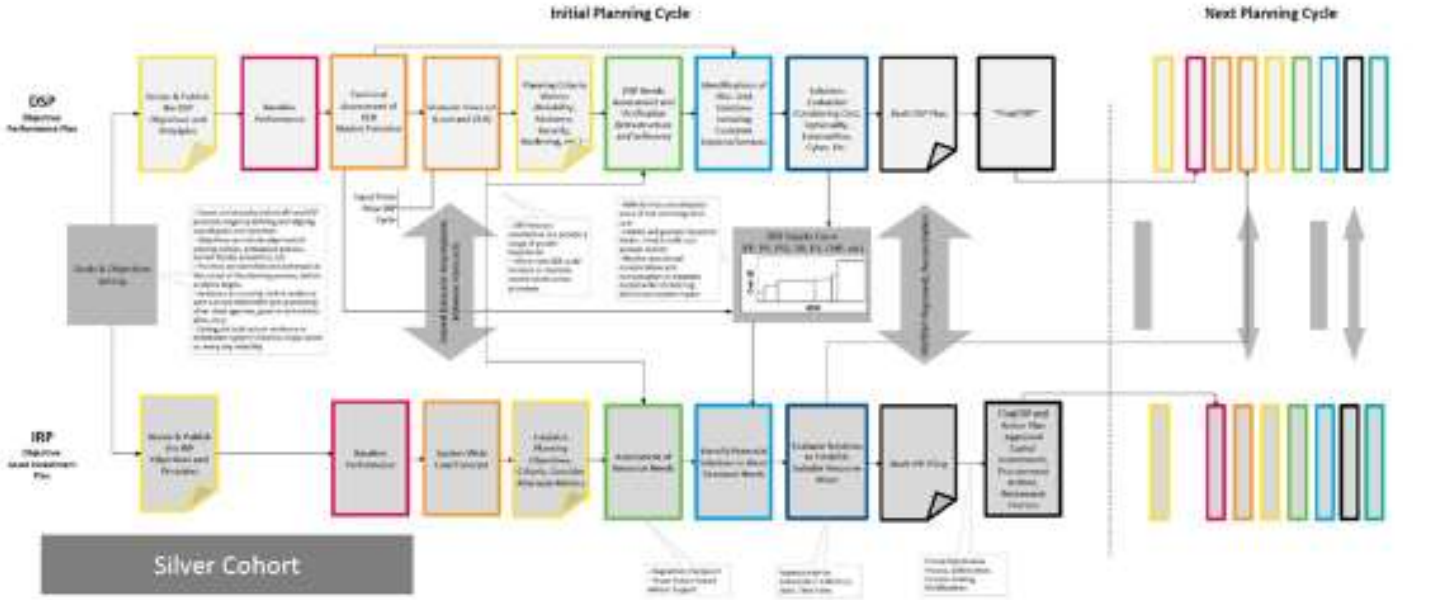
Vertically Integrated				Restructured
Coral	**Turquoise**	**Amber**	**Silver**	**Jade**
• Within organized markets	• Outside organized markets	• Within organized markets	• Outside organized markets	• Within organized markets
Tackling alignment of distribution, resource, and transmission planning			Tackling alignment of distribution and resource planning	Focused on integrated distribution planning (combined with other energy planning & programs)
• *Pragmatic state; works collaboratively in region; operates in 2 RTOs*	• *Anticipates range of energy policies; juggles urban vs. rural needs: long distances between load centers; transmission challenges*	• *State is facing increasing weather-related damages and costs; new transmission and generation siting requests coming in*	• *Coastal state vulnerable to weather-related natural disasters; experiencing flat to declining load*	• *Retail competition in state; dynamic policy environment; impacted by cold-weather events*

Task Force Process

Process Maps Based on "Building Blocks" of Electricity System Planning

- Represent fundamental steps in system planning
- Use common language across cohorts while preserving diversity in approach
- Focus on information/results ("what") state decision makers want to see, in what order ("when") to inform decision making, not on specific methods/tools ("how") or "who" will perform
- Discussion draft and description of the building blocks at: www.naruc.org/taskforce/resources/

Cohort Process Map (Example)



Key Issues Being Addressed by Cohorts in Process Maps

- **Clearly set expectations** at outset
- Identify improved approaches for **stakeholder engagement**
- Incorporate **emerging planning methods** (e.g., multi-scenario forecasting, non-wires alternatives)
- Evaluate a **wide range of solutions and procurement strategies**
- Coordinate and **sync data, assumptions, and modeling scenarios** across the entire system
- Acknowledge use of **DERs as a resource**

Additional Questions Pondered (*not* visible in process maps)

- How does **rate design** fit into aligned planning?
- What metrics should be used to factor **resilience** into aligned planning?
- How do we ensure **equity and affordability** in the transition being envisioned and articulated by new planning approaches?
- When will **tools and models** exist or need to be created to enable the types of holistic analysis that would allow for optimization of possible solutions across G, T, and D?
- Where should a state/utility draw the line between transparency and security when considering **data access / data sharing**?

Interviews with Utility Planners

- Partnered with EEI, NRECA, EPRI to identify ~30 utility planners for engagement --- each assigned to a cohort
- Engagement:
  - Webinars to orient them on Task Force and their cohort's materials
  - Individual interviews in August 2020
  - 'Focus Group'-style dialogue with cohort Sept. 15
- Interviews asked Qs related to:
  - **Lessons learned** from experts' own experience with aligning planning
  - **Feedback** on the cohort's process map
  - **Implementation challenges & opportunities**

Utility Planner Reactions

What's Good?	The steps are logical and nothing is missing	Adding a guidance document is an excellent suggestion	Thoughtful & well considered; very coherent	Stakeholder engagements beneficial
What Could be Better?	Target when to involve stakeholders	Refine approach based on how recent market-based RFPs went	Establish where data access gets resolved	Distribution planning needs to include grid mod
What's Going to be a Challenge?	Lack of optimization models	Still need solid DER performance data	Order of grid needs, wire soln's, locational value, non-wire soln's	How to balance iteration with timeliness

Task Force Resource Library

https://www.naruc.org/taskforce/resources/

15 categories of publications & webinars

- Data access
- Ratemaking
- Distribution System Planning (DSP)
- Emerging DSP practices
- Forecasting
- Grid Modernization
- Planning Coordination
- Planning Criteria
- Procurement Strategies
- Resilience
- Rural DER integration
- Scenario and risk analysis
- Solution Evaluation
- Stakeholder Engagement
- Utility best practices for integrated planning

Final Products: February 2021

PROCESS MAPS (5)

Cohort vision for **WHAT STEPS** need to happen in **WHAT SEQUENCE** to better align planning processes -- some combination of:

- Distribution-level planning
- Resource planning
- Transmission planning

ROAD MAPS (5)

HOW a cohort-level process map could be implemented. Contains:

- Short description of each step in the **process map**
- Guidance, resources, or examples ("GREs") that could offer a starting point

BLUEPRINT FOR ACTION

What Task Force resources are available and how to use them. Includes:

- Vocabulary / structure for collaboration and progress within a state
- Examples of approaches from the 15 Task Force states

MI POWER GRID

Making the Most of Michigan's Energy Future

5 Minute Break

Please mute your microphone and turn off your camera during break.

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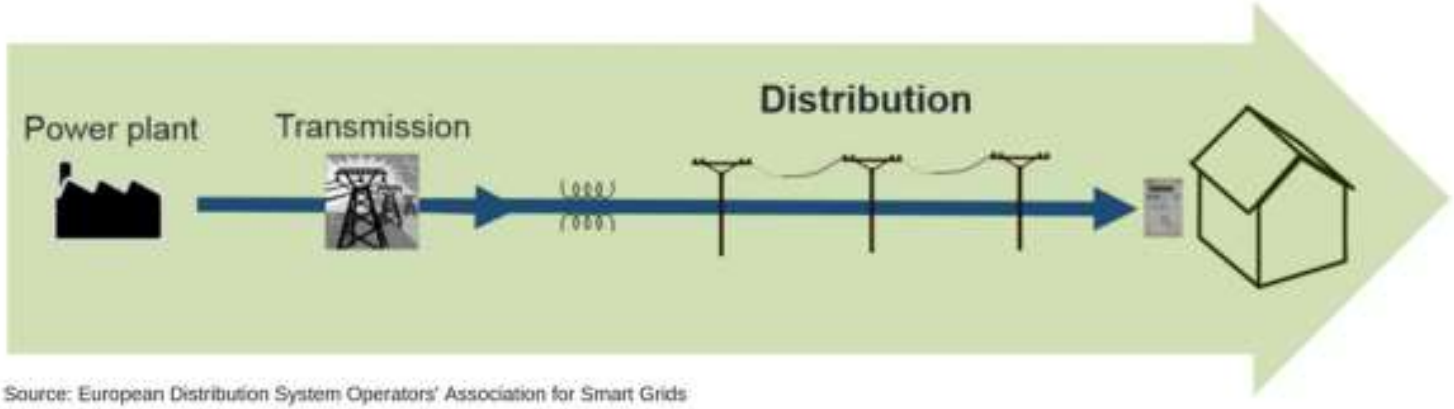
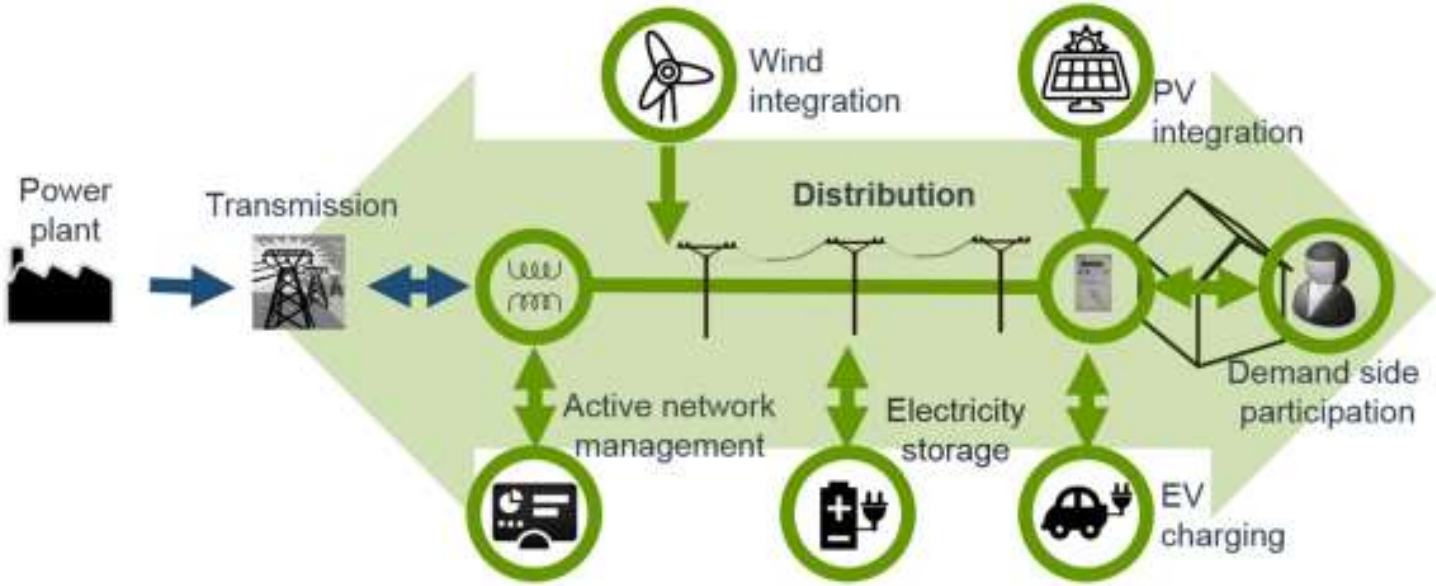
2 The Importance of Aligning Utility Planning Processes

Planning Used to Be "Simple"



Source: European Distribution System Operators' Association for Smart Grids

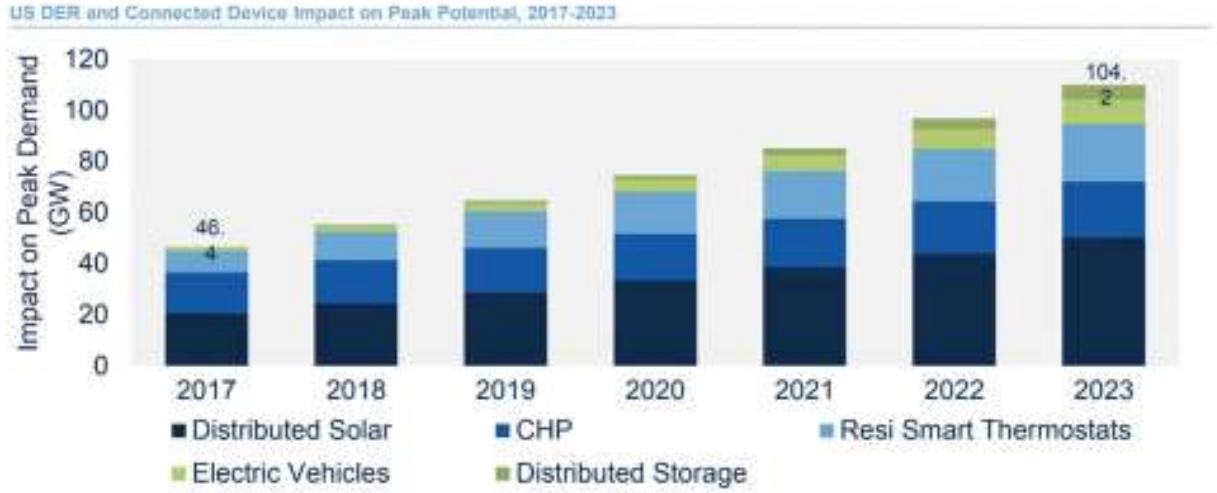
Planning Today Is More Complex



Source: European Distribution System Operators' Association for Smart Grids

Main Reason: Rapid Growth in Distributed Energy Resources

US DER and Connected Devices Impact Expected to More Than Double from 46 GW to 104 GW

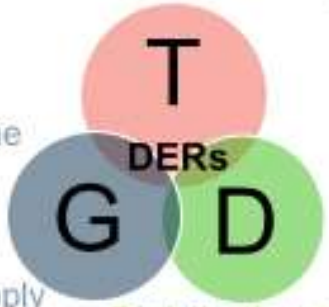


Grid Edge Innovation Summit 2018 gtmresearch

DERs Affect System Needs Across All Planning Realms

Transmission needs might be reduced with less reliance on central station power and increased DER penetration

With growth of DER, the amount and type of **central station generation** needed to balance supply and demand is evolving



Distribution system investment decisions now need to account for the quantity, location, capabilities, and load shapes of resources added to the distribution system

With greater alignment of resource and distribution planning, states & utilities could:

- Improve grid reliability and resilience
- Optimize use of distributed and existing energy resources
- Avoid unnecessary costs to ratepayers
- Support state policy priorities
- Increase the transparency of grid-related investments decisions

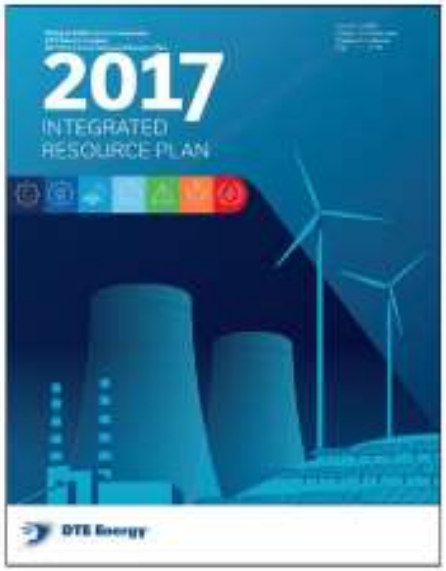
Other Key Drivers for Changes to Planning Processes

- ✓ Growth in variable generation (utility scale)
- ✓ Competition in electricity services & procurement
- ✓ New reliability challenges (climate, cyber, etc.)
- ✓ New emphasis on resilience
- ✓ Climate and environmental goals
- ✓ Equity and environmental justice concerns

Need to Change *and Align* the Various Planning Processes

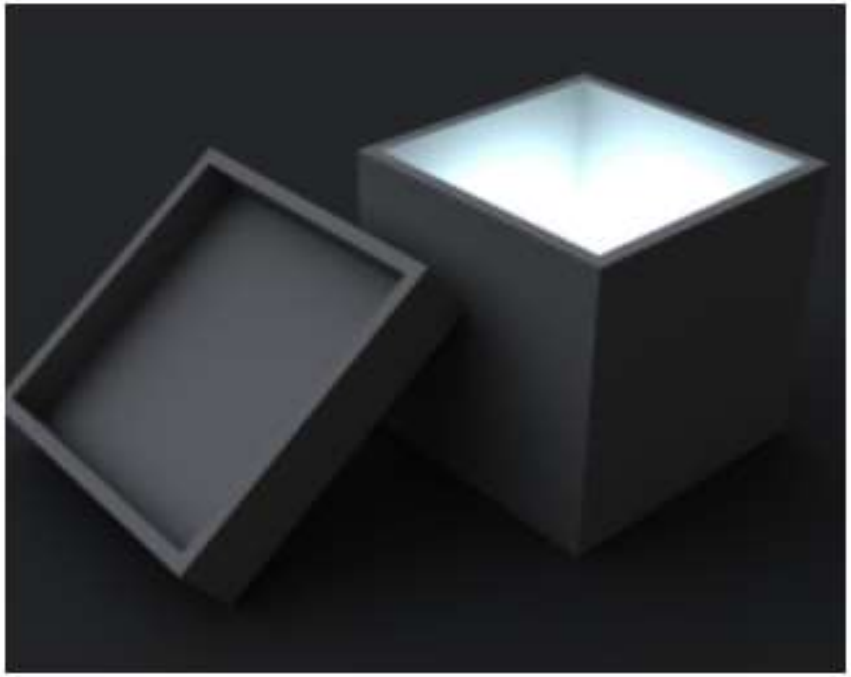
How State Regulators and Intervenors See Utility Planning

Resource Planning

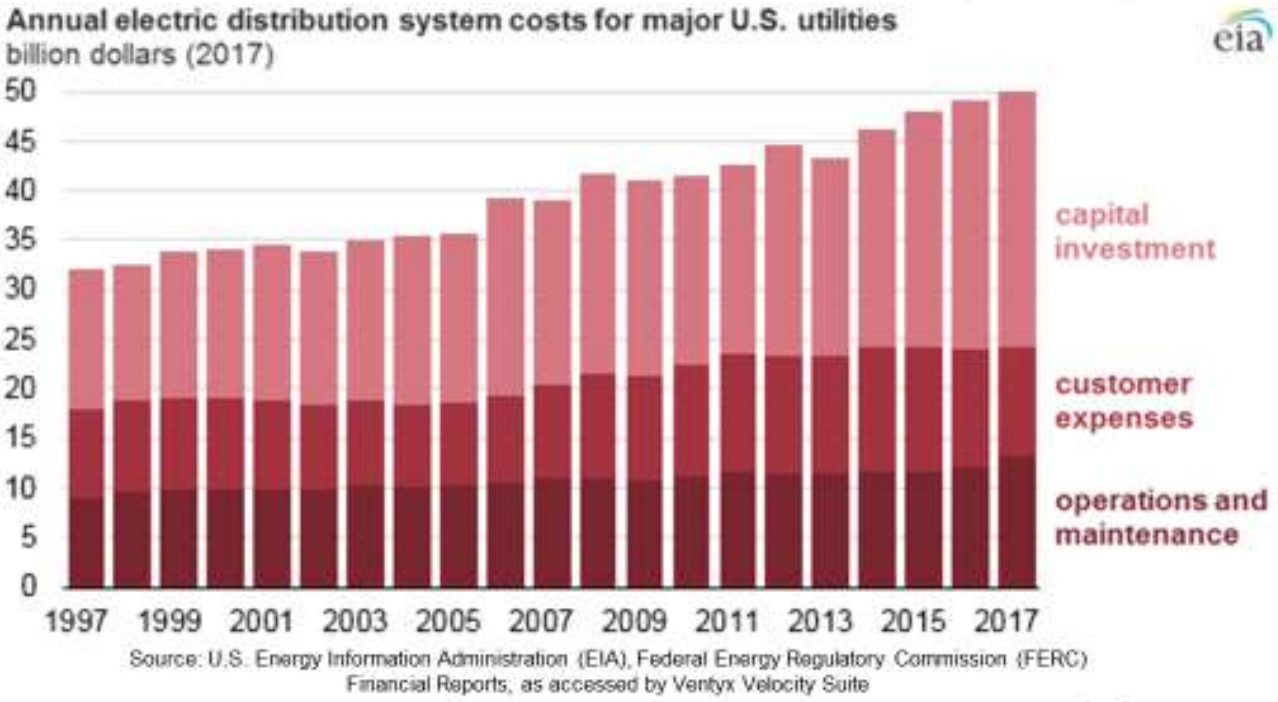


Distribution Planning

Regulators are Realizing They Need Visibility into the Black Box



Distribution System Costs are Rising Steadily



Source: U.S. Energy Information Administration (EIA), Federal Energy Regulatory Commission (FERC) Financial Reports, as accessed by Ventyx Velocity Suite

Reliability & Resilience are Primarily Distribution System Problems

- Graph shows average minutes of outage per customer in 2017
- Most MI utilities > 200 minutes
- Resource adequacy standard = 2.4 hours

Where is Alignment between IRP and DSP Most Needed or Helpful?

- Goals and objectives
- DER forecasts
- Load/net load forecasts
- Resource capabilities and costs
- Decision making criteria
- Non-wires solutions

Two Common Barriers to Treating DERs as Resources

1) Inconsistent valuation/compensation across DERs
   - States/utilities often use different cost tests for each type of DER
   - May also *apply* the tests differently (e.g., different assumptions about inputs)

Two Common Barriers to Treating DERs as Resources

2) Inconsistent consideration of DERs versus utility infrastructure

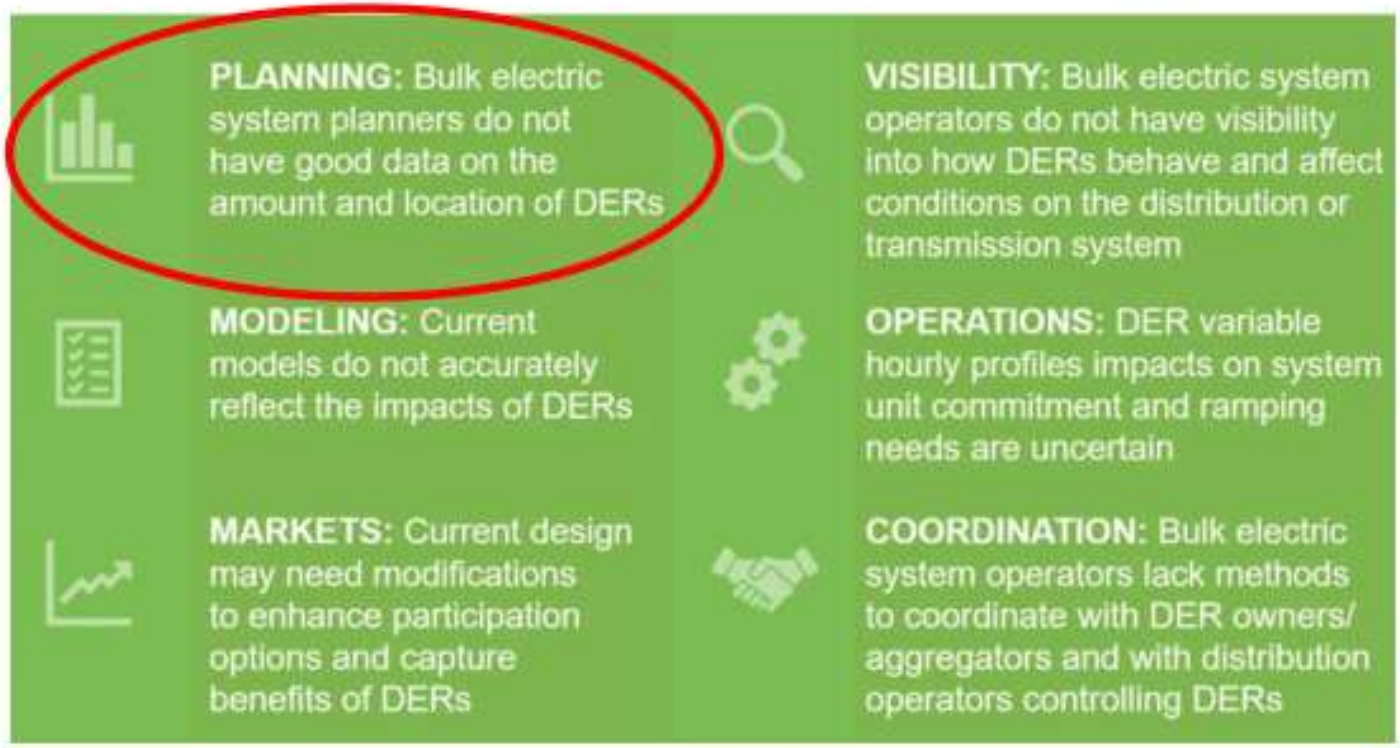
- Least-cost/best-fit procurement for utility investments
- Cost-effectiveness tests for DER decisions

Both types of flaws can lead to suboptimal allocations of ratepayer resources – a more consistent approach is desirable

Transmission/Bulk Power System Planning Challenges

- Jurisdictional challenges
  - Regional planning by RTOs/ISOs (MISO and PJM) is FERC regulated
  - Investment/siting is state regulated
- Coordination challenges
  - Timelines not synchronized
  - Visibility/data availability
  - Seams issues

MISO's Take on the Challenges

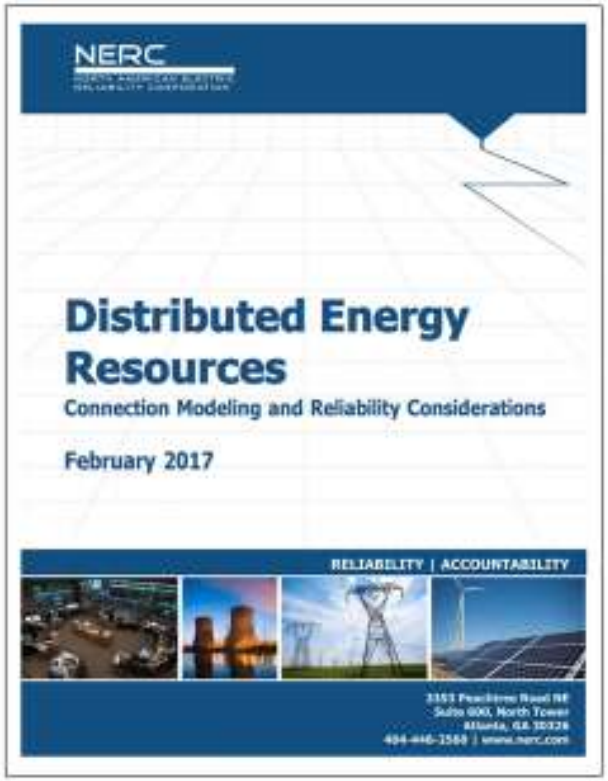


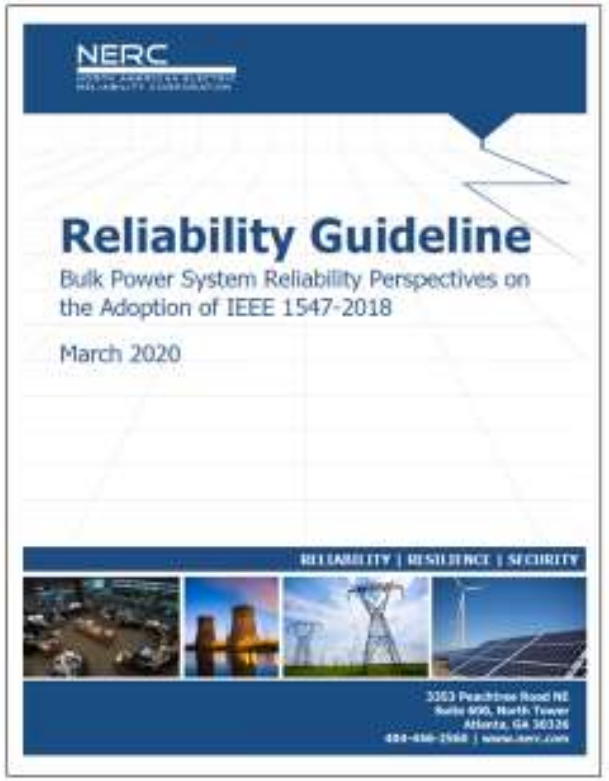
Source: MISO

PJM Gets It, Too

- DER Ride Through Task Force created by **Planning** Committee (November 2018)
- Guideline for Ride Through Performance of Distribution-Connected Generators (Q4 2019)
- DER and Inverter-based Resources Subcommittee created (July 2020)

And NERC Also





Recommended Reading

- Integrated Distribution Planning for Electric Utilities: Guidance for Public Utility Commissions
  - https://www.madrionline.org/resources/
- Insights on Planning for Power System Regulators
  - https://www.irena.org/publications/2018/Jun/Insights-on-planning-for-power-system-regulators
- Capturing More Value from Combinations of PV and Other Distributed Energy Resources
  - https://www.raponline.org/knowledge-center/capturing-more-value-from-combinations-of-pv-and-other-distributed-energy-resources/
- National Standard Practice Manual For Benefit-Cost Analysis of Distributed Energy Resources
  - https://www.nationalenergyscreeningproject.org/national-standard-practice-manual/


ANY
QUESTIONS
?

About RAP

The Regulatory Assistance Project (RAP)® is an independent, non-partisan, non-governmental organization dedicated to accelerating the transition to a clean, reliable, and efficient energy future.

Learn more about our work at raponline.org

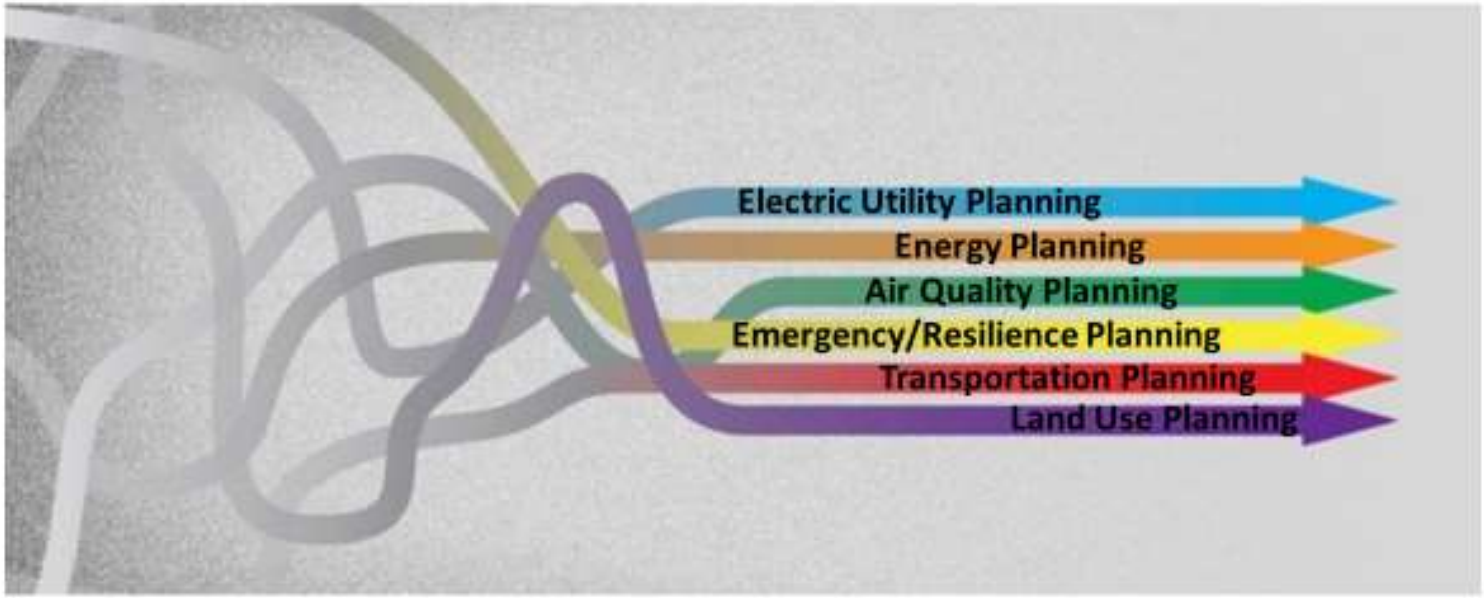
John Shenot
Senior Advisor
The Regulatory Assistance Project (RAP)®

Fort Collins, Colorado
United States

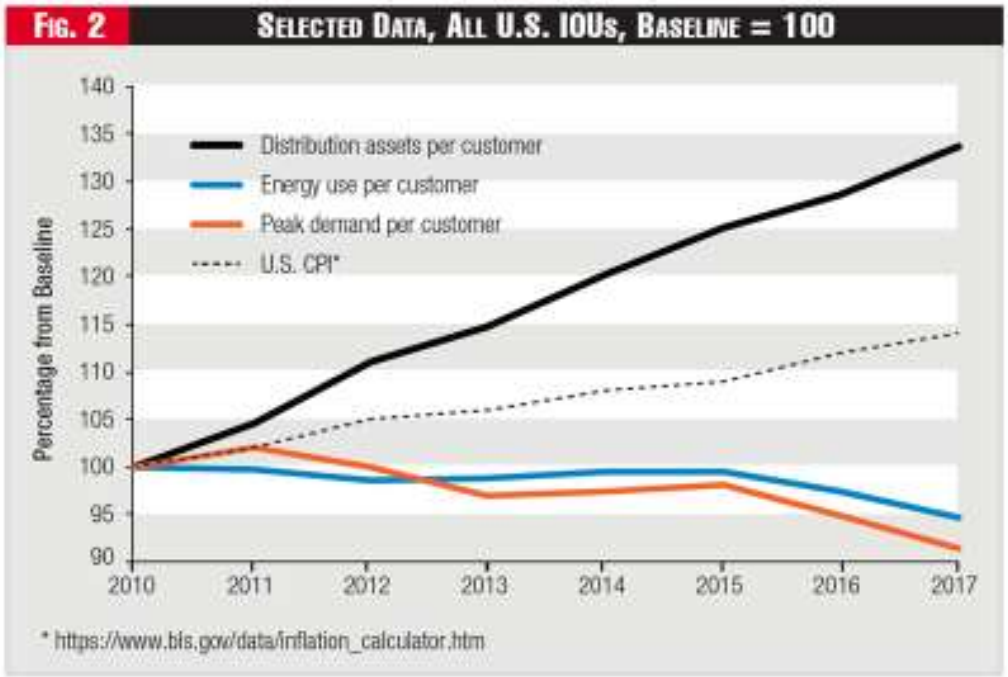
+1 802 595 1869
jshenot@raponline.org
raponline.org

8 Supplemental Slides if Helpful for Q&A

In a Perfect World…

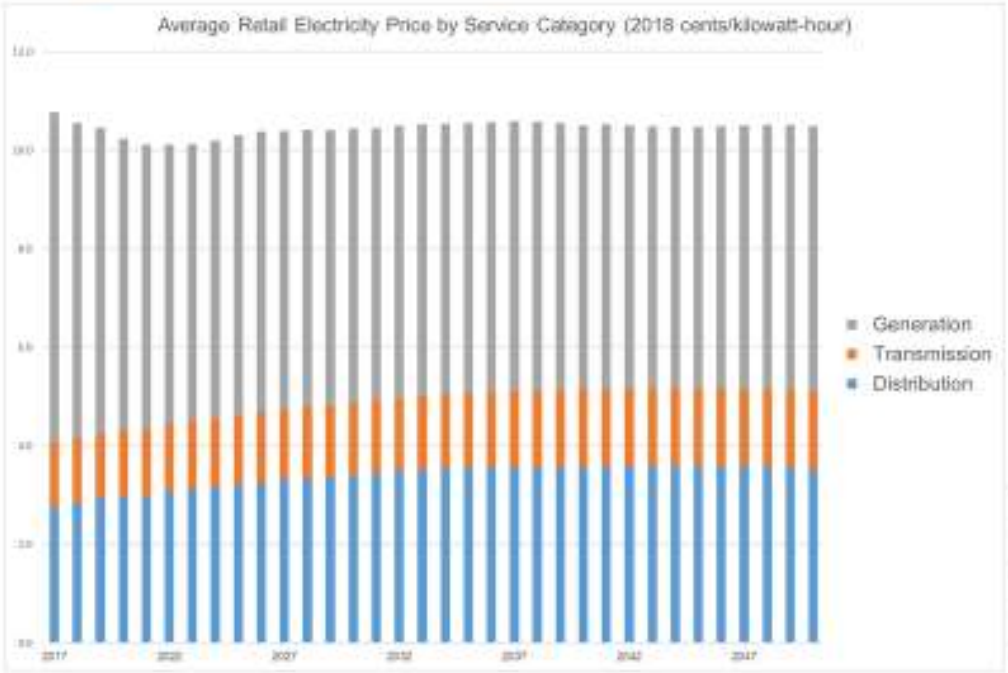


…Much Faster Than Inflation



Source: Alvarez, P., Ericson, S., and Stephens, D. (2019, July). The Rush to Modernize: Distribution Planning, Performance Measurement. *Public Utilities Fortnightly*. Retrieved from: https://www.fortnightly.com/fortnightly/2019/07/rush-modernize

Distribution Share of Retail Bills is Large and Projected to Grow



2017: 25.8%

2030: 32.7%

2040: 34.0%

Data Source: EIA Annual Energy Outlook 2019

MI POWER GRID

Making the Most of Michigan's Energy Future

Planning Alignment Focused on Distributed Generation and Non-Wires Alternatives

Juliet Homer, P.E., Pacific Northwest National Laboratory

MPSC

Michigan Public Service Commission

Planning Alignment focused on Distributed Generation and Non-wires Alternatives

Juliet Homer, P.E.

Pacific Northwest National Laboratory

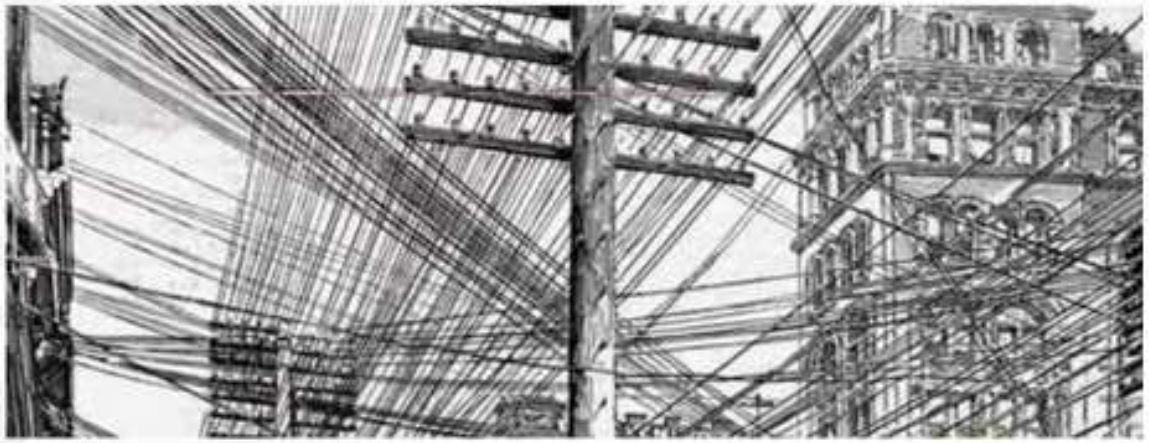
Michigan Power Grid
Integration of Resource/Distribution/Transmission Planning
Stakeholder Meeting #2
October 21, 2020

Background

- U.S. Department of Energy Grid Modernization Laboratory Consortium
- Funded by Office of Electricity (Joe Paladino) and Solar Energy Technologies Office (Elaine Ulrich)
- Presentation today based on report: **Electric Distribution System Planning with DERs – High Level Assessment of Tools and Methods**
- Report authors:
  - PNNL: Juliet Homer, Yingying Tang (now with Microsoft), Jeffrey Taft, Alice Orrell
  - NREL: Dave Narang, Michael Coddington, Michael Ingram, Andy Hoke
- Additional insights and content provided by:
  - PNNL – Alan Cooke, Kevin Schneider, Jeremy Twitchell
  - LBNL – Lisa Schwartz
  - Debra Lew – formerly with GE Consulting, now with Debra Lew LLC

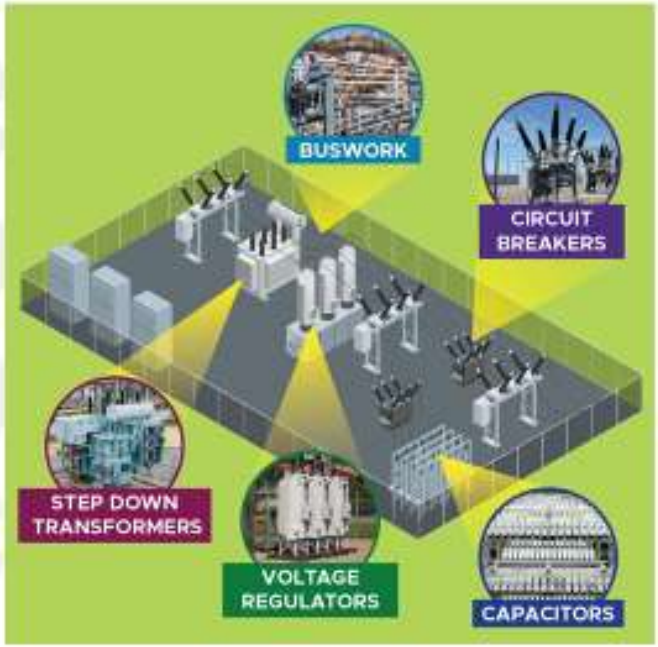
In this presentation

- Transmission and distribution system coordination
- Integrated distribution system planning
- Load and distributed generation forecasting
- Non-wires alternatives
- Data requirements
- Net value method in IRP modeling
- Closing thoughts



Transmission and Distribution handshake point – The substation

Substation



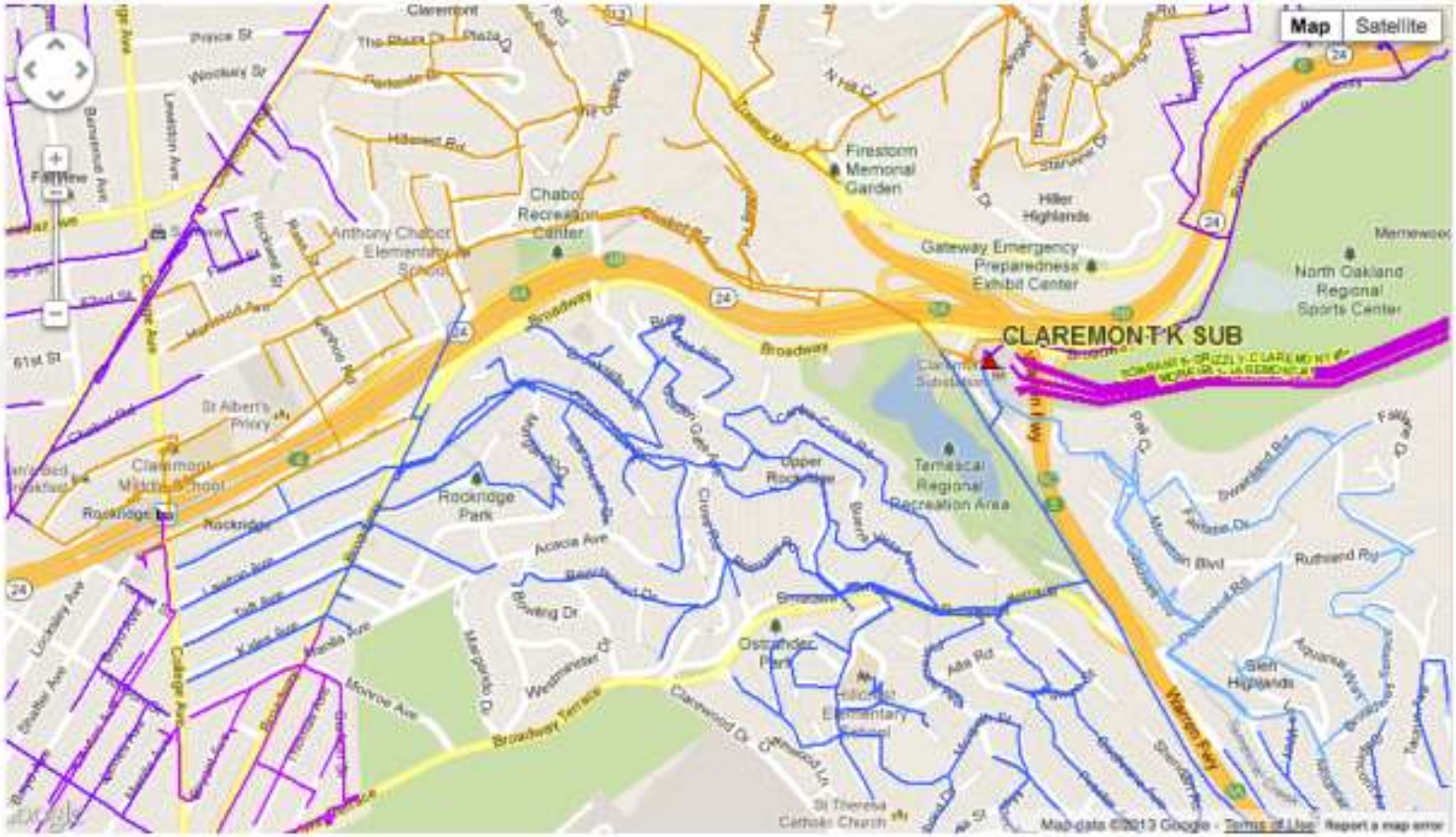
Link to full distribution system infographic

Map of transmission 115-kV

115 kV Transmission network

▲ Distribution substations

Map of distribution systems



Interface between transmission and distribution (T&D) systems

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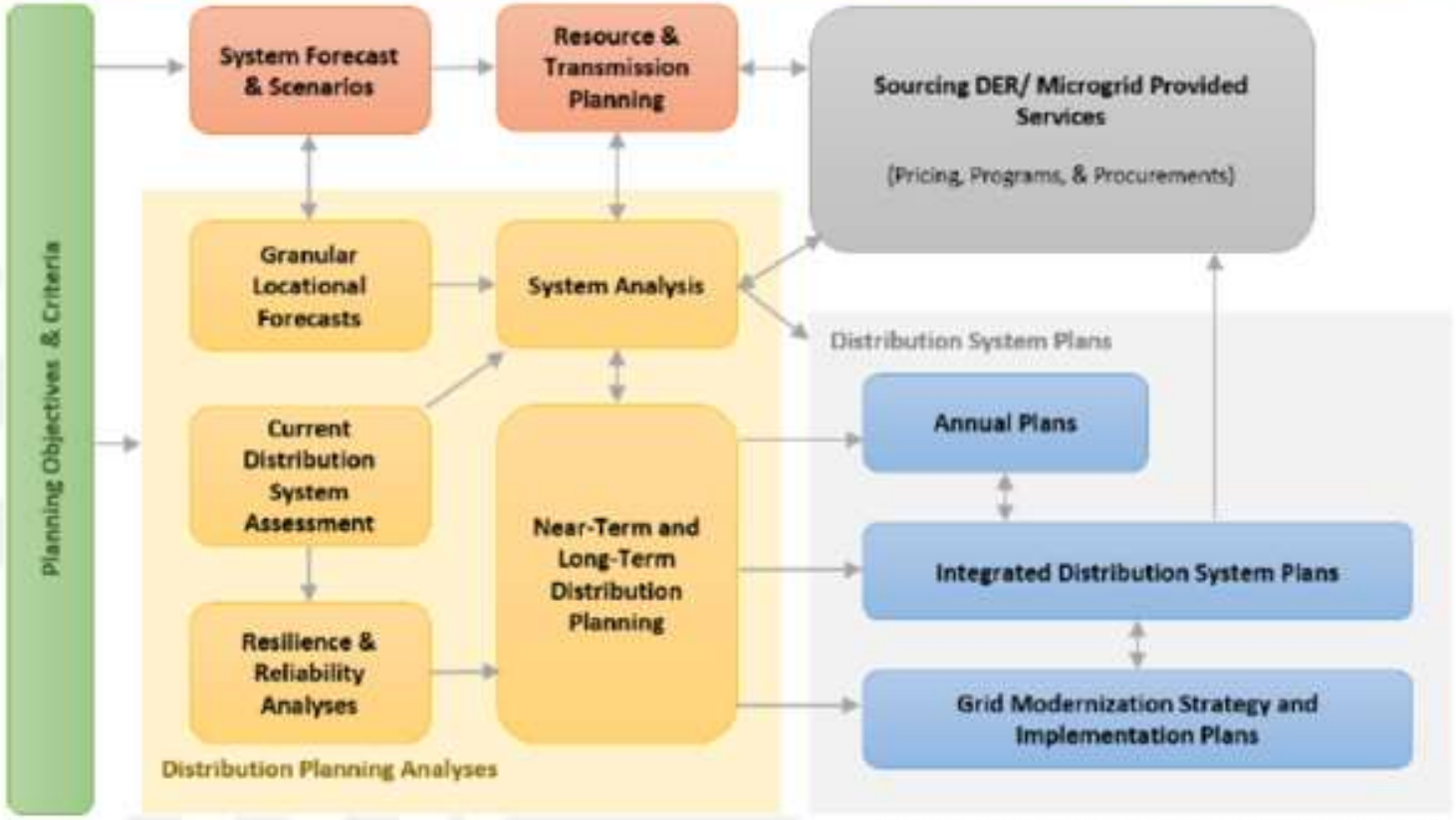
- Traditionally
  - Very hierarchical – transmission system drove economics and energy
  - All power was produced on the transmission system
  - Distribution system took what it was given from the transmission system
  - The interface between T&D systems was static
  - Transmission operators managed transmission with their models
  - Distribution operators managed distribution with their models
- With increased Distributed Energy Resources (DERs)
  - The interface between T&D is more complex and dynamic
  - Under certain conditions, power can flow from distribution system to transmission system
  - Software, tools and communications have to evolve
  - Transition from transmission-to-distribution hierarchy to more co-equal - tougher modeling problem

Coordinating transmission and distribution (T&D) planning

- Large numbers of DERs can impact the transmission system
- Transmission system can also impact DERs in terms of ride-through capability and frequency and voltage impacts
- Separate data sets, simulation software and models support planning for T&D
- Traditionally, only limited data has been shared between T&D systems, primarily load
- Transitioning from strictly transmission-to-distribution hierarchy to more of a co-equal paradigm
- This represents a significant modeling challenge due to traditionally separate T&D modeling tools
- Computational burden of modeling the T&D system together is immense
- Tools
  - Researchers have developed steady-state global power flow models that solve the distribution and transmission system together; these models are just starting to capture the important dynamic/transient effects
  - Co-simulation platforms are being developed that link existing T&D simulators - Examples include HELICS and FNCS developed at PNNL

Integrated Distribution System Planning



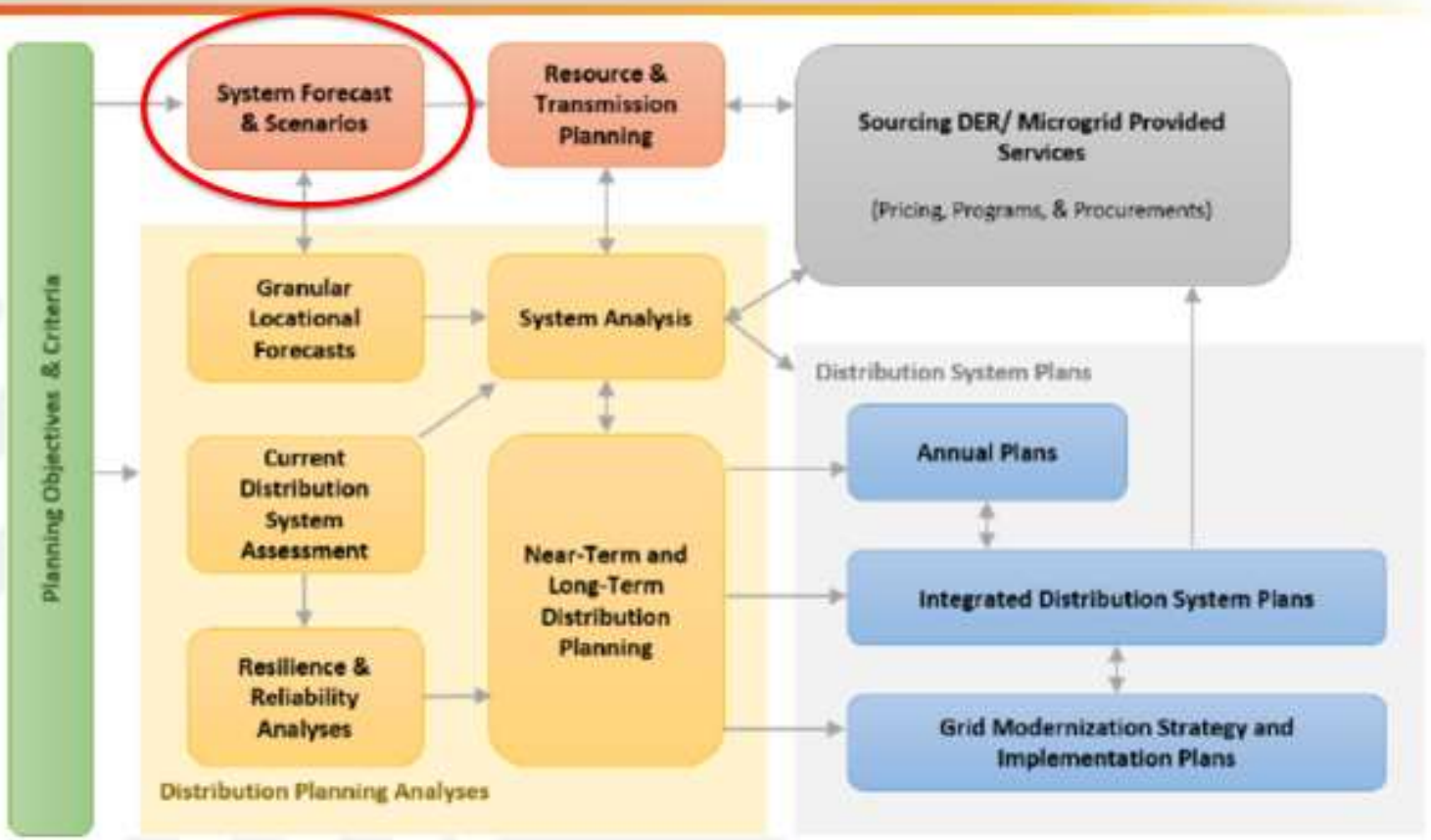
Source: DSPx Guidebook, Vol. 4 (final draft), 2020

States with distribution planning requirements

	California	Colorado	Delaware	District of Columbia	Florida	Hawaii	Illinois	Indiana	Maine	Maryland	Massachusetts	Michigan	Minnesota	Nevada	New Hampshire	New Jersey	New York	Ohio	Oregon	Pennsylvania	Rhode Island	Texas	Utah	Vermont	Virginia	Washington
Distribution system plan requirement	•	•	•	•		•	•	•	•	•	•	•	•	•	•		•				•				•	
Grid modernization plan requirement	•					•					•		•		•		•									
Hosting capacity analysis/mapping requirement	•			•		•					•	•	•	•	•		•									
Non-wires alternatives / locational value requirements	•	•	•	•		•			•			•	•	•	•		•				•					
Storage Mandates or Targets	•										•			•		•	•		•						•	
Benefit-Cost Methodology / Guidance	•								•					•	•		•				•					
Storm hardening requirements					•					•															•	
Required reporting on poor-performing circuits and improvement plans		•	•		•		•			•	•		•			•	•	•	•	•	•	•	•	•		•

Source: Schwartz/Homer presentation at Integrated Distribution System Planning training for Midwest/MISO region, October 2020

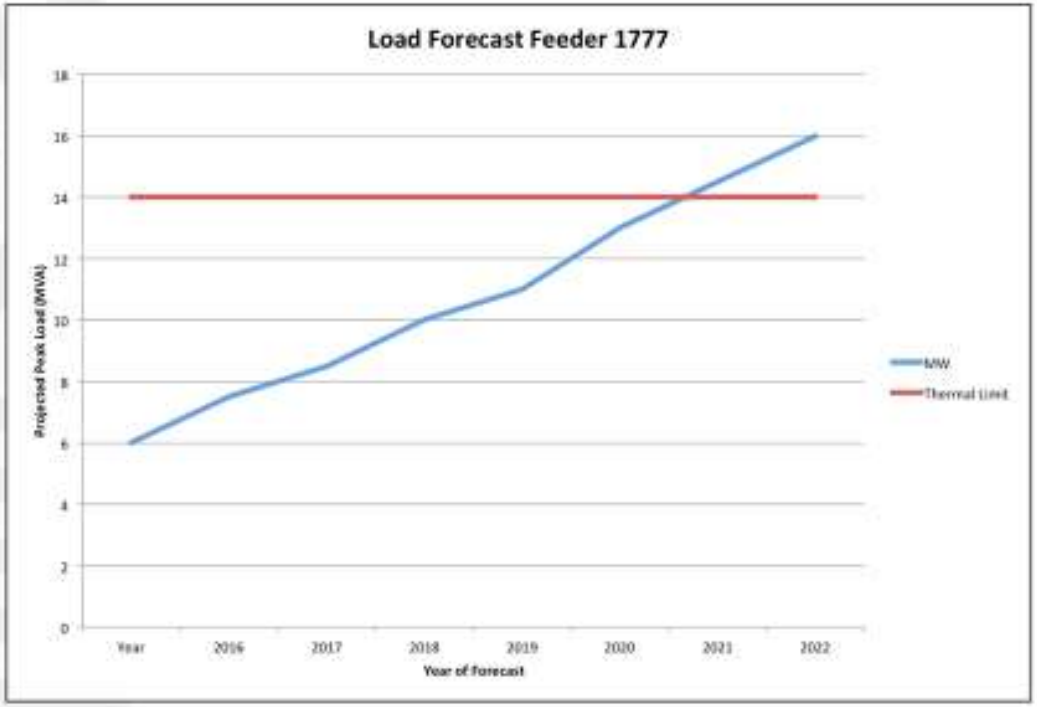
Integrated Distribution System Planning



Source: DSPx Guidebook, Vol. 4 (final draft), 2020

Traditional load forecasting

- Track peak loads (using SCADA data)
- Evaluate each distribution feeder for annual growth and new loads
- Feeder load forecasts aggregated to show substation status, need for expansion
- Substations may require upgraded transformers, new transformer banks, transmission, distribution equipment
- Traditional load growth projections are commonly included in utility tools (e.g., Cyme, Synergi, Milsoft)

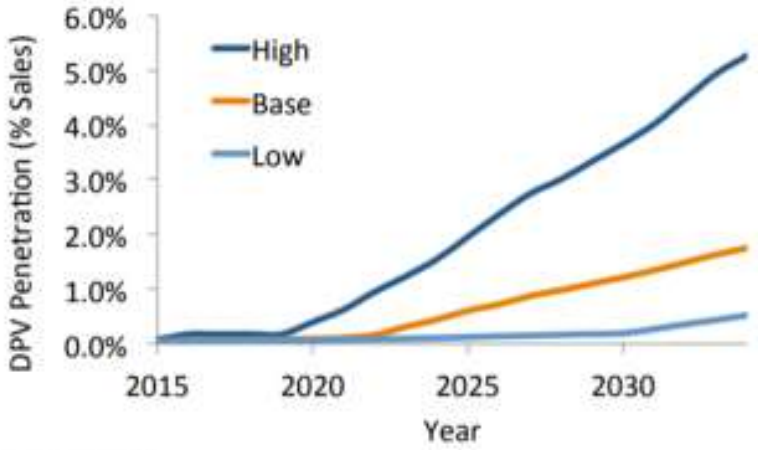


Traditional DER forecasting

- Even understanding baseline or current DER energy production is difficult – utilities don't have visibility or data on customer-owned systems
- Traditional DER forecasting has been based on:
  - Historical trends
  - Specific targets set by policy or program goals
  - Regression-based approaches applied at the service area level
  - Planners judgement
- These rely on few or no quantifiable predictive factors and may not be sufficiently robust for planning purposes going forward.
- Forecasting load and DER often happens in a "top-down" way, separately forecasting load and quantity of DER at the system level, and then allocating that system forecast down to more granular levels.

More advanced load and DER forecasting

- There is a move to more granular load forecasts in time and space, such as annual hourly load forecasts by feeder and/or by customer class.
- Multi-scenario forecasts of DER penetration and gross load can support understanding *potential* effects of DERs on a distribution system
- Scenarios may include:
  - a business-as-usual case
  - varying DER growth projections
    - (EE, DR, CHP, DG, EV and storage)
  - scenarios that reflect cost decreases for certain DERs
  - scenarios that reflect specific policies, including carbon/sustainability scenarios
  - scenarios that explore different energy service provider landscapes, such as a high community choice aggregation scenario.



- Market analysis reports, potential studies, procurement requirements, and internal company analysis can be used to develop different DER growth scenarios.

Load and DER forecasting tools

- Load Forecasts
  - LoadSEER - integrates geospatial and AMI data along with historical and forecasted weather information to develop regularly updated multi-scenario load forecasts.
  - CYME, Snergi, Milsoft - have add-on modules for developing multiple-scenario forecasts.
  - NREL's dsgrid - creates detailed electricity load data sets.
- DER Adoption forecasts
  - dGen forecasts technical and economic potential but does not project customer adoption in the short term.
  - Utility specific tools based on Bass Diffusion Models

Challenges and Gaps – Load and DER Forecasts

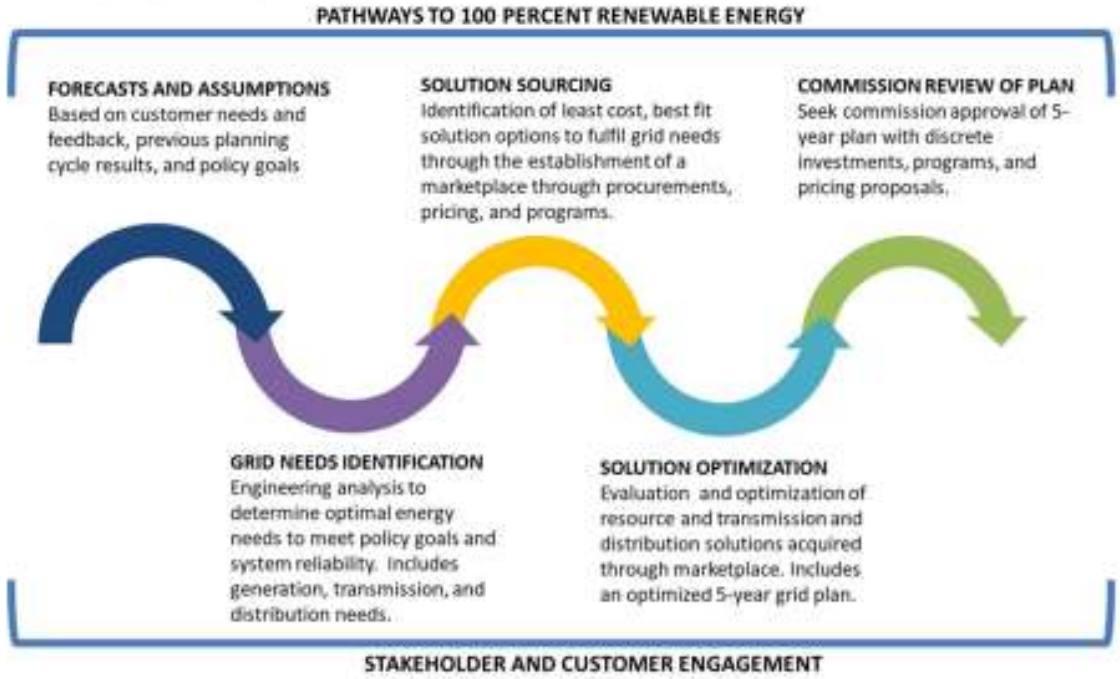
- Commercial/mature tools are needed that use customer adoption modeling and machine learning to project customer adoption rates of DERs and net load in a granular way, taking into consideration policies, and existing deployment rates
  - WattPlan Grid, a tool currently in development, plans to use machine learning and advanced analysis for project customer adoption

Integrated Grid Planning: Hawaiian Electric

Driven by the state's 100 percent clean energy requirement and customer uptake of distributed energy resources, Hawaiian Electric launched a new Integrated Grid Planning process in 2018:

Key points:

- Starts with common forecasts and assumptions
- Needs assessment conducted from the bottom up (includes distribution, transmission systems)
- Cost and performance assumptions informed by market providers
- Robust stakeholder processes provide transparency through all steps of the process



Non-wires Alternatives (NWA)

Considering non-wires alternatives

- Non-wires alternatives (NWA) are options for meeting distribution (and transmission) system needs related to load growth, reliability and resilience.
  - Single large DER (e.g., battery) or portfolio of DERs that can meet the specified need
- Objectives: Provide load relief, address voltage issues, reduce interruptions, enhance resilience, or meet local generation needs
- Potential to reduce utility costs
  - Defer or avoid infrastructure upgrades
  - Implement solutions *incrementally*, offering a flexible approach to uncertainty in load growth and potentially avoiding large upfront costs for load that may not show up

- Typically, the utility issues a competitive solicitation for NWA for specific distribution system needs and compares these bids to planned traditional grid investments (e.g., distribution substation transformer) to determine the lowest reasonable cost solution.

Non-wires alternatives

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NWA project stage by year announced

Source: Wood Mackenzie Grid Edge service, Wood Mackenzie Data Hub

- ~850 MW of NWAs have been identified or implemented in the US
  - Projects only move forward 40% of the time and the number of identified opportunities that are implemented is shrinking
  - Cost and reliability are key reasons for projects not going forward
  - Front-of-the-meter batteries are most commonly implemented NWA
  - Broad disclosure of NWA opportunities both informs the public and also dilutes share of NWA projects implemented

From Debbie Lew slides from NARUC/NASEO Midwest States Distribution System Training October 2020

Non-wires alternatives projects by state

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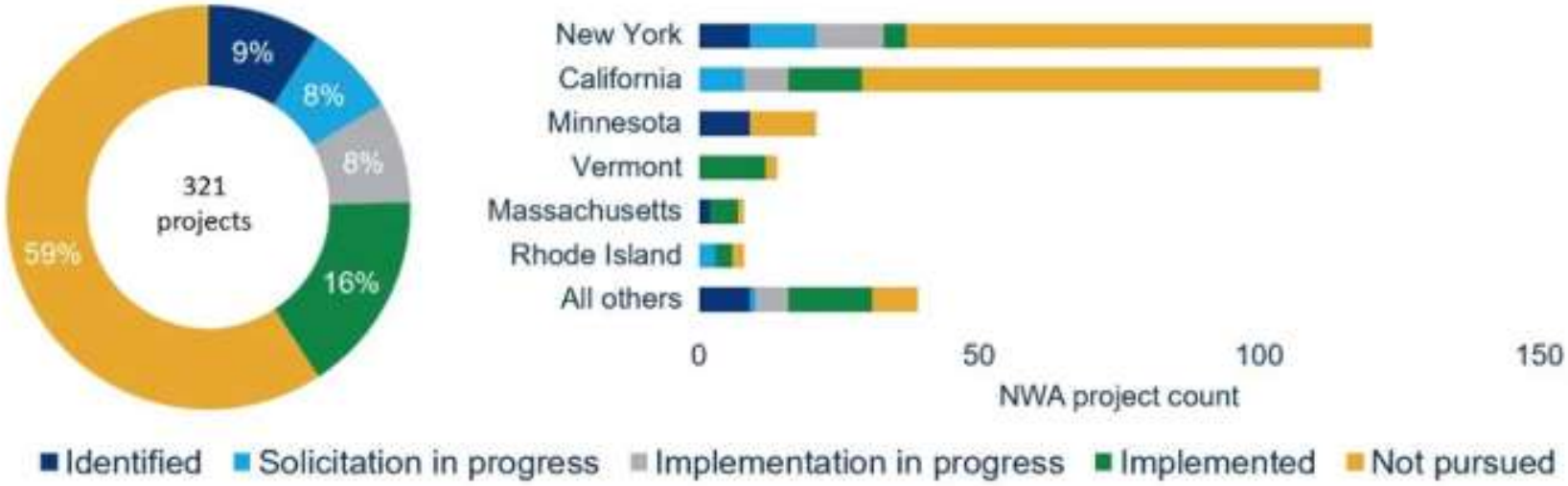
NWA project count by status and U.S. state



Source: Wood Mackenzie Grid Edge service, Wood Mackenzie Data Hub

NWA procurement strategies: New York (1)

- As part of annual capital planning, each utility must routinely identify candidate projects (load relief, reliability) for non-wires alternatives, post information to websites and issue RFPs. Utilities jointly provided suitability criteria (March 2017) for NWA projects and described how criteria will be applied (May 2017) in capital plans and procurement processes.

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

NWA procurement strategies: New York (2)

Projects, Needs and Default Solutions:
Example Consolidated Edison RFPs for Non-Wires Alternatives

Project (RFP year)	Need	Default Solution
Hudson Network (2017)	Amount: 7.1 MW Location: West 50th St. Substation Overload period: 1-8 pm (5 pm peak) When: 2021 (summer)	Feeder upgrades to reduce potential overloads
Columbus Circle Network (2017)	Amount: 4 MW Location: West 42nd St. No. 2 Substation Overload period: 2–7 pm (6 pm peak) When: 2021 (summer)	Feeder upgrades to reduce potential overloads
West 42nd Street Load Transfer Project (2017)	Amount: 42 MW (total, varies by year) Location: W. 42nd St. No. 1 Substation Overload period: 9 am–7 pm (2–3 pm peak) When: 2021–2027 (starting May 2021)	Transfer 55 MW of load from W. 42nd St. No. 1 Substation to Astor Substation before summer 2021

Sources: Con Edison 2017a, Con Edison 2017b, and Con Edison 2017c

See Joint Utilities NWA Opportunities and REV CONNECT

Locational Value

- DER compensation tariffs based on locational benefit
  - New York Value Stack tariff compensates DER based on location, in addition to energy, capacity, environmental and demand reduction
  - Locational specific relief value (LSRV) zones are identified by each utility based on utility-defined criteria
  - Response to event calls in LSRV zones results in additional DER compensation

Source: Con Edison LSRV Zone Map

NWA procurement strategies: California

- Distribution Investment Deferral Framework (DIDF) decision (Feb. 2018) created an annual process for consideration of DERs
  - *"The central objective…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."*
  - Utilities file annually (now consolidated):
    1) Grid Needs Assessment (example GNA) — main driver for Distribution Resources Plan
    2) Distribution Deferral Opportunity Report (DDOR)
  - Recommend deferral opportunities for competitive annual solicitations
    - Examples: SCE, PG&E, SDG&E
  - May 2019 update modified requirements
    - $/MWh and locational net benefit analysis values for prioritizing projects
    - Additional requirements for GNA narrative and datasets
    - Additional project-specific data required for planned investments and candidate deferral project shortlist

2019 DIDF Project Locations

	Candidate Deferral	In Service Date	Deficiency (MW)
★	New Lammers Feeder	6/1/2021	1.5
★	Huron Bank 1	4/1/2021	3.7
★	Santa Nella Bank 1 and New Feeder	5/1/2022	5.4
	Subtotal		*10.6*

Source: PG&E presentation on 2019 RFO for local distribution capacity relief in 3 areas

CPUC's Distribution Investment Deferral Framework (DIDF)

- Process to consider NWAs
- Review historical peak demand data
- Disaggregate load and DER forecasts
- Identify grid needs
- Develop utility-owned projects to solve these needs
- Project screening (3 years to identify project, CPUC approval, solicitation, interconnection study, permits, procurement, installation, operation)
  - Timing
  - Technical
- Prioritization
  - Cost-effectiveness (LNBA $/kW-yr and $/MWh-yr)
  - Forecast certainty
  - Market assessment

Region	Distribution Service						Total
	Capacity	Capacity (UCT)	Reactive Power	Reliability, Capacity	Reliability, Voltage	Voltage	
Desert	11	20	7	4	2	0	44
Metro East	7	25	7	2	0	0	41
Metro West	27	14	15	1	0	1	58
North Coast	12	14	2	4	0	2	34
Orange	0	10	2	5	0	0	17
Rurals	15	8	7	1	0	8	39
San Jacinto Valley	5	8	2	3	0	2	20
San Joaquin	1	5	1	1	0	1	9
Total	**78**	**104**	**43**	**21**	**2**	**14**	**262**

Region	Project Type					Total
	Subtrans. Line	Subtrans. Substation & Subtrans. Line	Subtrans. Substation	Dist. Sub & Dist. Feeder	Dist. Feeder	
Desert Region	0	0	0	0	3	3
North Coast Region	2	0	0	1	2	5
Orange Region	0	0	0	0	1	1
Rurals Region	2	0	1	0	0	3
San Jacinto Valley Region	0	1	0	0	1	2
Total	**4**	**1**	**1**	**1**	**7**	**14**

Tier	Project	Cost Effectiveness	Forecast Certainty	Market Assessment
1	Alberhill System Project (ASP)			
	New Circuit at Elizabeth Lake Substation			
	New Circuit at El Casco Substation			
	New Circuit at Sun City Substation			
2	Saugus-Colossus-Lockheed-Pitchgen Subtransmission Line Reconductor[79]			
	Saugus-Elizabeth Lake-MWD Foothill Subtransmission Line Reconductor[79]			
3	Slate Circuit Line Reconductor			
	New Circuit at Garnet Substation			
	New Circuit at Farrell Substation			
	New Circuit at Saugus Substation			
	Capacitor Addition at Edwards Substation			
	Kramer-Calcity / Holgate-Calcity Subtransmission Line Reconductor			
	Del Valle 66/16 kV Substation Project			
	Kramer-Edwards Subtransmission Line Project			

SCE, "Grid Needs Assessment and Distribution Deferral Opportunity Report," August 17, 2020

October 9, 2020 | 50

From Debbie Lew slides from NARUC/NASEO Midwest States Distribution System Training October 2020

October 21, 2020 | 25

Southern California Edison (SCE) example: DIDF Request for Offers

- Six upgrade needs at five locations identified in Distribution Deferral Opportunities Report process
  - Demand Response (100 kW min)
  - Renewables: 250 kW min front-of-the-meter (FTM), 100 kW min behind-the-meter (BTM)
  - Storage 500 kW min FTM, 500 kW min BTM
  - Renewables+storage: 250 kW min FTM, 100 kW min BTM
  - Permanent load shift (100 kW min)
  - Energy Efficiency (100 kW min)
- Preference for BTM that can provide resiliency for Public Safety Power Shutoffs

SCE DIDF RFO

From Debbie Lew slides from NARUC/NASEO Midwest States Distribution System Training October 2020

NWA implementation challenges

- Year by year planning analysis yields changed requirements
- Procurements take time which can lead to challenges
- Southern California Edison example – needs changed significantly between 2019 and 2020 planning cycles: https://library.sce.com/content/dam/sce-doclib/public/regulatory/filings/pending/electric/ELECTRIC_4208-E.pdf

Table 1: Eisenhower Project Comparison of 2019 and 2020 Planning Cycles

Eisenhower Project	2019 Planning Cycle	2020 Planning Cycle
Grid Needs	Capacity: Crossley 33 kV circuit out of Eisenhower 115/33 kV Substation	Capacity: Crossley 33 kV circuit out of Eisenhower 115/33 kV Substation
Nature of Grid Needs	Forecasted demand expected to exceed capacity limitations	Forecasted demand expected to exceed capacity limitations
Scope	Construct (1) new 33 kV circuit out of Eisenhower 115/33 kV Substation	Construct (1) new 33 kV circuit out of Eisenhower 115/33 kV Substation
Need Year	2022	2022
Unit Cost of Traditional Mitigation	$3.42 M	$3.42 M
Capacity Requirements (MW)	2.5	16.2
Energy Requirements (MWh)	4.4	107.5

From Debbie Lew slides from NARUC/NASEO Midwest States Distribution System Training October 2020

Table 7: Overall Comparison of Capacity Requirements (MW)

		2019 Planning Cycle (Advice 4108-E)	2020 Planning Cycle	Delta
Capacity Requirements (MW)	Eisenhower	2.5	16.2	+13.7
	Saugus-Newhall	12.5	12.5	0
	Pechanga	1.9	0.0	-1.9
	Alessandro	3.9	0.0	-3.9
	Elizabeth Lake 1	6.8	13.5	+6.7
	Elizabeth Lake 2	7.8	14.0	+6.2

Table 8: Overall Comparison of Energy Requirements (MWh)

		2019 Planning Cycle (Advice 4108-E)	2020 Planning Cycle	Delta
Energy Requirements (MWh)	Eisenhower	4.4	107.5	+103.1
	Saugus-Newhall	39.6	51.5	+11.9
	Pechanga	3.2	0.0	-3.2
	Alessandro	16.8	0.0	-16.8
	Elizabeth Lake 1	18.3	68.4	+50.1
	Elizabeth Lake 2	23.4	72.9	+49.5

Data-related requirements

Data-related requirements

- Data accessibility is being addressed in distribution planning proceedings
- Hawaii PUC order pointed out that "limited data visibility could lead to inefficient customer and grid investments" (HPUC 2019).
- Two types of data accessibility are being addressed

Green Button

1. **Customer usage data** - Making AMI interval data available to customers and third parties to support planning and decision-making
   - Some states are requiring utilities to use and/or evaluate feasibility of Green Button framework (Example: DC, NY, CA, HI and IL)
     - Download My Data – standard enables customer to download their data
     - Connect My Data – data exchange protocol which allows automatic transfer of data from utility to third party on customer authorization
   - Some states requiring "15/15 rule" when sharing aggregated customer data
     - An aggregation sample must have more than 15 customers and no single customer's data may comprise more than 15 percent of the total aggregated data
2. **System level data** – Making system level data available to support customer and third-party solutions
   - Increasingly common to require hosting capacity maps to be shared online
   - New York, DC and California are examples of states with more detailed system data sharing requirements – see next three slides

System data sharing requirements Example 1: New York

- New York – Each utility has a data sharing portal that includes the following

System data sharing requirements Example 2: California

- By order, California utilities required to make datasets available as part of Grid Needs Assessments & Distribution Deferral Opportunities filings, including:

- Grid needs
  - By circuit, substation, and sub-transmission capacity service
    - Peak load (five years)
    - DER growth (EE, DR, PV, EV, storage)
    - Facility loading %
    - Current year demand
    - 5 year forecasted demand
    - Forecasted percentage deficiency above the existing rating over five years
    - Forecasted MW deficiency over five years
    - Anticipated season or date by which distribution upgrade must be installed

- Distribution deferral opportunities
  - Planned investments
    - Project description
    - Distribution service required
    - Type of traditional capital investment equipment to be installed
    - In-service date
    - Deferrable by DERs? Y/N
    - Number and composition of customers
  - Candidate deferrals
    - Expected performance and operational requirements
    - Specific locational values
    - Distribution service required
    - Expected magnitude of DER service provision (MW/kWA)
    - Duration and timing of the deficiency and associated DER service requirements
    - Unit cost of traditional mitigation
    - Contingency plans

System data sharing requirements
Example 3: District of Columbia

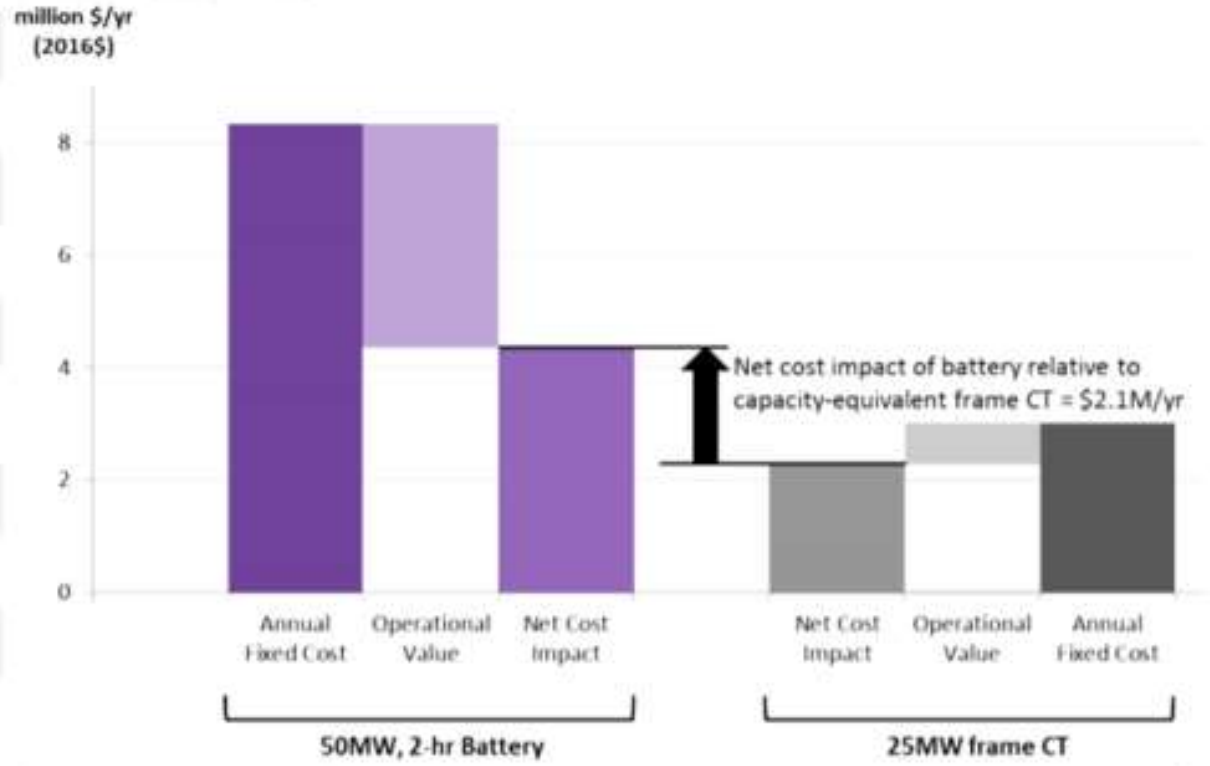
- Following MEDSIS working group recommendations, DC PSC required dedicated data sharing website
- Datasets below were requested by MEDSIS Data Information Access and Alignment working group
- Some data sets require secure access and some requested data sets are not yet available

Data Type	Frequency	Granularity	Availability
Capital Investment Plan – General Overview	Annual, 10 year forecast period	System	Current; Public (Pepco's Annual Consolidated Report)
Load forecast	Annual, 10 year forecast period	Substation	Current; Public (Pepco's Annual Consolidated Report)
Reliability statistics (SAIFI, CAIDI)	Annual (ACR)	Feeder level	Current; Public (Pepco's Annual Consolidated Report)
Planned resiliency/ reliability projects	Annual	Varies by project	Current; Public (Pepco's ACR and Rate Case Construction Report)
Load data	Annual (ACR)	Feeder (Historic)	NDA
Hosting Capacity	Quarterly	Feeder level	Hosting Capacity Map; Website
Beneficial Location	N/A	N/A	Not Available
Existing DER Capacity	Monthly	Feeder level	Heat Map; Website

Data Type	Frequency	Granularity	Availability
Circuit Capacity/ Design Criteria	Static (updated as projects are implemented)	Feeder level	Critical Energy Infrastructure Information (CEII); Secure access required.
Physical Attributes	Static (updated as projects are implemented)	Node level	Critical Energy Infrastructure Information (CEII); Secure access required.
Protective devices	Static (updated as projects are implemented)	Feeder level	Critical Energy Infrastructure Information (CEII); Secure access required.
Voltage profile	Static (updated as projects are implemented and with changes in load information)	Feeder level	Critical Energy Infrastructure Information (CEII); Secure access required.
Circuit impedance models	Static (updated as projects are implemented)	Feeder level	Critical Energy Infrastructure Information (CEII); Secure access required.

Net Cost Approach for considering storage in IRPs

- An IRP model compares resources in terms of capital cost and hourly value
  - For storage, that's an apples-to-oranges comparison
  - Net cost uses an external model to capture non-IRP values of storage
  - Deducting those operational values from modeled storage cost → apples-to-apples

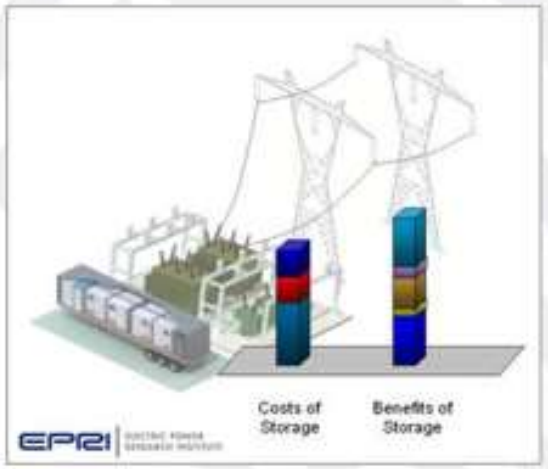


Portland General Electric 2016 IRP, p. 239

Slides from Jeremy Twitchell at PNNL
(Jeremy.twitchell@pnnl.gov

Net Cost Approach – Available Models

- Battery Storage Evaluation Tool (PNNL)
  - Free, non-exclusively licensed software
  - Conducts sub-hourly storage system optimization using user-input service values
  - Can be used to optimally size and site storage projects



- StorageVET (Electric Power Research Institute)
  - Free, open source software
  - Web-based interface
  - Flexible granularity and time horizons
  - Can directly compare storage to other resource options (i.e. combustion turbine)

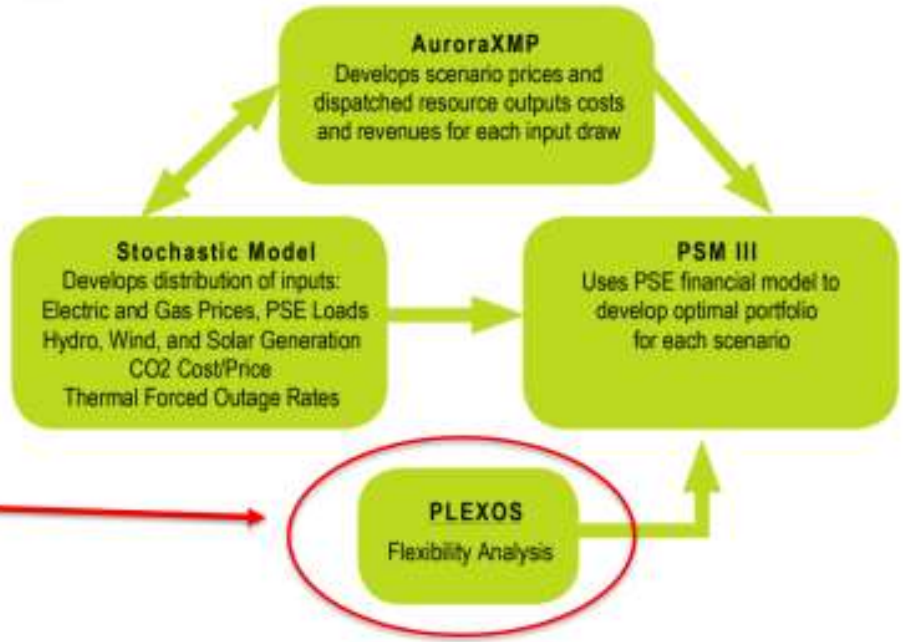
Sub-hourly Planning

- At hourly granularity, many flexible and ancillary services are omitted
  - Frequency response is one of most universally valuable services, but it's measured in seconds
  - Under high DG penetration, load following may be measured in minutes as solar comes on and off with passing clouds
- Market operations moving toward sub-hourly transactions
  - FERC Order 825 requires regional market operators to clear markets at the same interval at which they are dispatched
  - Regional markets moving to 5- and 15-minute markets at varying paces
  - CAISO's Energy Imbalance Market offers granular market participation to non-market utilities
  - Optimizing revenue in increasingly granular market intervals is pushing utilities to plan and operate systems with comparable granularity

CAISO

Sub-hourly Planning Models: Puget Sound Energy

- Deploying a new resource planning model is an expensive and time-consuming process
  - Planning software is expensive
  - Utilities spend years training staff on model usage
  - Planning cycle obligations remain constant
- Puget Sound Energy developed a gradual transition for its 2017 IRP
  - Traditional (hourly) planning tools used to identify model inputs and portfolio selection
  - Once resource portfolio was selected, PSE used PLEXOS to compare it to a portfolio with storage at 5-min granularity
  - Result: 50 MW of storage by 2035 became 75 MW by 2024



Puget Sound Energy, 2017 IRP, pg. N-4.

Closing thoughts

Closing thoughts

- Utilities provide more than just energy:
  - Day to day energy
  - Energy at peak demand
  - Voltage control
  - Frequency regulation
  - Ancillary services
  - Standby generation in case something unexpected happens
- Non-utility entities can't provide solutions without a willing partner
  - Grid signal
  - Appropriate pricing, programs and procurement
  - Clear mechanisms for participation
  - Clear ground rules
  - Clear objectives
- Change management requires patience, time, and trial and error
- Learn from other states but find Michigan-specific solutions!

Thanks!

Juliet Homer, P.E.
Juliet.homer@pnnl.gov
509-375-2698

Pacific Northwest
NATIONAL LABORATORY

MI POWER GRID

Making the Most of Michigan's Energy Future

Compliance with Governor's Executive Directive: Emission's tracking in IRPs

Jesse Harlow
Manager, Resource Adequacy and Retail Choice Section
MPSC

MPSC
Michigan Public Service Commission

Background on Executive Directive (ED) 2020-10

- Gov. Whitmer issued ED 2020-10 and Executive Order (EO) 2020-182, on September 23, 2020
- Pursuant to this ED, Michigan joined the United States Climate Alliance, which aligns the State's carbon reduction goals with the Paris Climate Accord
- Commits Michigan to a goal of achieving a 28% reduction below 1999 levels in greenhouse gas emissions by 2025
- Aims to achieve economy-wide carbon neutrality by 2050

Impact of ED 2020-10 on Utility IRPs

- Directs department of Environment, Great Lakes, and Energy (EGLE) to "expand its environmental advisory opinion filed…in the [MPSC's] Integrated Resource Plan Process under MCL sections 460.6t and 460.6s"
- EGLE's expanded role includes determining potential impacts of resource plans and whether IRP is consistent with emissions reduction goals in ED 2020-10
- EGLE must also consider environmental justice and health impacts under the Michigan Environmental Protection Act

Council on Climate Solutions

- Created by Gov. Whitmer's EO 2020-182, consists of directors of departments of the State government and other leaders of State government
- Chair Scripps is representing the MPSC on this Council
- Council will advise EGLE in formulating and overseeing the implementation of the Mi Healthy Climate Plan

Emissions Reporting Options for IRPs filed in 2023 or After

Four options considered in the Straw Proposal to meet ED 2020-10 for utilities filing IRPs in 2023 or after

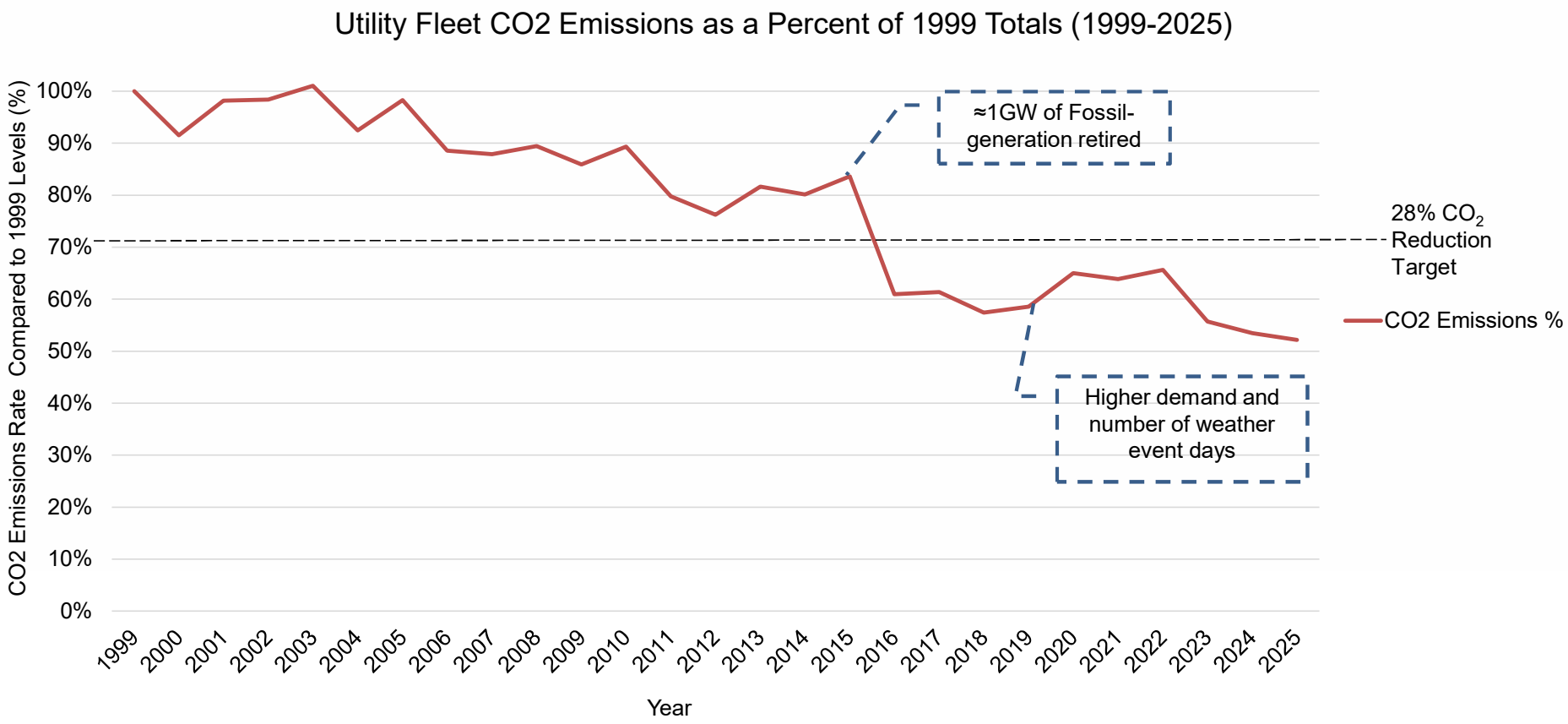
<table>
<tr><th>Option 1</th><th>Option 2</th><th>Option 3</th><th>Option 4</th></tr>
<tr><td colspan="2">Requires MIRPP <u>BAU</u> scenario change to include carbon goal of 28% reduction by 2025 as a sensitivity.</td><td>Requires MIRPP change to <u>all</u> scenarios reflecting the Carbon goal of 28% reduction by 2025 as a sensitivity.</td><td>Requires MIRPP change to all scenarios reflecting Carbon Neutrality by 2050 and therefore modeling as a sensitivity.</td></tr>
<tr><td colspan="3">If the utility preferred plan does not comply with the 2025 goal, include an optimized alternative plan that does comply with the 2025 goal and compare to the preferred plan.</td><td>If the utility preferred plan does not comply with the 2050 goal, include an optimized alternative plan that does comply with the 2050 goal and compare to the preferred plan.</td></tr>
<tr><td>Charts Carbon out to 2025.</td><td colspan="2">Charts Carbon out to the 15-year planning horizon to illustrate a path toward 2050.</td><td>Charts Carbon out to 2050 in Exhibit to illustrate goal.</td></tr>
<tr><td colspan="3">Spreadsheet of CO2, SOx, NOx, Mercury, and PPM for each year of the 15-year planning horizon for the utility's preferred plan and each MIRPP scenario optimized plan.</td><td>Spreadsheet of CO2, SOx, NOx, Mercury, and PPM for each year out to 2050 for the utility's preferred plan and each MIRPP scenario optimized plan.</td></tr>
</table>

Emissions Reporting Options for IRPs filed before 2023

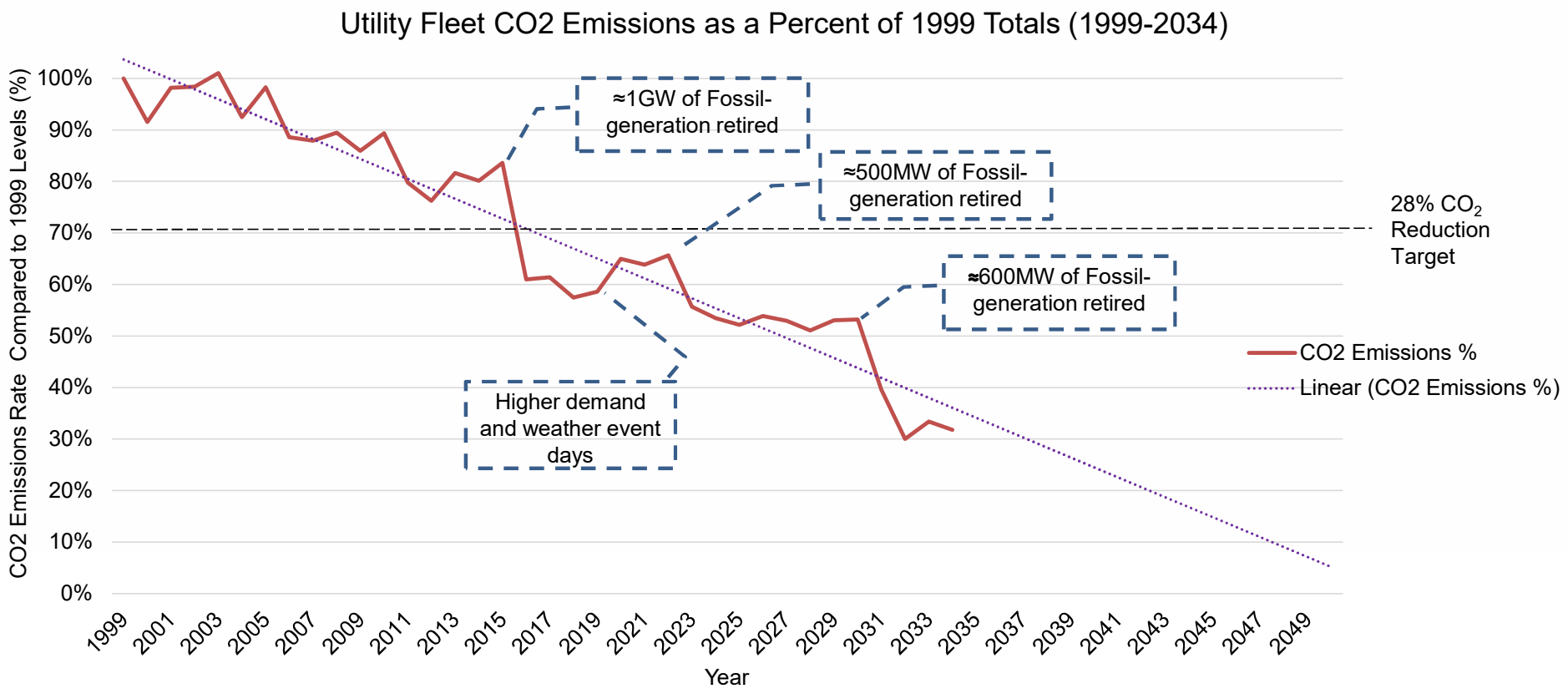
Two options considered in the straw proposal to meet ED 2020-10 for utilities filing an IRP before 2023

Option 1	Option 2
No MIRPP Update but Commission order directing addendum to filing requirements.	
Charts Carbon out to 2025 compared to 28% Carbon reduction.	Charts Carbon out to the 15-year planning horizon to illustrate the path toward 2050 and highlighting when the utility achieves a 28% reduction.
Spreadsheet of CO2, SOx, NOx, Mercury, and PPM for each year of the 15-year planning horizon for the utility's preferred plan and each MIRPP scenario optimized plan.	

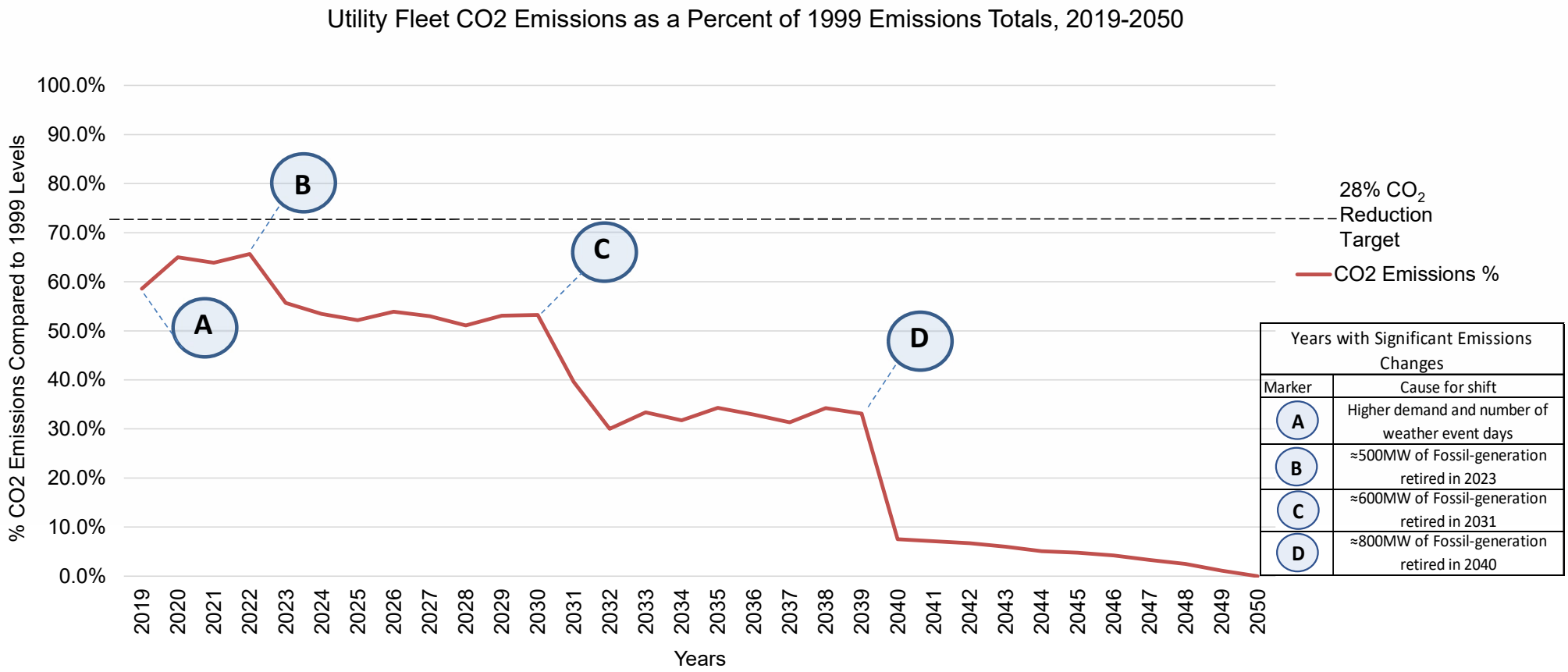
CO_2 Emissions Tracking in Option 1 Example



CO_2 Emissions Tracking in Option 2/3 Example



CO_2 Emissions Tracking in Option 4 Example



Feedback Request

- **Executive Directive**
  - Any interested person that wishes to propose an alternative method for satisfying the ED should submit to Naomi Simpson by **October 23.**
  - SimpsonN3@michigan.gov
- **Stakeholder Feedback Requests**
  - Please submit responses to the stakeholder feedback comments received to Danielle Rogers by **October 28.**
  - RogersD8@michigan.gov

MI POWER GRID

Making the Most of Michigan's Energy Future

Thank You

Upcoming Advanced Planning Stakeholder Meetings
November 6
November 18
December 16

MPSC

Michigan Public Service Commission