February 2021

TURQUOISE COHORT ROADMAP

NARUC-NASEO TASK FORCE ON COMPREHENSIVE ELECTRICITY PLANNING

NARUC
National Association of Regulatory Utility Commissioners

NASEO
National Association of State Energy Officials

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Introduction

This roadmap document describes a vision for an ideal comprehensive electricity planning process created by the members of the NARUC-NASEO Task Force on Comprehensive Electricity Planning – Turquoise cohort.[1] This idealized planning process is viewed from the state perspective, specifically a collaboration between the public utility commission and state energy office. For the purposes of this roadmap, a comprehensive electricity planning process refers to the alignment or integration of distinct planning processes that, historically, have not significantly informed one another (i.e., resource, distribution, and transmission planning processes). This roadmap includes:

- A flowchart of the entire integrated or aligned planning process.
- Brief descriptions and explanations of each section of the flowchart.
- Points of evidence for innovative planning steps that appear in the vision.

The roadmap explains the ideal, integrated planning process one section at a time, including both procedural and analytical steps in the planning processes. Each section identifies the specific innovations developed by the Turquoise cohort, accompanied by a brief discussion of the rationale for these changes in comparison to the status quo of electricity system planning.

About Turquoise: A Fictional, Representative State

Structure	
Regulatory	**Our state's investor-owned utilities** own generation assets
Market	**Our state is located** outside of an RTO/ISO market
Planning Processes	**Our state is seeking to align** distribution, resource, and transmission planning processes
Additional Characteristics	
A few other characteristics you should know	• Competing energy policies • Large amounts of space between load centers, which requires a unique approach to transmission planning
We are doing this because we want to accomplish	• Pathways for innovation and customer options that preserve the robustness of system planning & fairness of cost causation and allocation • A holistic planning approach that focuses on maintaining a flexible system that can respond to a changing generation mix • Transparency of planning processes • Pathways for allowing DERs the opportunity to compete fairly in the system planning process and provide cost-effective outcomes
While keeping in mind	• Preserving the value proposition of the utility-driven system (reliability, affordability, security)
And trying to be responsive to	• Promoting data-driven results that are verifiable

1 Cohorts are groups of Task Force members from three states, organized by similar market and regulatory structures. Members of each cohort worked as a team to define and support their fictional, representative state. Each cohort was given a color name.

The roadmap is intended to support states considering taking actions to increase the alignment of their own electricity system planning processes by providing:

- A high-level understanding of the sequence of steps included in an electricity planning process.
- Descriptions of the innovations introduced by the cohort and represented in the vision.
- Starting points for all states, particularly those with similar characteristics to the Turquoise cohort.

How to Read the Roadmap

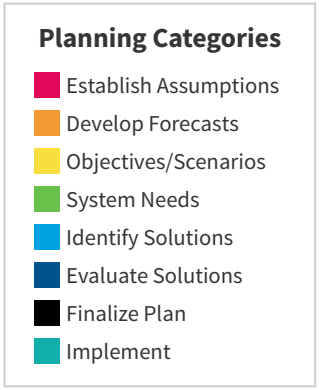
The roadmap describes the substantive activities, specific milestones, regulatory actions, and other deliberate aspects of this cohort's vision that comprise an ideal planning process. It describes the necessary sequences, dependencies, and relationships among steps, actions, and information flows (e.g., where the outputs from one step are leveraged as inputs to the next step), depicted by arrows.

- The roadmap contains **guidance, resources, and examples** of emerging and promising approaches currently being implemented, which offer points of evidence for innovations that states and utilities have already incorporated into their efforts, demonstrating the feasibility of these approaches. In places where no guidance, resources, or examples are included, new efforts might be needed to enable or demonstrate an innovation's viability.
- The roadmap uses a **color key**—outlining each box in the flowchart—to allow for comparison with other Task Force cohort roadmaps. The colors align with eight generalized procedural and analytical planning steps that typically characterize electricity system planning processes. For further descriptions of these general steps, see the two-page briefing paper *Aligning Integrated Resource Planning and Distribution Planning – Standard Building Blocks of Electricity System Planning Processes*.[2]

The roadmap does not place planning steps on a timeline or calendar and does not indicate a responsible entity or actor for various steps because such details will necessarily vary across states.[3]

Guidance, resources, and examples are accompanied by this symbol:

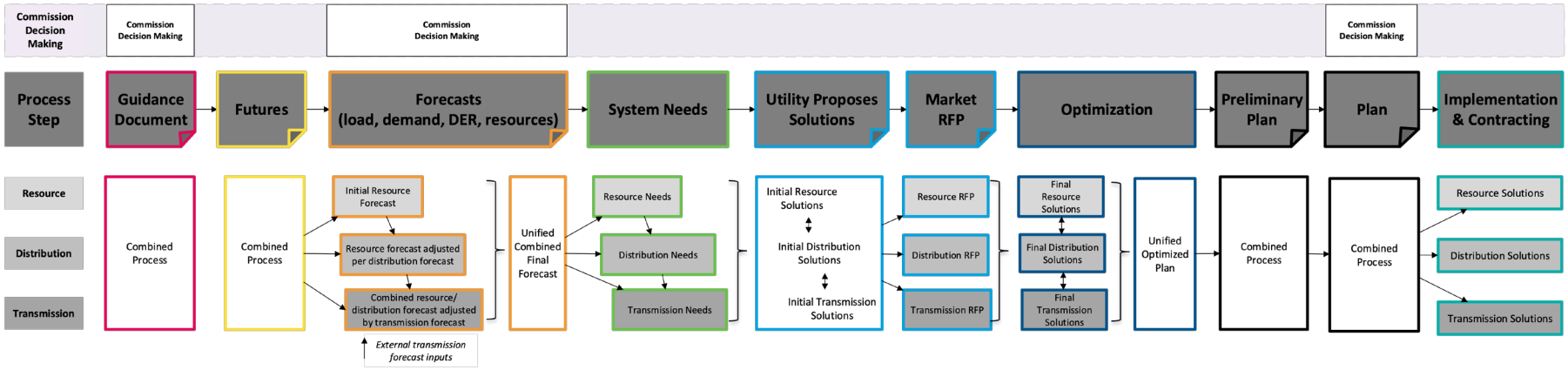
Color key used in flowchart and vision summary:



2 Kristov, Lorenzo. "Aligning Integrated Resource Planning and Distribution Planning: Standard Building Blocks of Electricity System Planning Processes." Discussion Draft for NARUC- NASEO Task Force on Comprehensive Electricity Planning. July 2019.

3 While timing differences between processes are important, timelines were not broken out in order to reduce the number of complexities when mapping the relationships between the distribution, resources, and transmission processes.

Turquoise Cohort Flowchart of Idealized Comprehensive Electricity Planning Process



Key

Planning Categories

- Establish Assumptions
- Develop Forecasts
- Objectives/Scenarios
- System Needs
- Identify Solutions
- Evaluate Solutions
- Finalize Plan
- Implement

Process Steps

- Transmission Planning Process
- Integrated Resource Planning
- Distribution System Planning
- Touchpoints Across Planning Processes
- Stakeholder Engagement

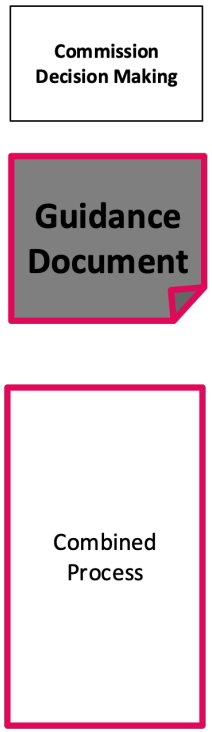
Acronyms

DER: Distributed Energy Resources
IRP: Integrated Resource Planning
RFP: Request for Proposal

Turquoise Roadmap Features

The Turquoise cohort envisioned several innovative steps that represent a departure from traditional planning practices. These innovations include:

- **Re-envisioned holistic process**. The flowchart illustrates the key steps for an integrated system planning process that better aligns traditionally discrete resource, distribution, and transmission planning efforts. It represents what integrated planning could look like if wholly re-envisioned as a harmonized process, instead of as a cobbled together compromise among existing discrete (and potentially anachronistic) practices. The integrated system plan is market-based, technology-neutral, transparent, holistic, and ambitious.
- **Market-based**. Incorporating a request for proposal (RFP) step into the solution identification process enables evaluation of market-based options and enhances the optimization and sourcing of a realistic procurement plan. The RFP serves as a check on utility-proposed solutions and opens the process to other options.
- **Interactive**. The forecasting step and system needs/system solutions/RFP steps are intended to be iterative such that each planning sub-process (resource, distribution, and transmission) can be considered independently and interdependently (e.g., can first conduct a forecast for resource needs, then for distribution needs, then for the combined set of needs).
- **Regulatory authority**. The process is premised on the level of authority vested within the regulatory commission as a decision-making body across all planning sub-processes. If that level of authority does not currently exist, it is envisioned that there will be evolution toward that level of authority, or that the Commission and other participants through this process will still influence the ultimate decision makers.
- **Robust stakeholder engagement**. Stakeholder engagement underpins the process, with a range of techniques (e.g., participatory focus groups, public polling, technical workshops) encouraged to ensure meaningful and diverse engagement of stakeholders throughout the entire planning process.



Guidance Document

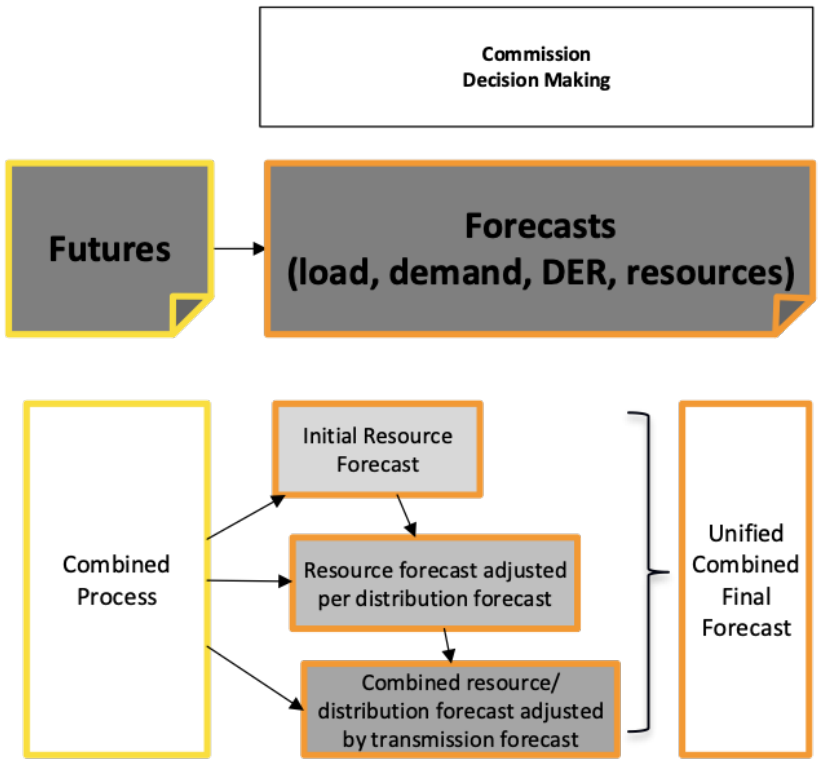
The first step is for stakeholders to effectively frame the integrated planning process by working together to develop a **Guidance Document** that articulates the planning timeline and objectives. Through polling, education, and workshops, stakeholder input is solicited to ensure that the different social, economic, regulatory, and policy dimensions of planning are appropriately considered.

The Guidance Document delineates key elements that the planning process must address, including state policies; consideration of the utility business model; parameters for ongoing stakeholder engagement; a comprehensive approach to planning, identification, and evaluation of risks; and the use of tools and specific process methodologies.

The Commission is involved as a stakeholder in the development of the Guidance Document, and is responsible for formally approving it, thereby commencing the planning cycle.

Existing Guidance, Resources, and Examples

- **Streamlining planning objectives**. Hawaiian Electric Company's (HECO) Integrated Grid Planning Process. Planning Hawaii's Grid for Future Generations: Integrated Grid Planning Report. March 1, 2018. p. 5.
- **Key Commission decisions in Integrated Distribution Planning (IDP); stakeholder involvement**. Mid-Atlantic Distributed Resources Initiative. Integrated Distribution Planning for Electric Utilities: Guidance for Public Utility Commissions. October 2019. pp. 6–9, 421.
- **Guidance Document (example)**. Case 14-M-0101, Proceeding on Motion of the Commission in Regard to Reforming the Energy Vision. Staff Proposal: Distributed System Implementation Plan Guidance.
- **Guidance Document**. Maryland's Statement of Guiding Principles. In the Matter of Transforming Maryland's Electric Distribution Systems to Ensure That Electric Service Is Customer-centered, Affordable, Reliable and Environmentally Sustainable in Maryland. p. 3.
- **Guidance Document.** Minnesota's Integrated Distribution Planning Requirements for Xcel Energy. Docket No. E-002/CI-18-251, Order Approving Integrated Distribution Planning Filing Requirements for Xcel Energy. Issue Date: August 30, 2018.
- **Guidance Document**. Michigan's Overarching Goals for Distribution System Planning. Michigan Public Service Commission Issue Brief. Electric Distribution System Planning. October 11, 2017. p. 2.



Futures and Forecasts

Once the Guidance Document has been developed, a **Futures** step identifies probable future trajectories across the transmission, resource, and distribution systems based on consideration of the key variables that could influence forecasting. For example, the Futures step will consider current and prospective state, regional, and federal policies, as well as the potential for new technologies, market disruption, and potentially other exogenous factors. Futures should also consider prospects for utility and asset ownership, including planned retirements of generation and other assets. By leveraging modeling tools and reliable techno-economic data, an appropriate range of potential future scenarios are created, evaluated, and refined. Stakeholders are engaged in this process step through a platform such as a technical conference.

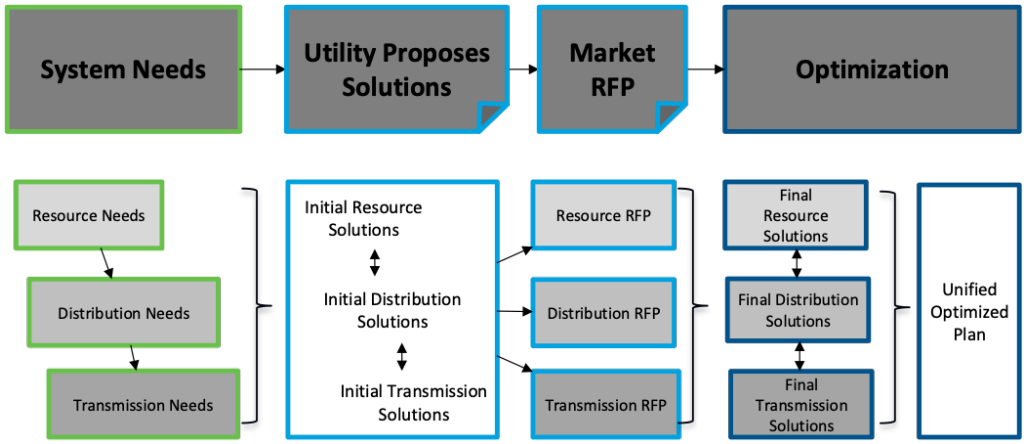
Next, a **Forecasts** step uses transparent and justified input assumptions for the resource, distribution, and transmission systems to project system demand and compare it to current capabilities. Since transmission planning is not entirely within the domain of state jurisdiction, external transmission inputs are expected to be required. The forecasts also incorporate current and potential future policies (e.g., codes, standards, electric vehicles, greenhouse gas emissions, resiliency and security policies) and markets (e.g., Energy Imbalance Market [EIM], Regional Transmission Operator [RTO]/Independent System Operator [ISO]), current and potential technology trajectories (e.g., distributed generation, energy efficiency, electric vehicles, other distributed energy resources [DERs]), and relevant socio-economic data.

The forecasting process is iterative such that the results of each sequenced forecasts step impact the next forecasted layer. Specifically, the resource forecast is conducted first and is then adjusted per the distribution forecast, and subsequently by the transmission forecast.

The forecast outputs include granular spatial and temporal characteristics of demand and supply resources. Forecasts for all three systems are combined into a final integrated system plan forecast that is used to identify system needs. Stakeholder input on forecasts is received through formal comments, and the Commission issues a decision on the direction of the forecasts.

Existing Guidance, Resources, and Examples

- **Integrated planning coordination**. Electric Power Research Institute. Developing a Framework for Integrated Energy Network Planning (IEN-P). July 2018.
- **Planning objectives and criteria**. NARUC-NASEO Task Force on Comprehensive Electricity Planning. Planning Criteria Metrics for Distribution System Planning. September 25, 2019. Webinar slides and recording.
- **Forecast assumptions and stakeholder engagement**. HECO's Integrated Grid Planning. Forecast Assumptions Working Group Documents.
- **Advanced forecasting.** New York State Joint Utilities. Appendix A: Response to Staff Whitepaper 2018 DSIP Guidance. See section 4.2 from New York State Electric & Gas and Rochester Gas and Electric Corporation. July 31, 2018.
- **Aligning planning forecasts with state energy policy**. California Integrated Energy Policy Report Process. 2020 Integrated Energy Policy Report Update. California Energy Commission. March 2020.
- **Holistic forecasting best practices**. Mills, Andrew D. Forecasting load on the distribution and transmission system with distributed energy resources. Lawrence Berkeley National Laboratory, Distribution Systems and Planning Training for Midwest Public Utility Commissions. January 16–17, 2018. Presentation.
- **Forecasting DERs**. NARUC-NASEO Task Force on Comprehensive Electricity Planning. There's a Major Change Headed Our Way: Forecasting DERs for Planning Purposes. July 23, 2019.



System Needs, Proposed Solutions, RFP, and Optimization

The **System Needs** step includes describing modeled deficiencies technically to inform a scope of work for the RFP. Information pertaining to system needs is identified for each discrete planning system and may include the type of deficiency (product or service required), the amount (megawatts and megawatt-hours), location, time (applicable hours and months), likelihood, safety features and risks, and reliability and resilience needs.

Then, the next step is for **Utility-Proposed Solutions** to address those needs. A diverse array of potential solution options should be considered (e.g., procurement, rate design, policy changes, market design, customer programs, operational changes). While solutions are identified within separate processes, solutions in one process may be used to address a need identified in a separate process.

For example, distributed generation may reduce the need for utility-scale generation resources and transmission, or greater transmission may reduce the need for local generation resources. Utilities consider "one to many" relationships where multiple solutions can meet a given need or a single solution can meet multiple needs. In proposing solutions, cost-benefit analysis is conducted that considers hard-to-value elements, risks, and uncertainties. Stakeholder input is incorporated into the utility-proposed solutions.

To engage the creativity of the market, a **Market RFP** is issued for the set of identified system needs for each planning level (resource, distribution, and transmission) to validate or possibly alter utility-proposed solutions. The RFP provides the market with data-rich descriptions of needs, is technology-neutral, and includes the utility-proposed solution description and cost. It serves as a check on utility-proposed solutions by asking the market to submit bids of alternative solutions to the needs at competitive costs. Solutions may include operational practices, customer programs, and market-based approaches, as well as procurement and installation of equipment and infrastructure.

The Forecasting step described earlier, and the system needs/system solutions/RFP steps are intended to be iterative such that each planning level (resource, distribution, and transmission) can be considered both independently and interdependently. For example, a forecast for distribution needs can be conducted, then for resource needs, and then for the combined set of needs.

Once all utility and market solutions have been proposed, a multipronged **Optimization** process is pursued to evaluate first for each discrete planning process, and then holistically for all three in as unified a manner as possible, to determine which set of solutions would best fulfill system needs. This step recognizes that not all individual factors can be simultaneously optimized; there will be tradeoffs. This step aims to leverage the best available computer models and qualitative reasoning to solve for the least-cost, least-regrets solution portfolio across potential futures. Modern modeling software is leveraged wherever possible to produce, streamline, and validate optimal results. It is important to ensure that all identified system needs are solved and that solutions are aligned with the Guidance Document goals.

Existing Guidance, Resources, and Examples

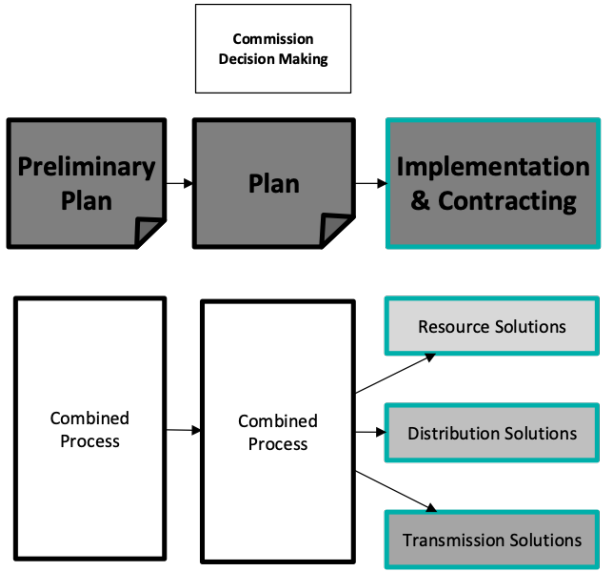
- **Non-wires solutions implementation**. Rocky Mountain Institute. The Non-Wires Solutions Implementation Playbook: A Practical Guide for Regulators, Utilities, and Developers. 2018.
- **Identifying system needs and sourcing solutions**. Non-Wires Alternatives Identification and Sourcing Process and Notification Practices. Joint Utilities of New York. Supplemental Information on the Non-Wires Alternatives Identification and Sourcing Process and Notification Practices. Filed with the New York Public Service Commission on May 8, 2017.
- **Framework for sourcing DER solutions on distribution system**. California Public Utilities Commission Decision 18-02-004 and example of PG&E's 2019 Distribution Investment Deferral Framework (DIDF) Request for Offers (RFO or Solicitation).
- **Industry survey of non-wires alternatives for distribution grid needs**. Pacific Energy Institute. NWA Opportunity Evaluation Survey of Current Practice. Prepared for Hawaiian Electric Co. March 2020.
- **Utility experience with non-wires alternatives.** Non-Wires Alternatives: Lessons and Insights from the Front Lines. Presentation from Avangrid, Consumers Energy, and HECO at the Peak Load Management Alliance Conference. November 14, 2017.
- **Benefit-cost analysis**. Woolf, Tim. Benefit-Cost Analysis for Utility-Facing Grid Modernization Investments. Synapse Energy Economics. March 7–8, 2019. Presentation.
- **Solution evaluation and optimization + stakeholder engagement**. HECO's Integrated Grid Planning. Solution Evaluation and Optimization Working Group Documents.
- **Competitive procurement + stakeholder engagement**. HECO's Integrated Grid Planning. Competitive Procurement Working Group Documents.

Drafting, Finalizing, and Implementing Plans

A **Preliminary Plan** is then developed that describes the proposed portfolio resulting from the optimization process and describes an approach to implement the portfolio. The Preliminary Plan is released to stakeholders who provide input through technical conferences and formal comments focused on the costs, benefits, and risks of the proposal.

The Preliminary Plan is then refined into a **Final Plan** that addresses all system operational needs and meets Guidance Document goals. Stakeholders have opportunities to provide additional formal comments, and the Commission has its final checkpoint of the planning processes as it conducts its own decision making on the adequacy of the plan.

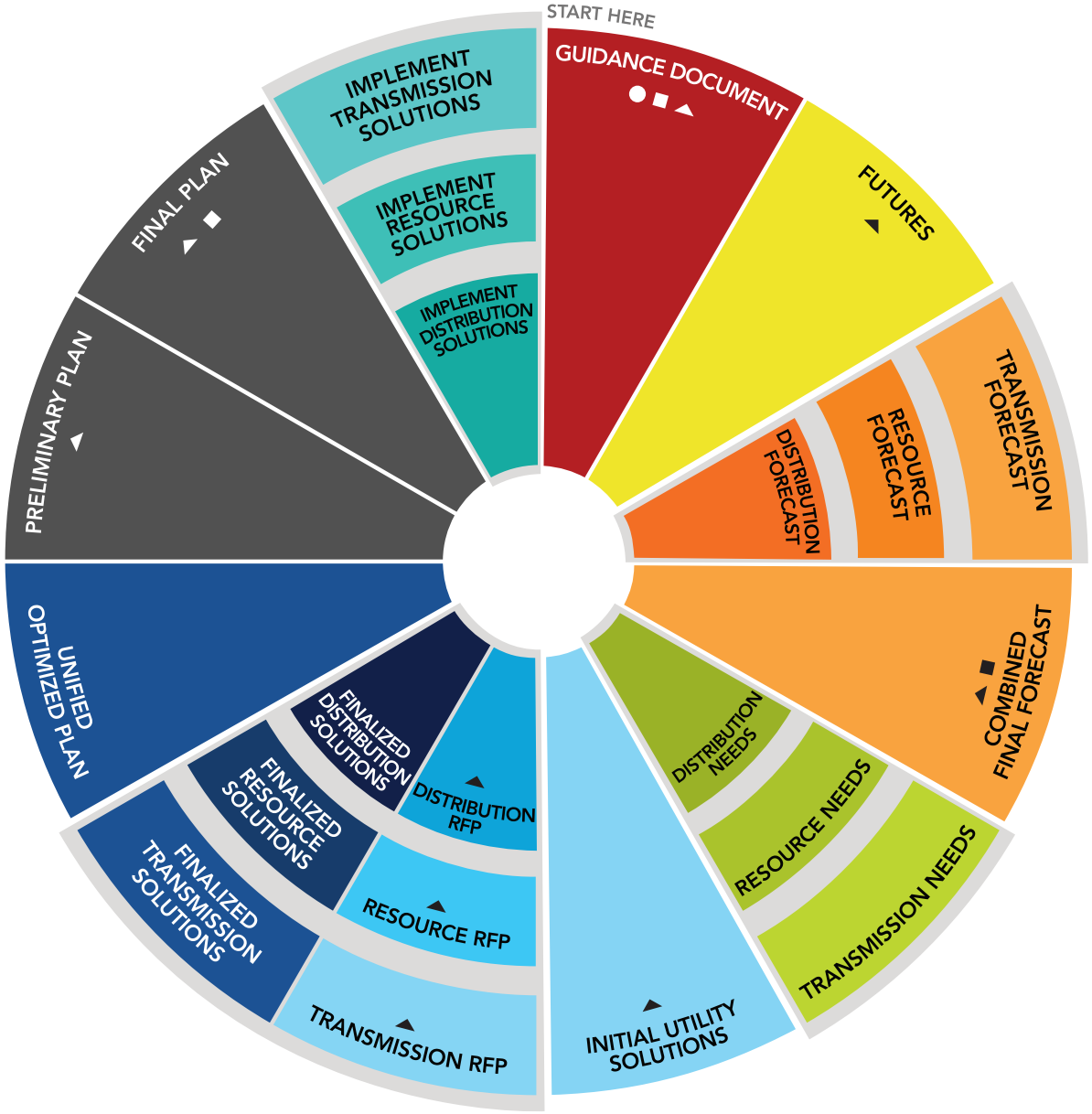
Implementation of the Final Plan includes **contracting** for the procurement of approved solutions; deploying utility pricing, programs, or policies; and consideration of the utility business model through a rate case or innovative regulatory design processes. Progress is tracked toward relevant policies and Guidance Document planning objectives. Market activities and technological advances are monitored. Learning and revisions to the planning process for future planning cycles will reflect policy and market changes. The Final Plan also will inform state policymakers about electricity system needs that can be addressed at the policy level.



Existing Guidance, Resources, and Examples

- **Final Integrated Distribution Plan (example)**. Xcel Energy. Integrated Distribution Plan (2020–2029). Docket No. E002/M-19-666. November 1, 2019.
- **Preparing action plans, incorporating stakeholder input**. Mid-Atlantic Distributed Resources Initiative. Integrated Distribution Planning for Electric Utilities: Guidance for Public Utility Commissions. October 2019. p. 42.

Vision Summary



This circular diagram is a representation of the Turquoise cohort's vision for aligned electricity planning, highlighting the vision and emphasizing the touchpoints and opportunities for greater alignment of electricity planning processes. The diagram serves two purposes: it is the executive summary of the cohort's roadmap and is designed in a way to facilitate comparisons with other cohorts' visions.

To structure their roadmap, the cohort relied on eight foundational categories of planning, indicated by the color of each step. The sequence of the categories in this diagram is specific to the Turquoise cohort vision for aligned planning.

Planning Categories

- Establish Planning Assumptions
- Describe the Future Trajectory
- Develop Forecasts
- Identify System Needs
- Identify Solutions to Address Needs
- Evaluate and Apply Criteria to Determine Preferred Solutions
- Finalize Solutions, Approve and Publish Plan
- Implement

- State Policy Inputs to Planning
- State Regulatory Role in Planning
- Stakeholder Engagement

The Turquoise diagram shows three concentric rings that represent distribution, resource, and transmission planning. Starting at the top and proceeding clockwise around the planning cycle, the wedges represent sequential steps. The Turquoise diagram includes six steps where wedges stretch across multiple rings. The cohort envisions an integrated approach to completing each of these steps:

- The development of a guidance document to clarify planning objectives at the beginning of each integrated planning cycle
- Electricity system futures scenario analysis
- Combining load forecasts from transmission, distribution, and resource analysis
- A holistic view of utility-proposed solutions to meet established system needs
- Selection of final solutions incorporating responses to RFPs from utilities and others
- A unified optimization plan building on the system-wide selected solutions
- A preliminary and then final single, integrated resource plan

This roadmap document explains the Turquoise cohort vision in greater detail, expanding upon the vision summary diagram to include a flowchart of the entire integrated or aligned planning process, brief descriptions and explanations of each section of the flowchart, and points of evidence for innovative planning steps that appear in the vision.

NARUC-NASEO Task Force on Comprehensive Electricity Planning Resources Available

Through the Task Force on Comprehensive Electricity Planning, Task Force members, NARUC and NASEO staff, technical and subject matter experts, and others have developed a robust set of resources to support state decision makers in advancing aligned electricity system planning processes. Task Force materials are now available on the Task Force website: www.naruc.org/taskforce.

Task Force Resources

- Factsheet provides a synopsis of the Task Force goals, members, and resources.
- Blueprint for State Action supports states seeking to further align electricity system planning processes in ways that meet their own goals and objectives. The Blueprint provides a step-by-step approach for states to develop and implement a plan or series of actions to better align planning processes, based on the experience of Task Force member states.
- Task Force Cohort Roadmaps describe five distinct visions for an ideal comprehensive electricity planning process created by Task Force members. The process is viewed from the state perspective on how to align or integrate distinct planning processes that, historically, have not significantly informed one another. Each roadmap explains one vision for aligned planning, including both procedural and analytical steps, alongside points of evidence for innovative approaches that appear in the vision.
- Opportunities to Improve Analytical Capabilities towards Comprehensive Electricity System Planning outlines potential data, tools, and methods for conducting integrated analyses across key points in electricity planning processes that could help achieve the visions of the Task Force. This scoping study will be used to conduct a gap analysis and develop a research agenda for approaches and capabilities in areas such as load forecasting, solution evaluation, and system optimization within planning.
- Standard Building Blocks of Electricity System Planning Processes shares information about the color-coded framework cohorts used to describe their vision for aligned planning processes in consistent terms.
- Comprehensive Electricity Planning Library enables further learning about important issues related to comprehensive electricity planning by linking to existing publications and webinars. The library is organized across 15 key topical areas.
- Member State Summary Information includes a 2018 snapshot of each of the 15 member state's electricity system profile, organizational responsibilities, policy goals, and existing planning processes.

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About NARUC

NARUC is a non-profit organization founded in 1889 whose members include the governmental agencies that are engaged in the regulation of utilities and carriers in the fifty states, the District of Columbia, Puerto Rico and the Virgin Islands. NARUC's member agencies regulate telecommunications, energy, and water utilities. NARUC represents the interests of state public utility commissions before the three branches of the federal government. www.naruc.org.

About NASEO

NASEO is the only national non-profit association for the governor-designated State Energy Directors and the over 3,000 staff of their offices from each of the 56 states and territories. Formed by the states in 1986, NASEO facilitates peer learning among state energy officials, serves as a resource for and about state energy policy, and advocates the interests of the state energy offices to Congress and federal agencies. www.naseo.org.

NARUC-NASEO Task Force on Comprehensive Electricity Planning