February 2021

SILVER COHORT ROADMAP

NARUC-NASEO TASK FORCE ON COMPREHENSIVE ELECTRICITY PLANNING

NARUC
National Association of Regulatory Utility Commissioners

NASEO
National Association of State Energy Officials

Table of Contents

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 – Silver 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 and distribution 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 Silver cohort, accompanied by a brief discussion of the rationale for these changes in comparison to the status quo of electricity system planning.

About Silver: 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 and resource planning processes
Additional Characteristics	
A few other characteristics you should know	• We have unique geography and are vulnerable to particular weather events and natural disasters • There is no retail competition • We have flat or declining load
We are doing this because we want to accomplish	• Achieving a functional, comprehensive planning process that integrates all of the components of the electricity system
While keeping in mind	• Environmental needs • Technical requirements • Affordability
And trying to be responsive to	• New customer needs and the capability of integrating new technology

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 Silver cohort.

How to Read the Roadmap

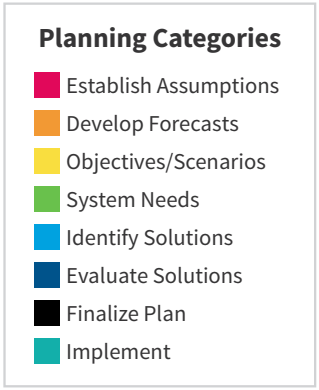
The roadmap describes the substantive activities, specific milestones, regulatory actions, and other deliberate aspects of this cohort's vision that comprise an ideal planning process. It describes the necessary sequences, dependencies, and relationships among steps, actions, and information flows (e.g., 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:

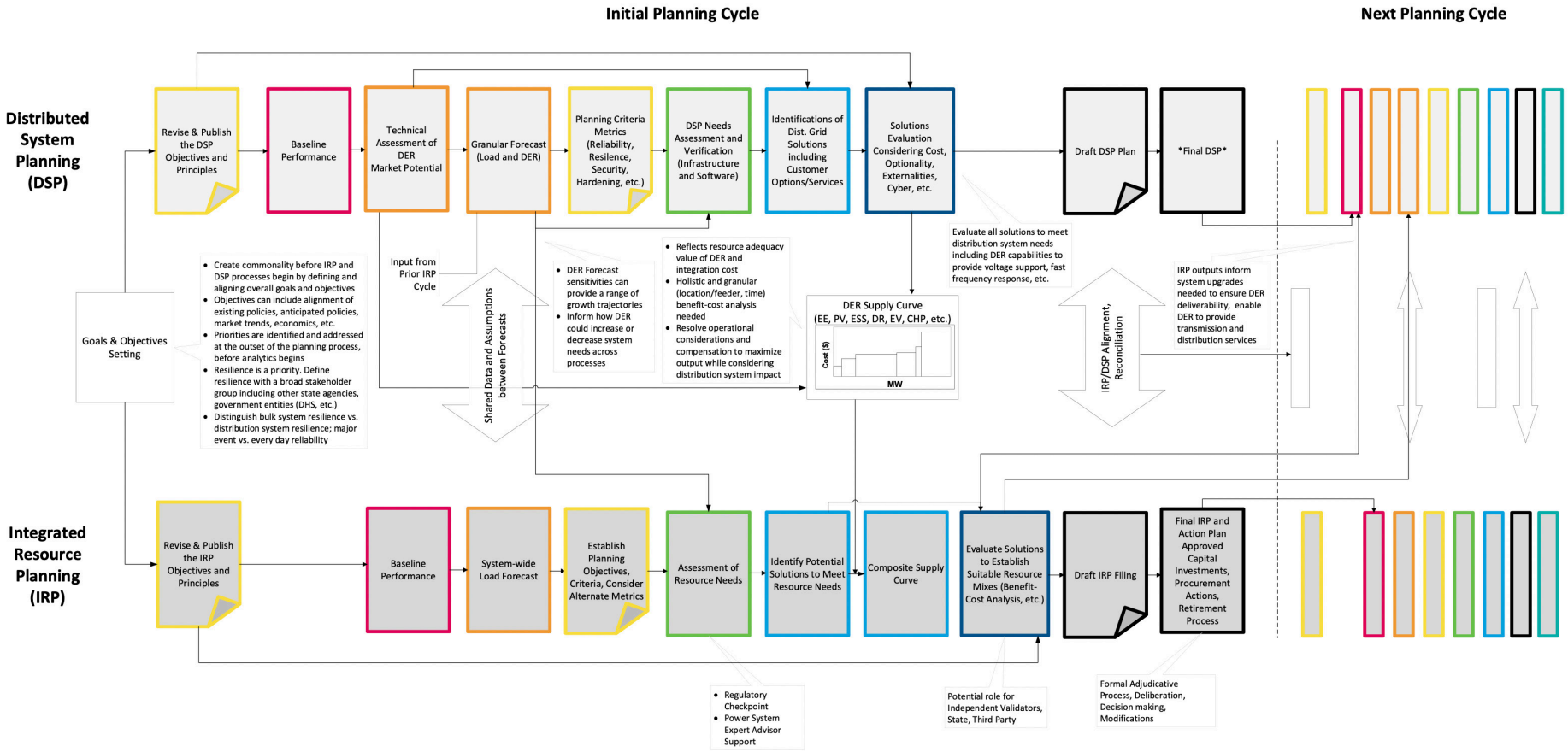
Color key used in flowchart and vision summary:



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.

Silver 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

- Distribution System Planning (DSP)
- Integrated Resource Planning (IRP)
- Touchpoints Across Planning Processes
- Stakeholder Engagement

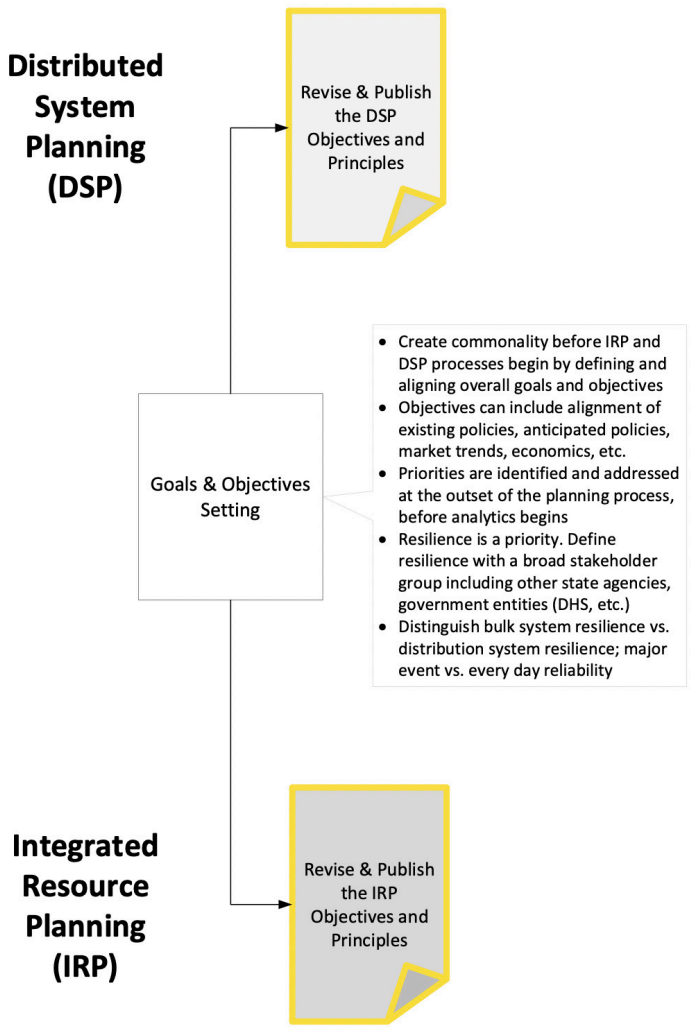
Acronyms

D: Distribution
DER: Distrubted Energy Resources
DHS: Department of Homeland Security
DR: Demand Response
DSP: Distribution System Planning
EE: Energy Efficiency
ESS: Energy Storage Systems
EVs: Electric Vehicles
IRP: Integrated Resource Planning
MW: Megawatts
PV: Photovoltaics

Silver Roadmap Features

The Silver cohort envisioned several innovative steps that represent a departure from traditional planning practices. These innovations are shown in the flowchart as shapes and arrows between the distribution system planning (DSP) and integrated resource planning (IRP) rows. They include:

- **Common goals and objectives**. Goals and objectives for DSP and IRP are identified at the outset, with stakeholder involvement, in ways that advance a level of congruence between the outcomes of both processes.
- **Information flows**. Pathways for information exchange and shared data between the planning processes and where these information exchanges occur in the sequence of planning are identified.
- **Holistic solutions**. Outlines an approach for solutions identification and evaluation in DSP to inform IRP, and vice versa, enabling a holistic view of solutions to meet system needs. Specific information flows and alignment mechanisms can mitigate process biases against investments in non-traditional resources in both IRP and DSP.



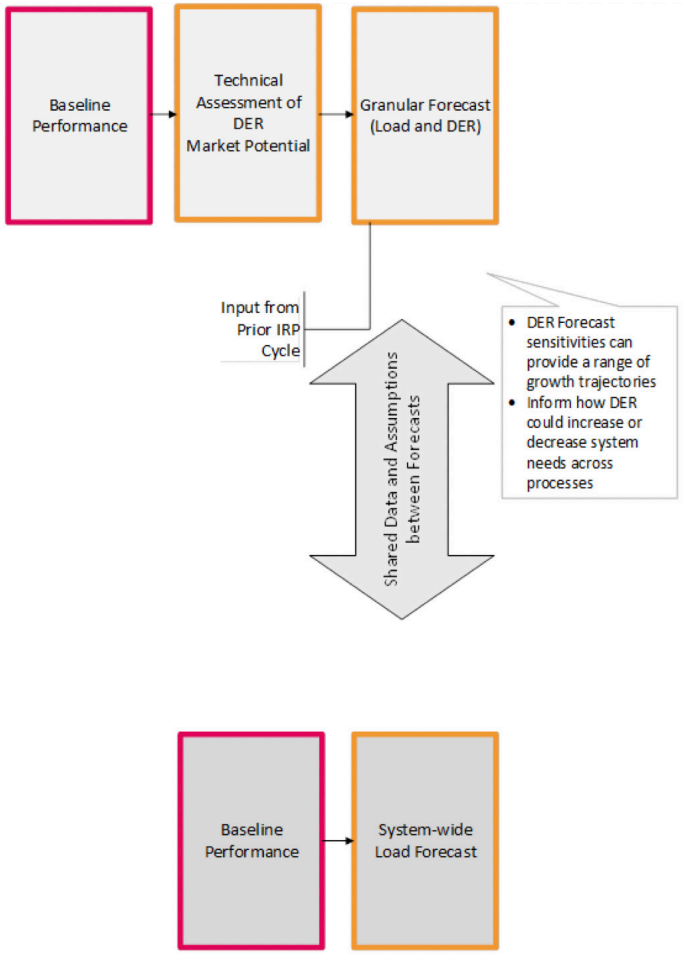
Objective Setting

The process begins with the development of common goals and objectives that will inform both DSP and IRP. These objectives impact how each plan is carried out and will help advance a level of congruence between the outcomes. Objectives can reflect a wide range of inputs, including public policy requirements, performance measures, and economic factors. Priorities are identified and addressed at the outset, before analytics begin.

Resilience is a high priority for the hypothetical State of Silver and is highlighted as a key element of the goals and objectives process step. The team outlined a public-facing stakeholder engagement process as a key element of this step and identified the need for input from numerous parties, including those who coordinate on resilience issues (e.g., prepare hazard mitigation plans, vulnerability assessments), such as local government, municipalities, communities, state emergency management agencies, and federal entities, such as the U.S. Department of Homeland Security and Federal Emergency Management Agency.

Existing Guidance, Resources, and Examples

- **Central location for stakeholder engagement information**. Duke Energy. Integrated System & Operations Planning (ISOP) Reference Information Portal. 2020.
- **Resilience objectives in planning**. NARUC-NASEO Task Force on Comprehensive Electricity Planning. Integrated Distribution Resilience Planning. May 26, 2020. Webinar recording. See also presentation slides from the session.
- **Resilience and reliability in near-term and long-term distribution planning**. NARUC-NASEO Task Force on Comprehensive Electricity Planning. DSPx Volume 4: Modern Grid Guidebook. December 17, 2019. Publication forthcoming (see section 2, Planning a Modern Grid).
- **Resilience in planning and stakeholder meetings**. Planning an Affordable, Resilient, and Sustainable Grid in North Carolina (PARSG) Project Overview and May 19, 2020 Stakeholder Meeting.
- **State Resilience Plan and development process**. North Carolina Climate Risk Assessment and Resilience Plan. June 2020.
- **Regulators and resilience**. Jeffers, R., & DeMenno, M. Regulating for Resilience Workshop. NARUC Annual Meeting and Education Conference. November 20, 2019.
- **Resilience Stakeholder Working Group**. Hawaiian Electric Company (HECO) Resilience Working Group. See Resilience Working Group Documents. See also Resilience Working Group Report for Integrated Grid Planning. April 29, 2020.
- **Resilience in planning**. Resilience Roadmap: A Collaborative Approach to Multi-Jurisdictional Resilience Planning (web version). Full report available here. See Step 1 (intergovernmental preparation and coordination) and Step 2 (planning and strategy development).
- **Resilience Planning Guidebook**. Stout, S., Lee, N., et al. Power Sector Resilience Planning Guidebook. National Renewable Energy Laboratory (NREL) – U.S. Agency for International Development Partnership. 2019.
- **Reliability metrics and reliability value-based planning**. Eto, Joe, Lawrence Berkeley National Laboratory. Reliability Metrics and Reliability Value-Based Planning. Mid-Atlantic Distribution Systems and Planning Training and NARUC-NASEO Task Force on Comprehensive Electricity Planning. March 7–8, 2019.



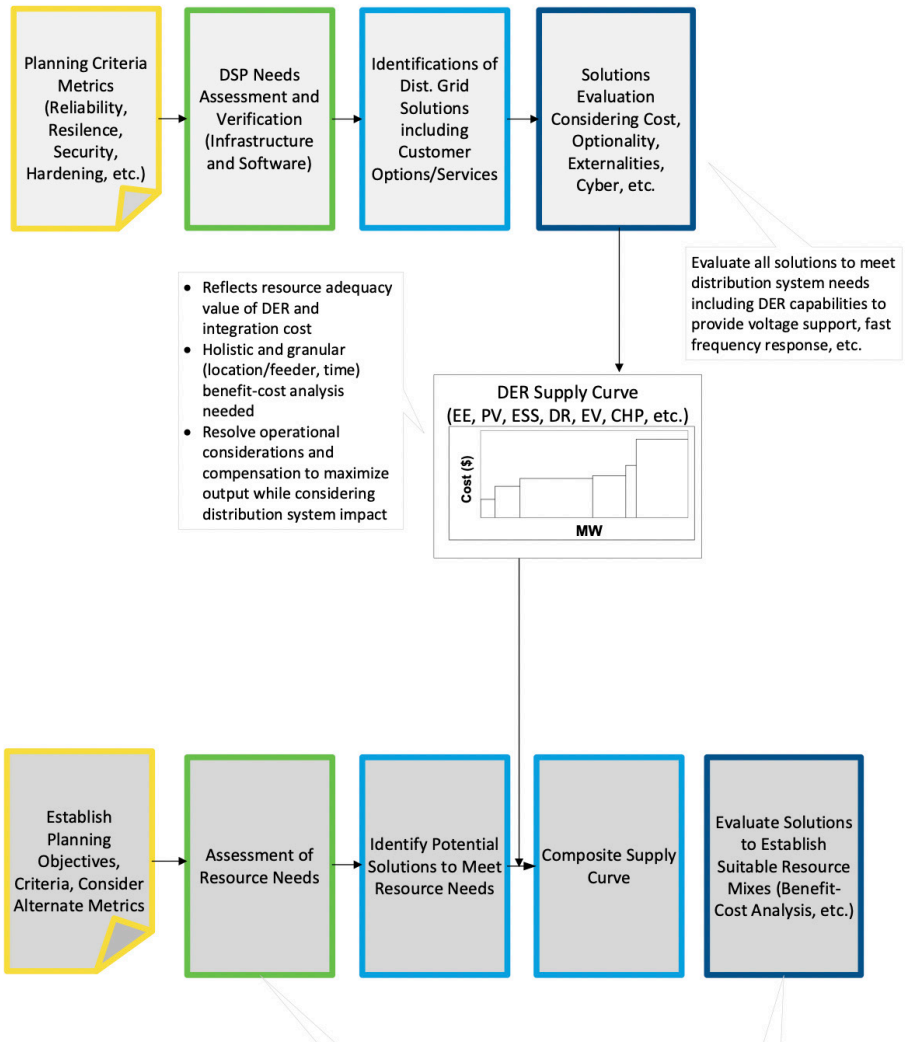
Forecast Alignment

Goals and objectives inform a **baseline performance** assessment of the system at both the distribution and resource levels. At the distribution level, the baseline performance step ensures that accurate information is available to adequately assess thermal, voltage, and protection limits. At the resource level, the baseline performance step entails ensuring that accurate information is available to establish resource adequacy needs (e.g., all planned retirements or additions are reflected). Defining objectives and outcomes at the start of the process may reveal data needs and guide methodologies to ensure that planners are able to identify the full set of solutions consistent with those principles. They also can identify the information needed to evaluate the alignment of solutions with the stated outcomes.

At the distribution level, the forecasting elements are split in two parts. First, a basic **technical assessment of distributed energy resource (DER) market potential** identifies how many DERs are possible. Second, the **granular forecast for load and DERs** identifies an expectation for how both load and DERs are likely to grow and evolve from current conditions, from the bottom-up. This analysis both informs and is informed by the **system-wide load forecast** at the resource level. There is a two-way information flow between the granular forecast and the system-wide forecast to advance greater consistency in the planning inputs used across processes.

Existing Guidance, Resources, and Examples

- **Forecasting DERs on distribution and transmission system**. McCabe, Kevin, NREL. Forecasting load on the distribution and transmission system with distributed energy resources. Mid-Atlantic Distribution Systems and Planning Training and NARUC-NASEO Task Force on Comprehensive Electricity Planning. March 7–8, 2019.
- **Forecasting distributed photovoltaic (PV) in utility resource planning**. Gagnon, Pieter, et al. Estimating the Value of Improved Distributed Photovoltaic Adoption Forecasts for Utility Resource Planning. National Renewable Energy Laboratory. May 2018.
- **Incorporating distributed PV in utility resource planning**. Mills, Andrew, et al. Planning for a Distributed Disruption: Innovative Practices for Incorporating Distributed Solar into Utility Planning. Lawrence Berkeley National Laboratory. August 2016.
- **Forecasting DERs for planning purposes**. NARUC-NASEO Task Force on Comprehensive Electricity Planning. There's a Major Change Headed Our Way: Forecasting DERs for Planning Purposes. July 23, 2019. Panel recording. See presentation slides from panelists, including Juliet Homer, Senior Energy Research Engineer, Energy Policy and Economics Group, Pacific Northwest National Laboratory; Kevin Kushman, President, Integral Analytics, Inc.; and Patrick McCoy, Distributed Energy Strategy, Grid Strategy and Operations, Sacramento Municipal Utility District.
- **DER forecasting tools.** Utility Dive. How leading utilities are planning for distributed energy resources. February 6, 2018. (Note case studies from Pacific Gas & Electric, Hawaiian Electric Company, Southern California Edison, Sacramento Municipal Utility District, etc.)



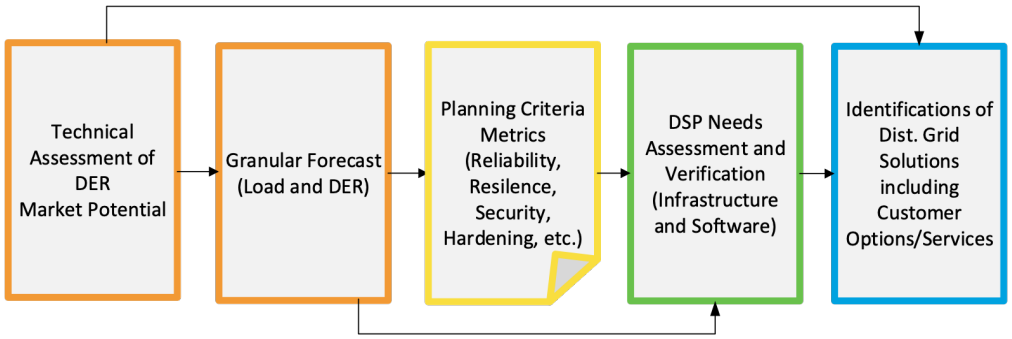
System Needs, Identify Solutions, Evaluate Solutions

After the forecast provides an expectation of how load and DERs will evolve, **planning criteria metrics** will need to be evaluated in the planning process. Consider sensitivities, alternative scenarios, policy impacts, or other analysis that can be conducted to provide a range of relevant growth trajectories and help inform how DERs could increase or decrease system needs at both the distribution and bulk system levels. Stakeholders are invited to provide input on establishing and prioritizing planning criteria metrics and modeling assumptions.

The long-term distribution system plan and integrated resource plan require the evaluation of solutions to meet system needs. These needs reflect the inputs that define the current state and the projected evolution across the planning horizon. In the case of resource planning, the focus will be on ensuring that there are sufficient planning reserves to ensure that the supply-demand balance meets established planning criteria and evaluating a defined set of contingency conditions. The long-term distribution system plan will identify projects to address any projected thermal, voltage, or protection criteria violation. The identification and evaluation of solutions in IRP and DSP should reflect all available resources and all relevant attributes of those resources. For example, the contribution of distributed resources to system resource needs (e.g., resource adequacy) and distribution needs (e.g., fast frequency response and voltage support) should be reflected and evaluated relative to traditional solutions using consistent, technology-neutral methods. In both cases, planners could evaluate additional attributes of potential solutions to assess them relative to the objectives established at the outset of the planning process.

To the extent that those objectives seek to ensure that a broad set of solutions are considered, additional steps might be needed to identify non-traditional solutions early to ensure that they can be evaluated on a comparable basis with traditional solutions. For example, DER forecasting results can provide information about the range of projected DER growth in a given location and its impact on system needs. In addition, the technical potential for DER in an area can form the basis of understanding the ability of sourcing additional resources in that area to meet an identified need. This is why the arrow from the orange box "Granular Forecast (Load and DER)" points to the green box focused on needs assessment, and the arrow from the orange box "Technical Assessment of DER Market Potential" points to the light blue box focused on solutions identification.

The alignment points between distribution system planning and integrated resource planning with respect to system needs evaluation and solutions identification, and solution evaluation reflects the notion that DERs have both distribution and bulk system value and impacts. Therefore, a **DER Supply Curve** that reflects the aggregate value of DERs at increasing costs can inform not only DER sourcing to meet distribution system needs, but also bulk system needs. Similarly, DERs sourced as part of the resource plan can impact distribution system needs and DER integration costs. This DER Supply Curve will be combined with traditional supply-side central station supply options to provide a composite supply curve that reflects all of the supply-side and demand-side resources available to meet system needs. The focus is on identifying investments that produce the least cost for society in the context of a broad set of metrics that are reflective of the objectives set out at the beginning of the planning process. This could include traditional measures such as resource adequacy contributions, but also could include additional aspects such as system flexibility and resilience.



Existing Guidance, Resources, and Examples

- **Exploring market solutions for supply needs**. HECO's Integrated Grid Planning Process.[4]
- **Industry survey of non-wires alternatives (NWA) for distribution grid needs**. Pacific Energy Institute. NWA Opportunity Evaluation Survey of Current Practice. Prepared for Hawaiian Electric Co. March 2020.
- **Non-wires opportunity evaluation methodology**. HECO. Non-Wires Opportunity Evaluation Methodology. June 2020.
- **Utility experience with non-wires alternatives**. What Everyone Keeps Getting Wrong About NWAs: And Why Utilities Should Pay Attention.
- **Utility experience with non-wires alternative**. Non-Wires Alternatives: Lessons and Insights from the Front Lines. Presentation from Avangrid, Consumers, and HECO at the Peak Load Management Association Conference. November 14, 2017.
- **Non-wires solutions implementation**. Rocky Mountain Institute. The Non-Wires Solutions Implementation Playbook: A Practical Guide for Regulators, Utilities, and Developers. 2018.
- **Non-wires solutions and value stacking**. How to "Stack" Your Way to a Successful NWA. ICF blog post. October 17, 2018. https://www.icf.com/insights/energy/stack-nwa-utilities.
- **Multiple use application issues for DERs**. California's Decision on Multiple-Use Application Issues. January 11, 2018.[5]
- **Planning criteria**. NARUC-NASEO Task Force on Comprehensive Electricity Planning. Planning Criteria Metrics for Distribution System Planning. September 25, 2019. Webinar recording.

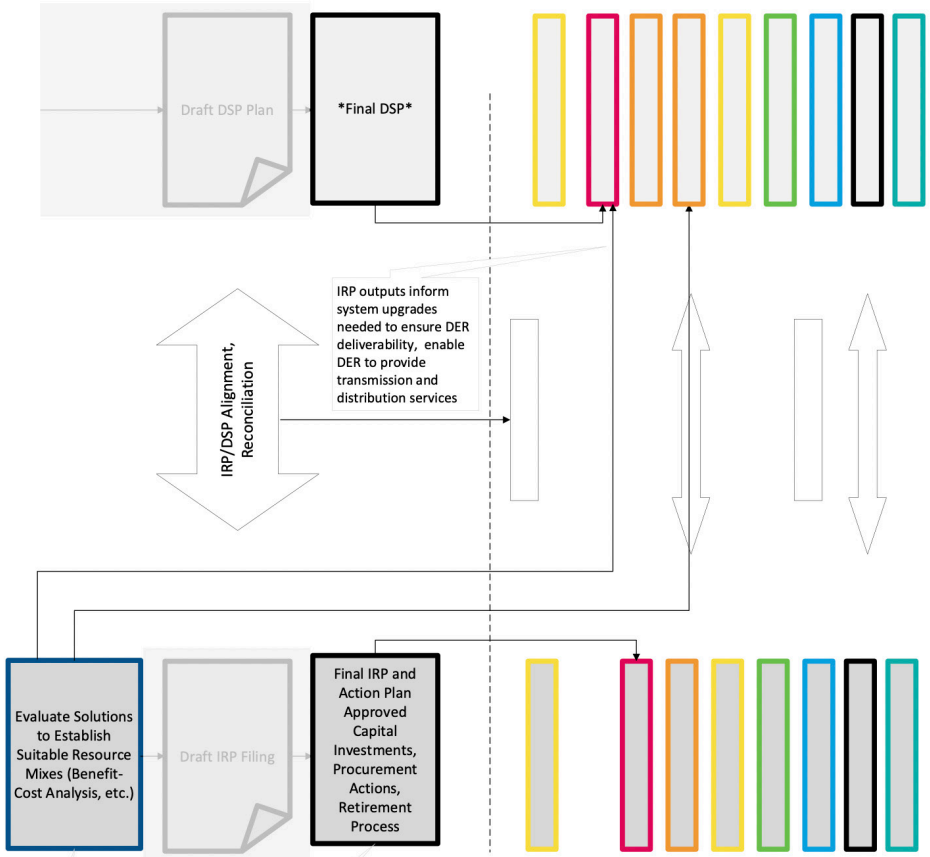
4 Hawaii is an example of an approach to identifying and evaluating solutions through requests for information (RFIs) and then procuring solutions through requests for proposals to identify the lowest cost/best fit solutions. Collecting market information through an RFI process may help ensure that the DER Supply Curve in the hypothetical State of Silver is as relevant and accurate as possible.

5 This decision provides direction to California utilities on how to promote the ability of storage resources to realize their full economic value when they are capable of providing multiple benefits and services to the electricity system. The California Public Utilities Commission adopted 12 rules to govern the evaluation of multiple-use energy storage applications and definitions of service domains, reliability services, and non-reliability services.

Informing Subsequent Planning Cycles

The final stage focuses on information flows between the planning cycles and identifying future opportunities for greater inter-cycle alignment. This reconciliation step informs how the goals and objectives and other alignment opportunities can be enhanced to ensure continuous improvement in subsequent planning cycles. For example, final plans will include a description of the current system and anticipated changes resulting from the latest iteration of planning; these results form the basis for the planning assumptions and modeling inputs used in the next iteration of planning.

Another *inter*-cycle linkage closes an important information loop. The loop begins in the DSP solution evaluation step (dark blue), which informs an *intra*-cycle pathway through the DER Supply Curve to the IRP solution identification step (light blue). This alignment path enables the IRP process to account for DER sourcing in the identification of solutions for bulk system needs. A similar step is needed to close that loop and enable subsequent DSP plans to account for DERs sourced through prior IRPs. The inter-cycle linkage, starting with the solution evaluation step in the IRP process (dark blue), completes that loop by feeding the latest information about how load and DERs are likely to evolve into the granular forecasting step of the DSP process in the subsequent cycle. These linkages also enable incorporation into the DSP baseline of IRP outputs such as system upgrades identified to ensure DER deliverability and enable DERs to provide transmission and distribution services.



Vision Summary

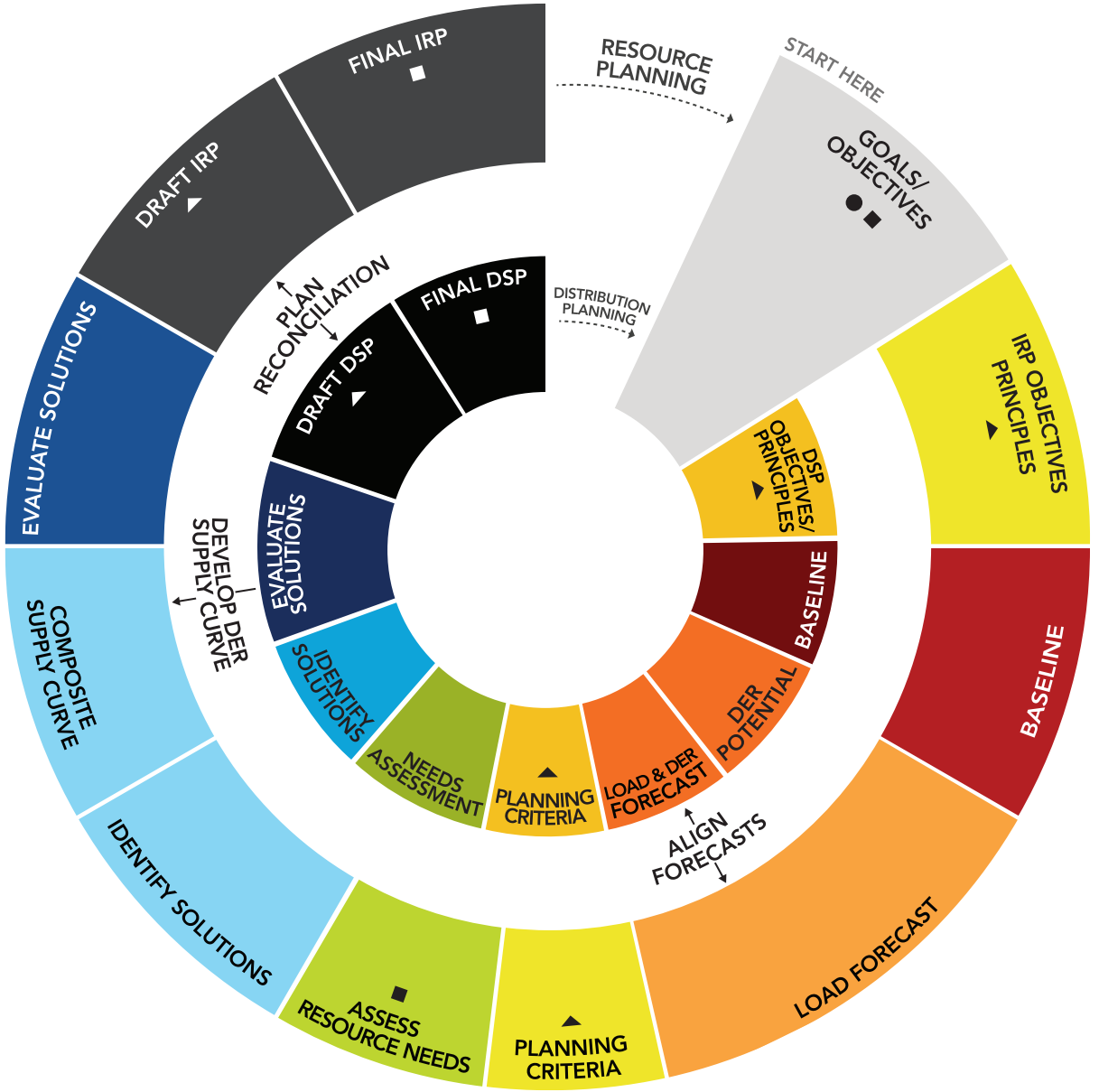
This circular diagram is a representation of the Silver cohort's vision for aligned electricity planning, highlighting the vision and emphasizing the touchpoints and opportunities for greater alignment of electricity planning processes. The diagram serves two purposes: it is the executive summary of 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 Silver cohort vision for aligned planning.

Planning Categories

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

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



The Silver diagram shows two concentric rings that represent distribution and resource planning. Starting at the top and proceeding clockwise around the planning cycle, the wedges represent sequential steps. The Silver diagram includes one step where the wedge stretches across both rings. The cohort envisions an integrated approach to completing the step:

- Establishing a unified set of goals and objectives across distribution and resource planning

Where the black arrows connect one step to another between the concentric circles, the Silver cohort envisions that reconciliation is needed between the distribution and resource planning steps for:

- Establishing a baseline
- Composing a resource supply curve and evaluating distribution system solutions through development of a DER supply curve
- Drafting the integrated distribution and integrated resource plans.

This roadmap document explains the Silver 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.

This material is based upon work supported by the U.S. Department of Energy under award numbers DE-OE0000818 and DE-OE0000810.

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.

This page intentionally left blank.

NARUC-NASEO Task Force on Comprehensive Electricity Planning