Reimagining Resource Planning

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About RMI

RMI is an independent nonprofit founded in 1982 that transforms global energy systems through market-driven solutions to align with a 1.5°C future and secure a clean, prosperous, zero-carbon future for all. We work in the world's most critical geographies and engage businesses, policymakers, communities, and NGOs to identify and scale energy system interventions that will cut greenhouse gas emissions at least 50 percent by 2030. RMI has offices in Basalt and Boulder, Colorado; New York City; Oakland, California; Washington, D.C.; and Beijing.

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Chapter 3 How to Reimagine Resource Planning	**IRPs must maintain three core qualities to be effective tools for utilities and regulators to evaluate resource decisions:** • **Trusted —** The integrated resource plan (IRP) is transparent and well vetted, with stakeholder input. • **Comprehensive** — The IRP can accurately represent the costs, capabilities, system impacts, and values of the resources that might be available within the planning time horizon, and can consider actions across the transmission and distribution systems as portfolio options. • **Aligned** — It is clear how the plan evaluates options to meet traditional planning requirements such as reliability, affordability, and safety as well as state and federal policies and customer priorities such as reducing emissions and advancing environmental justice. To holistically address the challenges facing planning today, regulators have an opportunity to proactively refine the **purpose, scope, roles,** and **tools** that support planning.
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Executive Summary

Opportunity to Improve Resource Planning

In this period of rapid change in the electricity sector, resource planning has never been more important — or more complex.

Planning represents an opportunity to shape a significant fraction of the future electricity system. Between now (2022) and the end of 2025, utilities serving at least 40% of US total electricity sales and over 90 million customers will file integrated resource plans.[i] Current utility resource plans show that utilities plan to invest over $300 billion in new resources over the next 15 years.

Utility integrated resource plans (IRPs) have historically been tools for utilities and regulators to determine the portfolio of generation and demand-side resources that can meet projected peak and energy demand over the next 10 to 30 years at least cost, while mitigating risk and meeting policy objectives. The outputs of the plan are intended to inform a utility's resource procurement, power purchasing, and program decisions — driving accountability toward a portfolio that results in affordable rates and maintains a safe and reliable grid.

Yet much of the value in resource planning is not in definitively determining the utility's portfolio 30 years out, but in the exercise of planning. Resource planning presents a crucial opportunity for utilities, regulators, and stakeholders to:

- Understand the energy needs of the households, communities, and businesses a utility serves, as well as how they will change over time, and translate them into system needs
- Establish a common set of assumptions and evidence that can be used to assess which near- and long-term options can meet system needs and achieve desired utility performance across multiple objectives
- Identify longer-term risks and opportunities and strategies to navigate them

Challenges of Planning for an Uncertain Future during a Period of Rapid Change

We observe that IRPs must maintain three core qualities to be effective tools for utilities and regulators to evaluate resource decisions, as outlined in Exhibit 1 (next page).

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i This is based on RMI analysis of EQ Research data from September 2022 that summarizes the total proposed resources for investment across 104 utility IRPs plus US Energy Information Administration (EIA) data for total annual sales.

Exhibit 1 **Core IRP qualities and why they're important to utilities and regulators**

IRP quality	Definition	Why quality is important to regulators	Why quality is important to utilities
Trusted	The IRP is transparent and well vetted, with stakeholder input.	When resource plans are trusted, regulators can use them as evidence that future investments are prudent and in the public interest.	When utilities seek input from their customers and engender trust in their assumptions, they can develop an accurate plan that meets customer energy needs and leads to regulatory approval.
Comprehensive	The IRP can accurately represent the costs, capabilities, system impacts, and values of resources that might be available within the planning time horizon; the IRP can consider actions across the transmission and distribution systems as portfolio options.	When plans are comprehensive, regulators can ensure that options to best serve customers have been surfaced and tested.	When plans are comprehensive, utilities can adequately assess the value and risk of their potential future investments.
Aligned	It is clear how the plan evaluates options to meet traditional planning requirements such as reliability, affordability, and safety, as well as state and federal policies and customer priorities, such as reducing emissions and advancing environmental justice.	When plans are aligned, regulators can assess whether the recommended portfolio can perform across the range of performance outcomes within their mandate.	When utilities demonstrate that plans are aligned with policy objectives, they can avoid future disallowance of investments and under- or over-procurement of resources.

Source: RMI

Today, a few major trends are adding urgency and complexity to the IRP process, including but not limited to:

- Rapid technology change and shifting resource costs
- A range of new state and federal policies that expand planning objectives beyond affordability, reliability, and safety to include emissions reductions, advancement of environmental justice, economic development, and support of electrification of transportation, buildings, and industry
- Increasing recognition that decisions made on distribution and transmission systems affect generation resource planning and vice versa
- Increasing stakeholder awareness that resource planning can have an impact on local air quality, health, jobs, energy bills, and climate change

If an IRP does not achieve these three qualities, its credibility, accuracy, and effectiveness may be eroded. The risks of unanticipated costs for ratepayers, disallowed future investments, dissatisfied customers, and failure to meet public policy objectives will increase.

Expanding Scope for Resource Planning

Updating the IRP process to ensure that it remains trusted, comprehensive, and aligned can make IRPs more complex. As such, making changes around the edges or adding new IRP requirements may no longer be what best serves a utility or regulator — especially with staff time and capacity constraints. To use a metaphor to guide our thinking, the goal is to avoid amassing incremental IRP expectations in a way that is like the straw that breaks the camel's back (Exhibit 2, next page).

Exhibit 2 **How new expectations might challenge the IRP process**

To address these challenges more holistically, regulators have an opportunity to proactively and repeatedly refine the purpose, scope, roles, and tools — and to ask big questions about what the next generation of planning should look like — before making piecemeal enhancements.

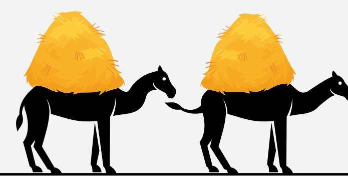
New IRP expectations

Purpose

Regulators and state policymakers have an opportunity to take a step back and clearly articulate goals for the electricity system over the next few decades and how the utility's options for future investment should be evaluated with respect to those goals. With clear goals and an updated framework for making decisions across multiple goals, the information that is needed to make decisions, which should be included in a plan, should become clearer.

Scope

Once the information needed to make decisions is clear, regulators and state policymakers have an opportunity to reevaluate the specific scope of utility resource planning. Instead of adding more requirements to the IRP, there is an opportunity to define additional planning activities with their own objectives, and the links among them. Defining new, separate planning activities is a good option when specific decisions need to happen more or less frequently than an IRP or require more granular or more broad information. For example, regulators or policymakers may identify a need to create a separate distribution system planning process, an economy-wide decarbonization process, or an additional plan that tracks annual progress toward climate targets.

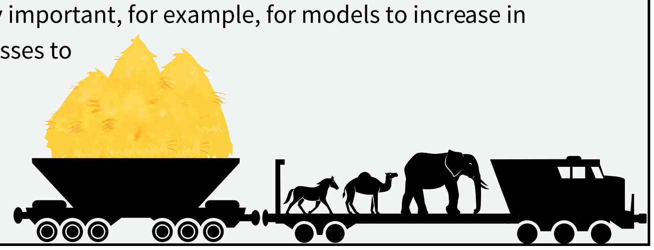


Roles

When clarifying the scope of IRP and other planning activities, state policymakers should consider who, beyond the utility or regulatory staff in the IRP process, might provide or verify key inputs or assumptions that are used in the IRP to maintain accuracy, credibility, and trust. For example, state agencies such as the department of transportation may be able to provide electric vehicle growth projections, or a state energy office might conduct a deep decarbonization study whose assumptions are used in an IRP.

Tools

Finally, the application of analytical tools and engagement processes that support resource planning need to be designed to be flexible, transparent, and continuously improved. It will be increasingly important, for example, for models to increase in computational ability and incorporate new technologies, and for processes to support utilities in meaningfully engaging stakeholders and in getting accurate market information (e.g., through consistent industry engagement and competitive solicitations). Effective tools and processes can reduce some of the friction in today's planning.

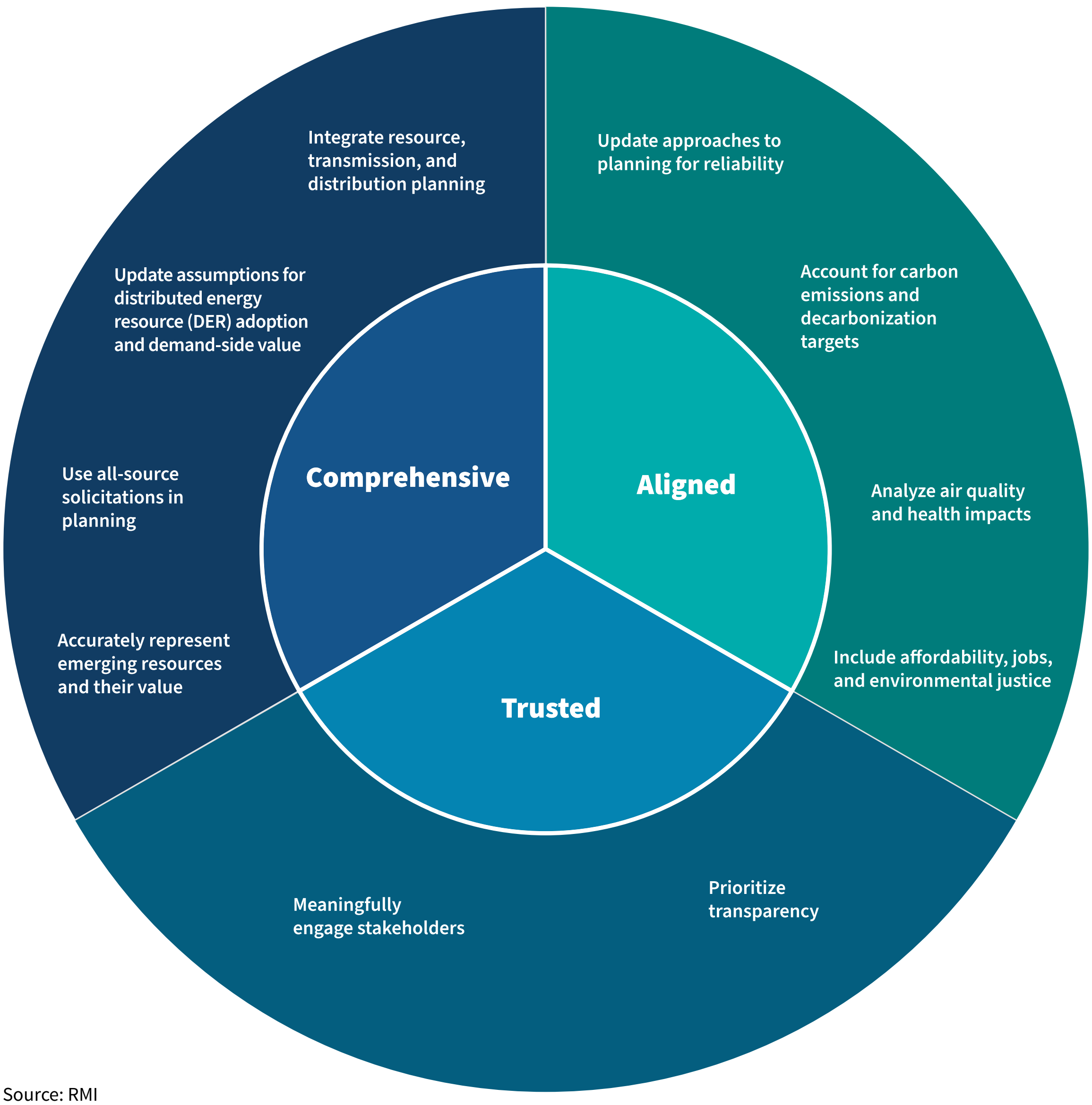


Source: RMI

Overview of Planning Enhancements

After aligning on a set of priority changes, utilities and regulators can look to approaches that have been tested in IRPs across the country that can "enhance" plans to be more trusted, comprehensive, and aligned. These enhancements are summarized in Exhibit 3.

Exhibit 3 **Options to enhance resource planning**



Source: RMI

To build **trust** in resource plans, regulators and utilities are:

- **Prioritizing transparency,** by updating rules that assess what information may be held as confidential or proprietary — and applying those rules to ensure that stakeholders have the information they need to engage effectively in the IRP process

- **Meaningfully engaging stakeholders,** with an inclusive and substantive process for input before and during the plan's development

To make plans more **comprehensive,** regulators and utilities are:

- **Integrating resource, transmission, and distribution system planning,** to better understand how decisions at one level of the grid might affect others

- **Using all-source solicitations in the planning process,** to bring in timely market data as a basis for making procurement decisions

- **Updating assumptions and modeling tools for distributed energy resources (DER) adoption and value,** to more accurately forecast DER growth patterns and impacts and assess DER costs and benefits

- **Accurately representing emerging resources and their value,** by including all options that may be commercially available in the planning horizon and using models with a level of spatial and temporal granularity needed to reveal values

To **align** resource plans with evolving objectives and understand the impacts of plans on people, regulators and utilities are:

- **Updating approaches to planning for reliability,** to better understand the risks, vulnerabilities, and types of solutions that can contribute to reliability, including resource adequacy and resilience

- **Accounting for carbon emissions and decarbonization targets,** to assess progress and alignment toward climate goals or better understand the risk of future climate policy

- **Analyzing health and air quality impacts** across resource options and portfolios

- **Including affordability, jobs, and environmental justice,** to make the human impacts of planning clearer

Reimagining Resource Planning

Ultimately, we hope that utilities and regulators will use this opportunity — when their resource planning processes are being stretched and challenged — to consider how resource planning may need to be more radically reimagined.

1. Integrated Resource Planning Purpose and Overview

This chapter provides a basic overview of integrated resource planning for readers unfamiliar with the key elements of resource planning, specifies who conducts resource planning, and explains why most states require utilities to conduct resource planning.

Utility IRPs have historically been tools for utilities and regulators to determine the portfolio of generation and demand-side resources that can meet projected peak and energy demand over a determined planning horizon at least cost, while mitigating risk and meeting policy objectives. This portfolio is intended to inform a utility's resource decisions — driving accountability toward actions that result in affordable rates and desired utility performance. Typically, IRPs have a planning horizon of 10 to 30 years, and utilities file new plans every two to five years.

Some IRPs conclude with a near-term action plan, commonly two to five years, outlining the utility's plan for investments, procurement processes, and customer programs as it moves toward the preferred portfolio. Even if IRPs are not decisional (see Exhibit 11, page 27), they are often used as a primary source of data and analysis that informs decision-making by regulators and utilities in other areas such as procurement, program design, and ratemaking.

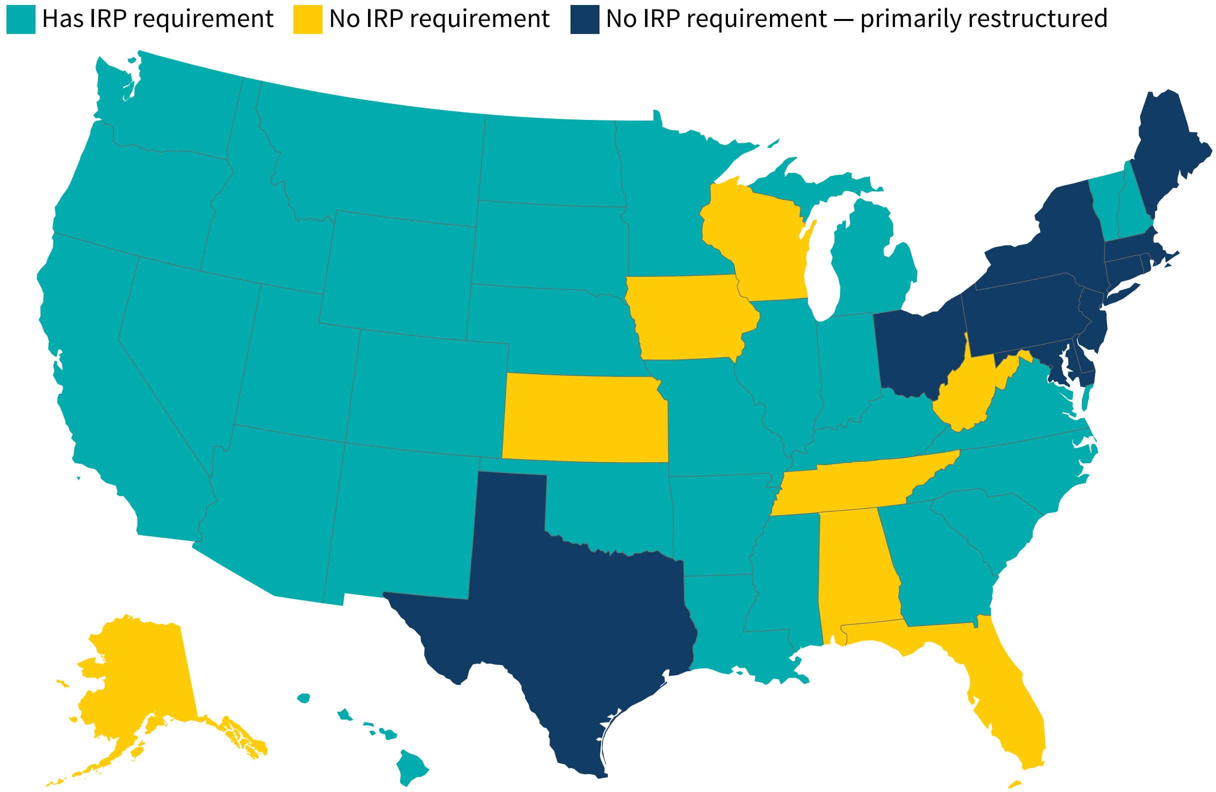
Resource planning requirements are determined by state, as summarized in Exhibit 4 (next page). Of the 19 states that have no formal utility planning requirement, most are in primarily restructured states where the mix of resources is largely determined by market dynamics rather than utility plans.[ii] Additionally, in some of those states (e.g., Connecticut), state energy offices or regulators undertake their own IRP process. Utilities that span multiple states must comply with the IRP requirements of each state within its territory.

Of the states depicted in Exhibit 4 (next page) with no planning requirements, utilities may still do long-term planning. In Florida, utilities file annual 10-year site plans.[1] Although Tennessee does not have an IRP requirement, the federal government requires the Tennessee Valley Authority to conduct an IRP.

ii "Primarily restructured" refers to states that are within a market footprint and have the majority of the state's generating capacity owned by entities other than electric utilities, according to EIA Form 860.

Exhibit 4

Planning requirements by state



Source: US Environmental Protection Agency, *State Energy and Environment Guide to Action: Resource Planning and Procurement*, Figure 2; RMI analysis of EIA-860M to add distinction for primarily restructured states

Absent clear state guidelines, utilities often still do some form of long-term planning because the exercise is essential to maintaining a safe, reliable, and affordable electricity system.

The Scale of IRPs and Their Impact

Resource plans present a massive opportunity to shape investments in our future electricity system. In the next three years, utilities representing about 40% of total US energy sales will file IRPs.[iii] Current utility resource plans show over $300 billion of projected new investments by 2035 — investments that will have an impact on the affordability of energy bills, health and jobs in our communities, and the ability to meet carbon targets.[iv]

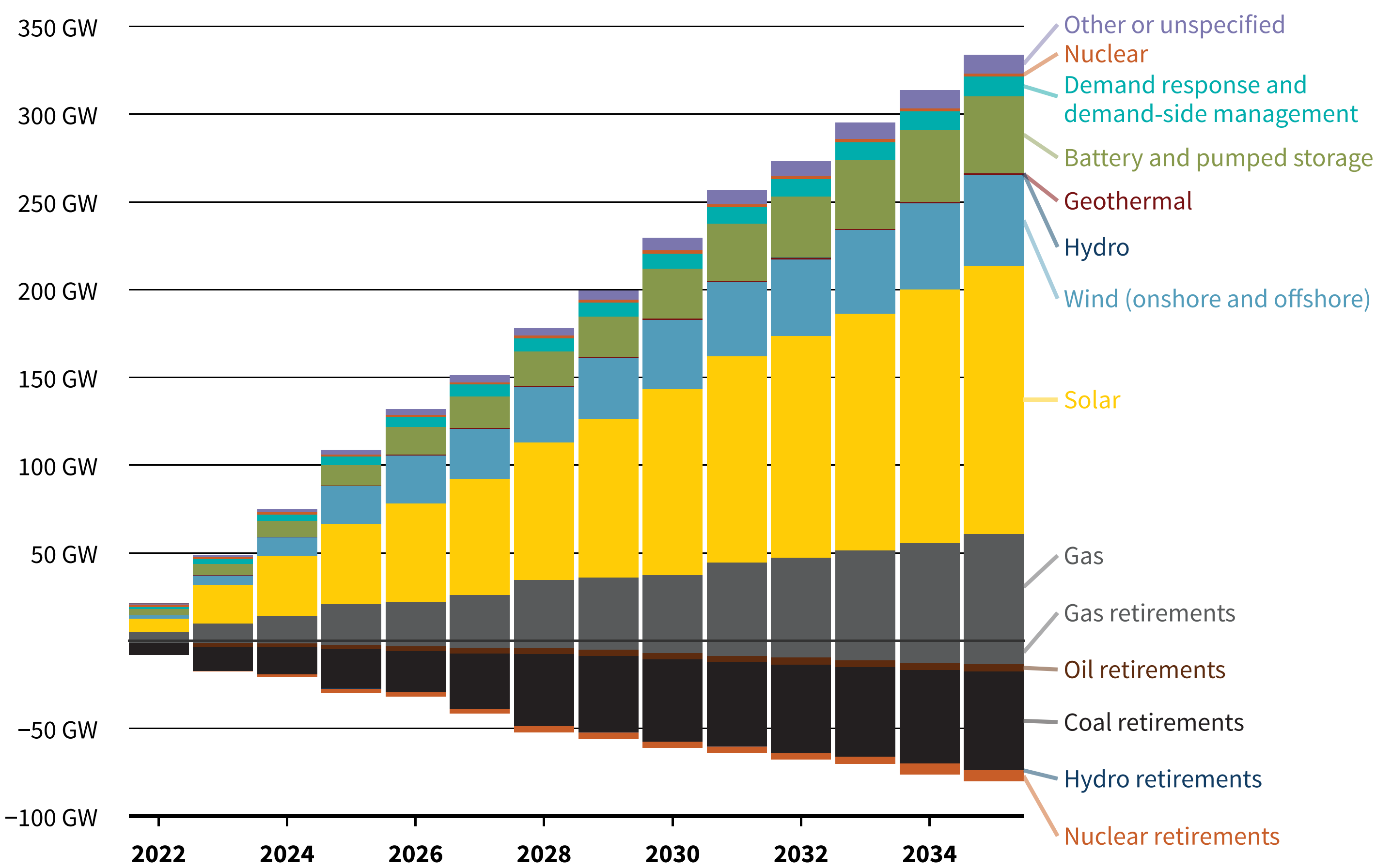
iii RMI analysis of EQ Research's monthly published data for September 2022, filtered for utilities that are expected to file resource plans before the end of 2025 with total annual sales from EIA.

iv RMI analysis of EQ Research's monthly published data for September 2022, across all 104 utilities' resource plans on record. Data on total capacity additions per year was combined with resource costs from the National Renewable Energy Laboratory (NREL) *2022 Annual Technology Baseline* to estimate projected investment.

An analysis of utility resource plans on record in September 2022 for 104 utilities, shared in Exhibit 5, shows that by 2035 utilities currently plan to:

- Build about 200 gigawatts (GW) of renewables, including solar, wind, geothermal, and new hydro
- Build 44 GW of battery and pumped hydro storage
- Deploy 11 GW of demand-side management
- Build 61 GW of gas power plants
- Retire 74 GW of fossil fuel–fired power plants, including coal, gas, and oil
- Retire 6 GW of nuclear and build nearly 2 GW of new nuclear

Exhibit 5 Cumulative capacity of projected retirements and additions in 104 utility resource plans, September 2022

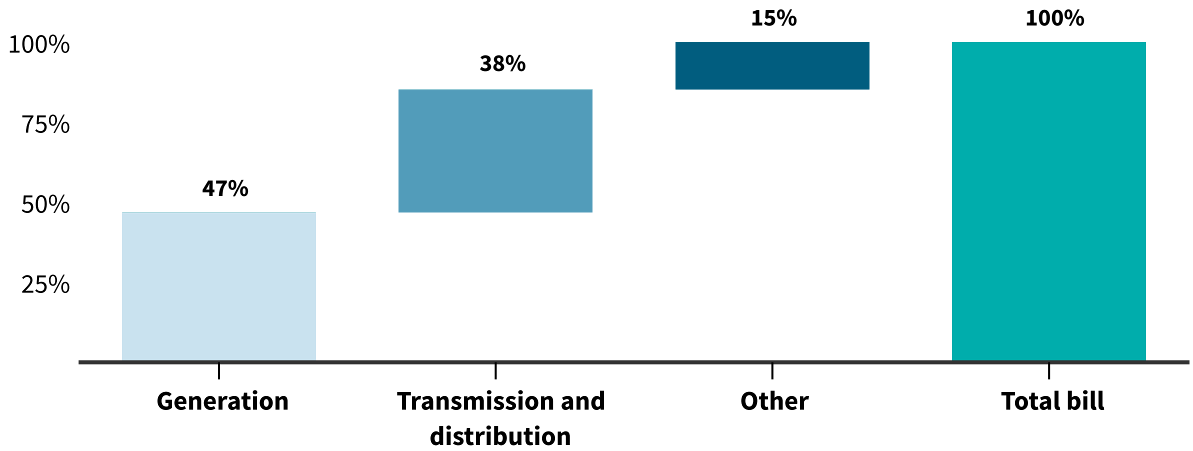


Source: RMI analysis of EQ Research data as of September 2022

The portfolios prioritized in resource planning eventually become capital investments, power purchases, administrative costs, and operations and fuel costs that affect customers' bills. In 2020, generation including purchased power accounted for 47% of customers' bills, as seen in Exhibit 6.

Exhibit 6

Components of a residential customer electricity bill



Note: The Utility Transition Hub calculates all utility expenses that are passed on to customers including both capital and operational costs by technology, based on data from FERC Form 1 and EIA Form 861. Here, we aggregated the approximate contribution to bills by resource type into three categories: generation; transmission and distribution; and other (e.g., administrative expenses). Data and documentation can be found on the Utility Transition Hub.

Source: RMI analysis of Federal Energy Regulatory Commission (FERC) Form 1 data, as shared in the Utility Transition Hub

As options for investment in transmission and distribution become increasingly integrated with resource planning processes, resource planning may present an opportunity to influence 85% or more of future bills.

Benefits of Resource Planning

Much of the value in resource planning is not in definitively determining the utility's portfolio in 10 to 30 years, but in the exercise of planning itself. The resource planning process presents a crucial opportunity for utilities, regulators, and stakeholders to:

- Understand the needs of the households, communities, and businesses that a utility serves, and how they will change over time
- Establish a common set of assumptions and evidence that can be used to assess which near- and long-term options can meet system needs and achieve desired utility performance across multiple objectives
- Identify longer-term risks and opportunities and align on strategies to navigate them

The outcomes of several recent utility planning processes have demonstrated that they can be valuable in continuously challenging past assumptions, discovering more affordable and beneficial investment pathways, or identifying new long-term risks. For example:

- In Xcel Energy's *2016–2030 Upper Midwest Resource Plan*, the utility proposed building a combined cycle gas-fired power plant to replace a retiring coal unit.[2] Stakeholders engaged extensively in the IRP with comments and testimony challenging the assumption that new gas was the best option to meet the identified need. Xcel redid its analysis in its 2020–34 resource plan and proposed instead building smaller combustion turbines and more renewable energy. This alternative plan is projected to save $372 million (present value of societal costs) and accelerate the timeline for meeting carbon reduction targets.[3]

- Duke Energy Indiana's 2021 preferred resource portfolio plans for less gas and more renewables relative to its 2019 portfolio, including adding hybrid solar and storage facilities for the first time. In 2019, Duke proposed a total of 2.4 GW of new combined cycle gas by 2034 and 1.6 GW of solar by 2037.[4] Two years later, the preferred portfolio planned for 50% less new combined cycle gas (1.2 GW), more than 1.5 times as much solar by 2037 (2.57 GW), and 1.1 GW of hybrid solar and storage.[5] Without this iterative approach with updated technology costs and capabilities, Duke might have otherwise built unnecessary assets and delayed progress toward its company emissions reduction targets.

- The Georgia Power IRP process has a robust stakeholder ecosystem with nearly 20 parties engaged in each three-year planning cycle. Over the past few cycles, the Georgia Public Service Commission has added more renewable resources than the previous IRP. In 2022, the PSC approved 2.3 GW of utility-scale renewables and 500 megawatts (MW) of battery storage, along with several short-term natural gas power purchase agreements.[6] This is nearly a 200% increase from its 2016 IRP, in which Georgia Power proposed 525 MW of renewables from requests for proposals (RFPs) or customer-sited projects and a slight increase from its 2019 proposal of 2.0 GW of utility-scale solar and 216 MW of customer-sited solar generation.[7]

Process of Developing an IRP

As much of the value in an IRP is in the exercise of planning, defining a clear and robust process is critical. IRP processes vary based on factors such as type of utility, regulatory guidelines or requirements for planning, and the size of the utility and resource planning team. Most include the core pieces depicted in Exhibit 7 (next page).[8]

Exhibit 7 **Building blocks of an IRP process**

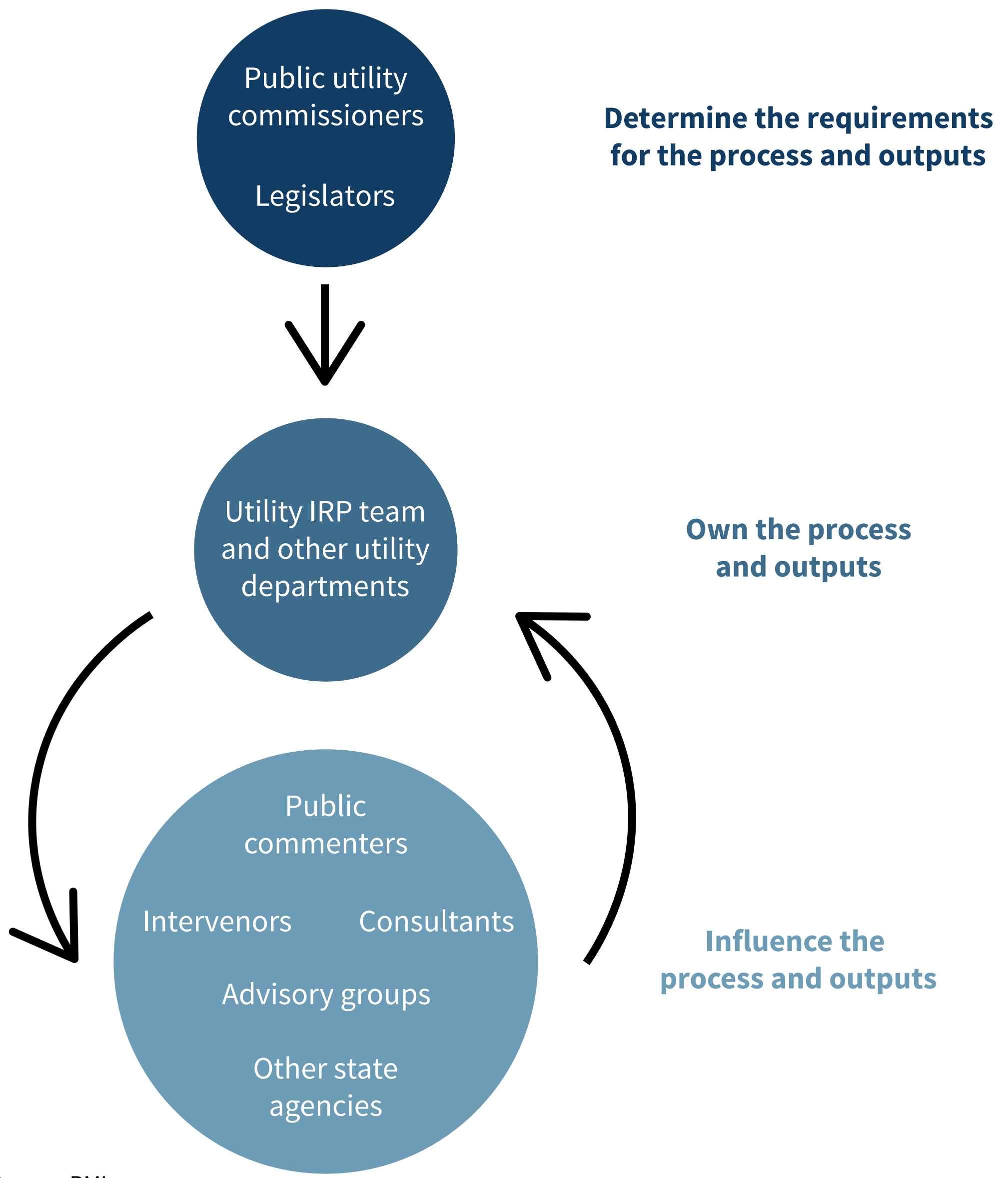
Source: "Standard Building Blocks" from the National Association of Regulatory Utility Commissioners-National Association of State Energy Officials (NARUC-NASEO) Task Force on Comprehensive Electricity Planning, 2019

Each of the steps varies in detail and complexity by utility, and some of these steps may occur simultaneously or in a different order, or be iterative. Many IRP processes include stakeholder engagement before or during the development of the IRP concurrent with these steps.

Key Actors in Resource Planning

Most of the examples of robust planning processes that are included in this report involve an ecosystem of actors beyond the utility. Who these actors are and how they influence the development of a resource plan are summarized in Exhibit 8 (next page).

Exhibit 8 **Stakeholders typically involved in developing a resource plan**



Source: RMI

Utilities are typically the owners of resource plans, because ultimately it is their responsibility to maintain the electricity system in line with established state and federal standards of performance. Usually, a designated team within the utility will lead the process of developing and publishing the IRP. This includes consolidating data, running analyses, engaging with stakeholders, and writing the plan. Other departments within the utility, such as regulatory affairs, financial planning, engineering, and operations, also are involved in developing a resource plan.

The public utility commission (PUC) outlines guidelines and/or requirements for resource planning. These typically address procedural elements of the planning process (e.g., who is involved, how frequently the plan is filed, opportunities for comment, and how the plan is evaluated) and substantive requirements for what should be included in the plan.

Some state statutes are specific about the role of the commission in resource planning, including the Georgia Code, which specifically outlines that the commission should require, review, and approve IRPs.[9] In many states, statute or authority for resource planning is not so specific, and the commission has further clarified its role through rulemaking or by building precedent through specific orders. For example, after a 2019 statute required the Colorado PUC to expand its resource planning purview to include cooperatively owned generation and transmission utilities, the commission followed with a Notice of Proposed Rulemaking to clarify and formalize requirements and its role.[10]

Consultants, public commenters, advisory groups, intervenors, consumer advocates, and other state agencies may also have roles in resource planning. Some utilities hire consultants to help with tasks such as modeling, stakeholder engagement, supportive studies, and technical writing. Utilities may incorporate input from public commenters or advisory groups, and in some states, specific types of engagement are required by the commission. In most states, intervenors in an IRP proceeding can submit comments that include requests for additional information from the utility, alternative analysis, critiques of the process, or statements of their constituents' needs from the resource plan.[v] In a formal, contested proceeding, comments are supplemented with testimony and can help get additional information and input on the record for the commission to consider in its IRP decision.

v Proceeding, in this context, means a quasi-judicial or quasi-legislative case administered by a public utilities commission. Typically, IRP proceedings will either be contested cases or investigations. For more information on types of proceedings, see *Regulatory Process Design for Decarbonization, Equity, and Innovation*, **https://rmi.org/wp-content/uploads/dlm_uploads/2022/07/regulatory_process_design_for_decarbonization_equity_and_innovation.pdf**.

2. Understanding How States Define Resource Planning Today

In many states, legislators and regulators have defined more prescriptive rules or guidelines that govern resource planning. IRP rules and guidelines typically consist of procedural requirements that govern how planning should be conducted, and content requirements for what should be included in a filed IRP. Utilities may still engage in planning without IRP requirements.

Most states with a set of prescriptive planning rules have sought to define the following procedural requirements governing how planning is conducted:

- **Which utilities submit IRPs** determines whether there is a recurring, formal planning process that provides regulators with visibility into utility plans. Where the IRP opens a contested case, plans are formally submitted in the public record.

- **How IRPs are reviewed, accepted, acknowledged, approved, or denied** determines how much of an influence the commission, staff, and other stakeholders engaged in IRPs have to provide input into or recommendations about planning.

- **To what extent IRP outcomes are tied to procurement decisions** can determine how influential the planning process is in specifying a portfolio for investment.

In this chapter, we map how 12 states have defined these three sets of procedural requirements in their resource planning rules. The 12 states we've chosen represent diverse geographic and regulatory contexts. Collectively, these examples highlight the range of resource planning requirements today and expose where and how legislators or regulators might consider providing more clarity or direction to improve the planning processes.

We do not cover the content requirements for what should be included in IRPs across states in this chapter. Although rules or guidelines typically require the basic information described in Chapter 1, the exact requirements and degree of detail vary significantly across states. In Chapters 4, 5, and 6, where we describe options to enhance resource planning, we highlight relevant examples of content rules or guidelines. For additional context and sources for the information included in this chapter, please see *Appendix: Resource Tables*.

Which Utilities Must Submit IRPs

Which utilities are required to submit IRPs varies by state rules and statutes. Most commonly, investor-owned utilities are required to submit IRPs. In a few states, IRP requirements extend beyond investor-owned utilities, such as in South Carolina, where electric cooperatives, municipally owned electric utilities, and the South Carolina Public Service Authority must prepare IRPs to submit to the state energy office (see Exhibit 9 on the next page for more examples). Some jurisdictions do not have specific requirements for which utilities are required to submit IRPs. For example, in Wyoming, only utilities filing IRPs in other jurisdictions must file their plans to the commission.

Municipal, cooperative, or federally owned utilities may have additional requirements for resource planning that are set by the city, the board, or the federal government. For example, some federal power marketing agencies, such as the Western Area Power Administration and Tennessee Valley Authority, require utilities that purchase federal power from them to submit IRPs.[11]

Exhibit 9 **Which utilities must file IRPs vary across 12 states**

No IRP requirement

Alabama: Alabama has no IRP requirements, but Alabama Power voluntarily submits a plan every three years for review.

Wyoming: Utilities filing IRPs in other jurisdictions must file one in Wyoming.

Some utilities

Utah: Applicable to Rocky Mountain Power.*

North Carolina: Applicable to Duke Energy Progress, Duke Energy Carolinas, Dominion every two years.

Georgia
- Each utility in the state whose rates are fixed by the Public Service Commission is required to file an integrated resource plan every three years.
- With the IRP, utilities also must file applications for building new plants, purchasing power, and demand-side expenditures.

Oregon: All investor-owned utilities are required to submit resource plans every two years after the previous IRP acknowledgment.

Michigan
- Each rate-regulated utility in the state is required to file an IRP at least every five years.
- Utilities with fewer than 1 million customers in the state can request a waiver for a portion of the requirements.
- Multistate utilities may file using other states' requirements, but the commission can request additional information.

New Mexico
- Public utilities supplying electric service to customers file an IRP, along with an action plan, with the commission every three years.
- Does not include distribution cooperatives.

All utilities

Minnesota
- Applicable to all utilities generating 100,000 kilowatts or more of electric power and serving, either directly or indirectly, 10,000+ retail customers in Minnesota every two years.
- The commission's order is advisory for cooperative and municipal utilities, rather than decisional.
- Some generation and transmission co-ops may file an optional IRP, and the commission can also make an advisory order.

Washington
- All utilities with more than 25,000 customers must develop IRPs.
- Investor-owned utilities submit plans to the commission.
- Consumer-owned utilities submit plans to the Department of Commerce.

Colorado
- Jurisdictional utilities, cooperative utilities, and transmission associations file resource plans to the commission every four years.
- Jurisdictional utilities and cooperative utilities have different sets of planning requirements.

South Carolina
- Electric utilities, electric cooperatives, municipally owned electric utilities, and the South Carolina Public Service Authority must each prepare an IRP.
- Each electric utility must submit its IRP to the commission.
- Electric cooperatives, municipally owned electric utilities, and the South Carolina Public Service Authority submit IRPs to the State Energy Office.**

* IRPs are most commonly applicable to investor-owned utilities (IOUs) and submitted to state PUCs.
** In some states, state energy offices review municipal and cooperative utility IRPs.

Source: RMI analysis; see *Appendix: Resource Tables* for additional context and sources

How IRPs Are Reviewed and Approved

In most states, the commission accepts, acknowledges, approves, or denies an IRP. The commission may acknowledge or approve the IRP with modifications and exceptions, as well as requirements for the next planning cycle. The terms "approval" and "acknowledgment" vary across states. "Approval" is more commonly used when the IRP is contested and the IRP decision authorizes a procurement outcome or tentative approval for cost recovery (see Exhibit 11, page 27). "Acknowledgment" typically defers the commission's judgment of the prudence of a proposed action to a certificate of public convenience and necessity (CPCN) or a rate case.

Many states require formal review of an IRP by the commission through a required hearing or along with an opportunity for public comment (see Exhibit 10, next page). For example, in South Carolina, the commission is required to open a proceeding to review the IRP and allow intervention from interested parties and reasonable discovery. Following this proceeding, the PUC must approve, modify, or deny the plan. In Oregon, the PUC considers public comments and recommendations in an established public meeting and then acknowledges the IRP through an order. In addition to the requirement for a public meeting, the proceeding includes rounds of review and comments among the utility, staff, and intervenors. In Utah, rules state that the public, state agencies, and other interested parties should have the opportunity to make formal comments.

Other states have fewer requirements for how the commission engages with filed IRPs. In North Carolina, the rules state that hearings are to be scheduled at the discretion of the commission, and the scope is explicitly limited to covering issues identified by the commission. In Wyoming, the commission's advisory staff is directed to review the IRP and draft a memo to report the findings to the commission in an open meeting or a technical conference. No further action is required, but the commission may accept the IRP as meeting the filing requirements.

Exhibit 10 **How the commission is required to review IRPs in 12 states**

Staff or the commission reviews and accepts

Alabama
- The IRP is reviewed with commission staff. The commission is not required to approve the resource plan.

Wyoming
- Commission advisory staff reviews the IRP as directed by the commission and drafts a memo to report its findings to the commission in an open meeting or technical conference.
- Review includes whether or not there was an opportunity for public comment.

North Carolina
- A hearing may be scheduled at the discretion of the commission, but an evidentiary hearing is not required.
- Public staff or intervenors may file comments or alternative plans.
- The commission typically issues an order to accept the plan as fit for future planning or request modifications.
- The commission has to report progress toward the plan to the state executive and legislative branches.

Commission acknowledges or requests modification, after seeking public input

Oregon
- The commission acknowledges IRP through an order after an uncontested proceeding and may request revisions before acknowledgment.
- The commission must consider comments and recommendations from a public meeting first.
- The public will be allowed significant involvement in the preparation of the IRP, including requests for information.

Utah
- The public, state agencies and other interested parties will have the opportunity to make formal comments. Formal hearings are not required but might be appropriate.
- The commission will review the plan and the merits of public comments and return the IRP for further work if needed.

New Mexico
- The commission reviews the IRP and accepts it or returns it with instructions for refiling, considering both the application and public comments in its review. It may open an investigation.
- A public comment period is required, and utilities are also required to respond to all public comments or explain why they were not addressed when the comment period concludes.
- Review and acceptance of the IRP is contingent not only on contents, but whether utilities followed public advisory process requirements including a yearlong series of meetings for public input.

Washington
- Utilities submit IRPs and clean energy action plans that are targeted toward 10-year progress for meeting state decarbonization targets.
- Public comment is required after draft IRPs are filed, and rules require IRP advisory groups.
- IRPs are acknowledged, with modifications that might affect the next clean energy implementation plan or action plan. Clean energy implementation plans are filed separately.
- Clean energy implementation plans are approved, rejected, or approved with conditions through a contested proceeding.

Minnesota
- The commission shall approve, reject, or modify the plan of a public utility consistent with the public interest.
- The case is conducted in an uncontested proceeding, allowing intervention, information requests, proposed. alternative plans, and written comments.
- The commission makes its decision based on the record, including response to information requests.

Commission approves, requests modification, or denies after a formal proceeding

Michigan
- The commission issues a final, appealable order approving or denying the plan.
- In a contested case proceeding, the commission shall review the IRP and allow intervention.
- The commission must seek an advisory opinion from the Department of Environment, Great Lakes, and Energy on whether the plan will increase air pollution and may invite other state agencies to provide testimony.

Georgia
- The commission will approve the utility's IRP, approve it subject to stated conditions, approve it with modifications, approve it in part and reject it in part, reject the utility's resource plan, as filed, or provide an alternative plan, upon determining, after a hearing is conducted, that this action is in the public interest.
- Must file an amendment if required before the next plan if there are impacts to a potential IRP or CPCN.

South Carolina
- The commission is required to open a proceeding to review IRPs, allowing intervention by interested parties and reasonable discovery.
- The commission needs to approve, modify, or deny the plan.

Colorado
- The commission may hold a hearing to review and render a decision.
- The commission will issue a written decision approving, disapproving, or ordering modification to the utility's plan, and the utility must implement modifications.

Source: RMI analysis; see *Appendix: Resource Tables* for additional context and sources

How Planning Relates to Procurement Decisions

IRP rules also typically define how influential IRPs are in resource procurement decisions.

In a few states, the acknowledgment or approval of an IRP directly authorizes resource procurement, meaning the utility can proceed with investments based on the outcome of the plan. In Georgia, if the commission approves an IRP, the utility is then required to issue a competitive solicitation for each type and quantity of supply-side resource in the approved plan.[12] In Minnesota, if the commission approves a proposed facility in a resource plan, a separate proceeding for certificate of public need and convenience may not be required.

In Washington and Colorado, approval of the IRP authorizes utilities to proceed with issuing an all-source solicitation for the identified need, rather than authorizing specific resources.

In other cases, acknowledgment of an IRP does not authorize procurement or guarantee any favorable ratemaking (i.e., all investments are still subject to an applicable prudence review) but is required to support the justification for new acquisitions. In Oregon, for example, requests for proposal must include "the alignment of the electric company's resource need addressed by the RFP with an identified need in an acknowledged IRP or subsequently identified need or change in circumstances with good cause shown."[13] Similarly, South Carolina and North Carolina also state in their rules that applications for new resources should reference a need determined in resource plans.

Exhibit 11 **How acknowledgment or approval of an IRP relates to procurement in 12 states**

Acknowledgment/approval does not authorize procurement

Wyoming and Alabama: There is no formal approval or acknowledgment, and therefore no procurement implications.

Utah: Acknowledgment of an acceptable plan will not guarantee favorable ratemaking treatment of future resource acquisitions.

New Mexico: An action plan does not replace or supplant any requirements for applications for approval of resource additions set forth in New Mexico law or commission regulations.

South Carolina
- The approval of a resource plan shall not be determinative of the reasonableness or prudence of the acquisition of any resource.
- Investment decisions may require demonstration that a facility is consistent with an approved resource plan.

North Carolina: Applications for resource acquisitions require reference to the need in an IRP.

Oregon
- Acknowledgment does not constitute guarantee of favorable ratemaking.
- Requests for proposals filed with the commission must be justified by a resource need in an acknowledged IRP.

Acknowledgment/approval authorizes procurement of specific resources

Minnesota
- If a resource is to be built before the next resource plan, the IRP is treated as a CPCN for that resource.
- If the commission approves a proposed facility in the resource plan, a separate certificate of need proceeding is not required.

Michigan
- In approving an IRP, the commission specifies the costs approved for investment in new generation, power purchase agreements, or other investments.
- Utilities are required to conduct pre-RFP requests for proposals to source bids to consider in the planning process.

Georgia
- The utility is required to issue an RFP for each block of supply-side resources identified in the IRP.
- For the 2029–2031 time frame, the utility should use an all-source RFP to meet projected needs.

Acknowledgment/approval authorizes all-source procurement

Washington: A utility must issue an all-source RFP if the IRP demonstrates that the utility has a resource need within four years.

Colorado
- The Phase I ERP (electric resource planning) decision requires approving an all-source RFP for the utility to issue.
- A commission decision approving the components of a utility's plan creates a presumption that utility actions consistent with that approval are prudent.

Source: RMI analysis; see *Appendix: Resource Tables* for additional context and sources

How States Are Evolving Requirements for Resource Planning

Resource planning rules are not static, and both regulators and legislators can revisit and update foundational, procedural resource planning requirements. This can make other content-based requirements more impactful. For example, states that require more extensive review of resource plans typically give regulators and stakeholders more opportunity to recommend content changes that better align utility resource plans with state policy objectives or that consider a wider range of resource options.

Updating resource planning rules can be ad hoc, prompted by legislation or an executive order, or planned for a regular cadence. For example, the Washington legislature prompted revisions to resource planning through the passage of the Clean Energy Transformation Act.[14] In Michigan, the statute that established resource planning requires the commission to open a proceeding to review the current regulations and revise the rules every five years.[15] The statute also requires the commission to consult with other government agencies and interested parties in this proceeding. The predetermined timeline for review creates an opportunity to continuously improve on the process and provides certainty around when planning requirements will shift.

3. How to Reimagine Resource Planning

Challenges of Planning for an Uncertain Future during a Period of Rapid Change

We observe that IRPs must maintain three core qualities to be effective tools for utilities and regulators to evaluate resource decisions, as outlined in Exhibit 12.

Exhibit 12 **Core IRP qualities and why they're important to utilities and regulators**

IRP quality	Definition	Why quality is important to regulators	Why quality is important to utilities
Trusted	The IRP is transparent and well vetted, with stakeholder input.	When resource plans are trusted, regulators can use them as evidence that future investments are prudent and in the public interest.	When utilities seek input from their customers and engender trust in their assumptions, they can develop an accurate plan that meets customer energy needs and leads to regulatory approval.
Comprehensive	The IRP can accurately represent the costs, capabilities, system impacts, and values of resources that might be available within the planning time horizon; the IRP can consider actions across the transmission and distribution systems as portfolio options.	When plans are comprehensive, regulators can ensure that options to best serve customers have been surfaced and tested.	When plans are comprehensive, utilities can adequately assess the value and risk of their potential future investments.
Aligned	It is clear how the plan evaluates options to meet traditional planning requirements such as reliability, affordability, and safety, as well as state and federal policies and customer priorities, such as reducing emissions and advancing environmental justice.	When plans are aligned, regulators can assess whether the recommended portfolio can perform across the range of performance outcomes within their mandate.	When utilities demonstrate that plans are aligned with policy objectives, they can avoid future disallowance of investments and under- or over-procurement of resources.

Source: RMI

A few major trends are challenging utilities and regulators to maintain these qualities in planning processes, including but not limited to:

- Rapid technology change and shifting resource costs[16]
- A range of new state and federal policies that expand objectives beyond affordability, reliability, and safety to include emissions reductions, advancing environmental justice, economic development, and supporting electrification of buildings, transportation, and industry[17]
- Increasing recognition that decisions made on the distribution and transmission systems have an impact on resource planning and vice versa[18]
- Increasing stakeholder awareness that resource planning decisions can affect local air quality, health, jobs, energy bills, and climate change[19]

Yet, if an IRP does not achieve these three qualities, its credibility, accuracy, and effectiveness may be eroded. The risks of unanticipated costs for ratepayers, disallowed future investments, dissatisfied customers, and failure to meet public policy objectives will increase.

Expanding Scope for Resource Planning

Making updates to the IRP process to ensure that it remains trusted, comprehensive, and aligned can make IRPs more complex. As such, making changes around the edges or simply adding new utility IRP requirements may no longer be what best serves a utility or regulator — especially with staff time and capacity constraints. To use a metaphor to guide our thinking, the opportunity is to avoid amassing incremental IRP expectations in a way that is like the straw that breaks the camel's back (see Exhibit 13, next page).

Exhibit 13 **How new expectations might challenge the IRP process**

To address these challenges more holistically, regulators have an opportunity to proactively and repeatedly refine the purpose, scope, roles, and tools — and to ask big questions about what the next generation of planning should look like — before making piecemeal enhancements.

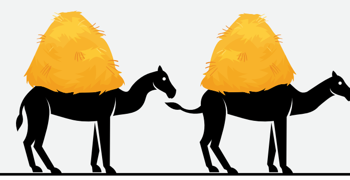
New IRP expectations

Purpose

Regulators and state policymakers have an opportunity to take a step back and clearly articulate goals for the electricity system over the next few decades and how the utility's options for future investment should be evaluated with respect to those goals. With clear goals and an updated framework for making decisions across multiple goals, the information that is needed to make decisions, which should be included in a plan, should become clearer.

Scope

Once the information needed to make decisions is clear, regulators and state policymakers have an opportunity to reevaluate the specific scope of utility resource planning. Instead of adding more requirements to the IRP, there is an opportunity to define additional planning activities with their own objectives, and the links among them. Defining new, separate planning activities is a good option when specific decisions need to happen more or less frequently than an IRP or require more granular or more broad information. For example, regulators or policymakers may identify a need to create a separate distribution system planning process, an economy-wide decarbonization process, or an additional plan that tracks annual progress toward climate targets.

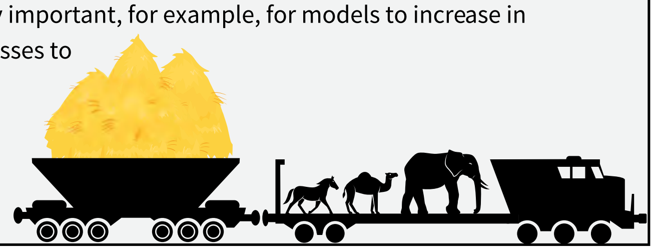


Roles

When clarifying the scope of IRP and other planning activities, state policymakers should consider who, beyond the utility or regulatory staff in the IRP process, might provide or verify key inputs or assumptions that are used in the IRP to maintain accuracy, credibility, and trust. For example, state agencies such as the department of transportation may be able to provide electric vehicle growth projections, or a state energy office might conduct a deep decarbonization study whose assumptions are used in an IRP.

Tools

Finally, the application of analytical tools and engagement processes that support resource planning need to be designed to be flexible, transparent, and continuously improved. It will be increasingly important, for example, for models to increase in computational ability and incorporate new technologies, and for processes to support utilities in meaningfully engaging stakeholders and in getting accurate market information (e.g., through consistent industry engagement and competitive solicitations). Effective tools and processes can reduce some of the friction in today's planning.



Source: RMI

The process of reassessing the purpose, scope, roles, and tools used to support planning before adding new IRP requirements should lead to a set of priority questions, for example as depicted in Exhibit 14:

Exhibit 14 Examples of questions generated when reassessing purpose, scope, roles, and tools in planning

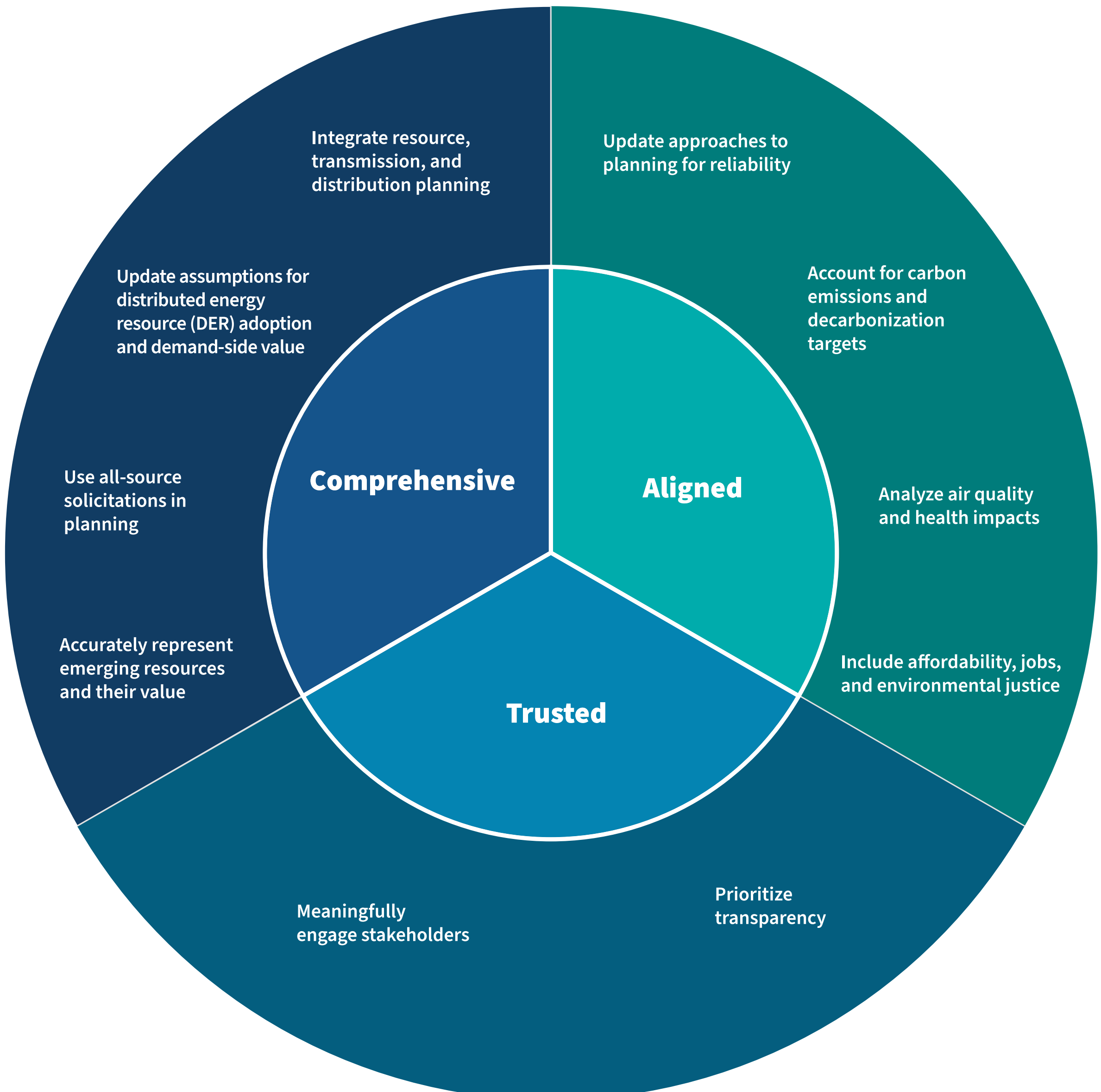
Category	Sample questions
Purpose	• What decisions will we make based on the outcomes of planning, and how might we design planning to support making those decisions? • How might we redesign planning to be able to evaluate decisions across multiple objectives?
Scope	• How should regional planning processes, statewide planning processes, and transmission planning processes interact with resource planning? • How can assumptions from other sectors' planning activities be integrated into the electricity system planning process (e.g., transportation plans, resilience plans, carbon plans)? • How should resource planning be integrated with distribution system planning? • How do planning and rate cases interact? • What are the links among planning, procurement, and siting? • How should benefit-cost analysis frameworks be used in planning?
Roles	• Can entities outside the utility or regulator provide or help evaluate assumptions, for example, the department of transportation providing EV forecasts, or environmental regulators assessing health impacts or the likelihood of meeting emissions reduction targets? • How might utilities collaborate with other utilities and states to assess regional needs and opportunities? • How should communities or customers' own energy planning processes be reflected in planning? • How might engaging with DER and emerging technology providers be structured to get critical inputs on how to characterize emerging technologies and their capabilities?
Tools	• Can modeling tools handle the spatial and temporal granularity required to assess value across resources? • Do modeling tools have accurate representations of the capabilities of emerging resources? • Do processes leverage stakeholder knowledge and input to improve assumptions and inputs? • Is data sufficiently transparent to enable thorough review by stakeholders and the commission?

Source: RMI

Overview of Planning Enhancements

When seeking to address these questions, utilities and regulators can look to approaches that have been tested in IRPs across the country that can "enhance" plans to be more trusted, comprehensive, and aligned. These enhancements are summarized in Exhibit 15:

Exhibit 15 **Summary of options to enhance resource planning**



Source: RMI

To build **trust** in resource plans, regulators and utilities are:

- **Prioritizing transparency,** by updating rules that assess what information may be held as confidential or proprietary — and applying those rules to ensure that stakeholders have the information they need to engage effectively in the IRP process

- **Meaningfully engaging stakeholders**, with an inclusive and substantive process for input before and during the plan's development

To make plans more **comprehensive**, regulators and utilities are:

- **Integrating resource, transmission, and distribution system planning,** to better understand how decisions at one level of the grid might affect others

- **Using all-source solicitations in the planning process,** to bring in timely market data as a basis for making procurement decisions

- **Updating assumptions and modeling tools for DER adoption and value,** to more accurately forecast DER growth patterns and impacts and assess DERs' costs and benefits

- **Accurately representing emerging resources and their value,** by including all options that may be commercially available in the planning horizon and using models with a level of spatial and temporal granularity needed to reveal values

To **align** resource plans with evolving objectives and understand the impacts of plans on people, regulators and utilities are:

- **Updating approaches to planning for reliability,** to better understand the risks, vulnerabilities, and types of solutions that can contribute to reliability, including resource adequacy and resilience

- **Accounting for carbon emissions and decarbonization targets,** to assess progress and alignment toward climate goals or better understand the risk of future climate policy

- **Analyzing health and air quality impacts** across resource options and portfolios

- **Including affordability, jobs, and environmental justice,** to make the human impacts of planning clearer

In the next three chapters, we walk through examples of enhancements that have already been tested in IRPs across the country: *Chapter 4 — Trusted*, *Chapter 5 — Comprehensive*, and *Chapter 6 — Aligned*.

4. Trusted

IRPs are most useful to utilities, regulators, and stakeholders when the processes and outputs are trusted. If regulators trust plans, they can use them as evidence in evaluating future resource decisions. When utilities use processes that build trust in plans, they can better meet their customers' needs, get more accurate information, and build support for regulatory approval of the plan and future investments. A trusted planning process may also increase stakeholders' satisfaction and improve the quality of engagement. However, planning today faces several challenges that impede trust, such as information gaps among utilities, stakeholders, and regulators, the perception of bias, the complexity of the system being modeled, and the number of unknowns when planning under uncertainty.

In this section, we highlight how regulators and utilities have increased trust in the planning process and outcomes through efforts that increase transparency and meaningfully engage stakeholders. With enhancements that address data transparency, expose modeling assumptions, and support stakeholder input, plans are more likely to have buy-in and can be used as support in future investment or cost recovery decisions.

Exhibit 16

Summary of enhancements to make planning more trusted

Enhancement	Leading practices and examples
Prioritizing transparency	• Establish rules or guidelines that maximize data transparency • Use a consistent set of assumptions or scenarios • Increase stakeholder access to modeling assumptions • Make plans accessible and relevant to a broad range of stakeholders • Develop and track metrics across IRPs
Meaningfully engaging stakeholders	• Define how to engage stakeholders before and during plan development • Create a dedicated IRP advisory group • Document how stakeholders influenced the plan • Reduce barriers to participation

Source: RMI

Prioritizing Transparency

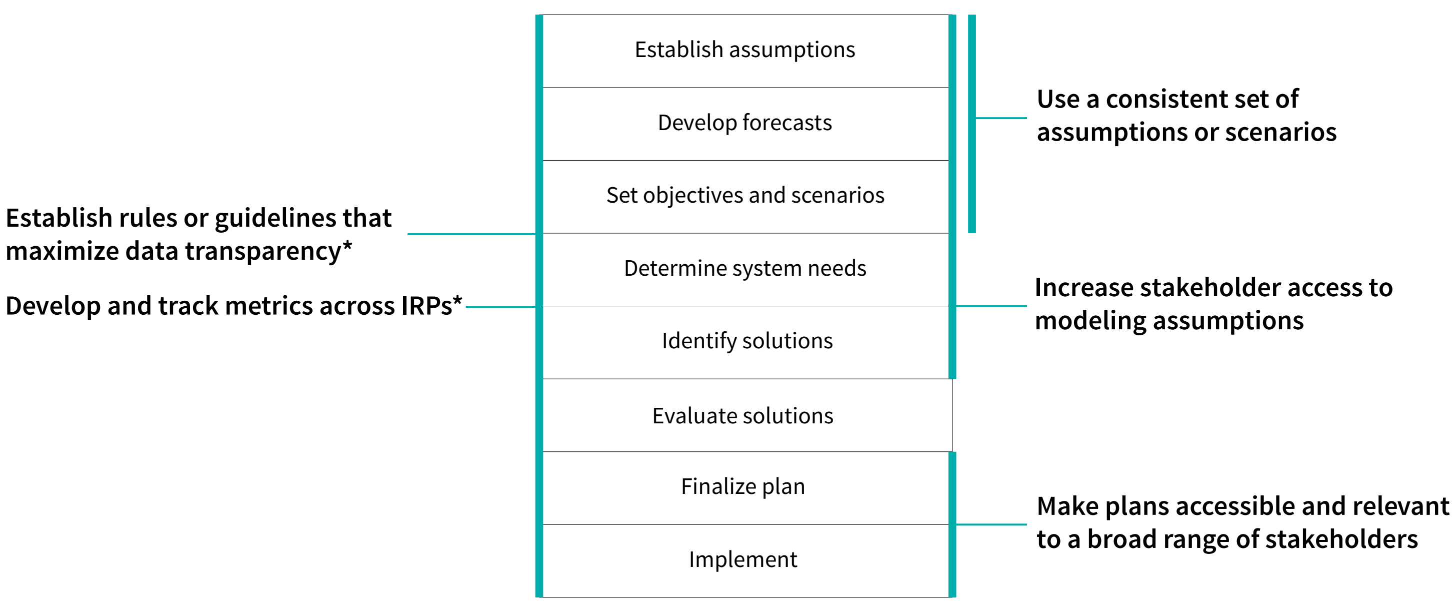
Visibility into data, key assumptions, analytical processes, and decision-making allows regulators and stakeholders to understand and interpret the resource plan results, which can increase trust in the outcomes. With an evolving generation mix and rapidly changing assumptions and modeling capabilities, transparency is even more important. Plans that withhold critical data require stakeholders and regulators to consider the outputs as valid or dismiss the outputs as untrustworthy without being able to understand and verify the underlying assumptions. This lack of transparency can also limit stakeholders' ability to meaningfully contribute solutions to resource planning challenges and can make it more difficult and time-consuming for regulators to compare findings.

Most utilities make their resource planning processes and outcomes public and transparent to some degree. Typically, stakeholders can access final plans on utility websites or through the state commission. However, only some states outline specific data transparency rules or guidelines for resource plans, which leaves the decision of what to share and how to share it up to the discretion of the utility.

Leading Practices and Examples

The following examples, and where they might be applied in the planning process, are summarized in Exhibit 17.

Exhibit 17 **Where options for prioritizing transparency might be applied in the IRP process**



*Applied before and throughout the process

Source: RMI additions to the "Standard Building Blocks" from the National Association of Regulatory Utility Commissioners-National Association of State Energy Officials (NARUC-NASEO) Task Force on Comprehensive Electricity Planning, 2019

Establish rules or guidelines that maximize data transparency. In some states, regulators detail specific data that must be shared. New Mexico, for example, requires utilities to include the specific cost data used in portfolio development, including "capital costs, fixed and variable operating and maintenance costs, fuel costs, and purchased power costs."[20] Thus, Xcel Energy Southwestern Public Service Company includes unit-specific cost data and capacity factors for all generation units in its IRP.[21] This allowed stakeholders to understand the utility's assumptions, like how thermal units operate within the model, without running the model themselves.

Other states require transparency without detailing specific requirements. For example, the Oregon PUC's IRP guidelines promote general data transparency, outlining, "While confidential information must be protected, the utility should make public in its plan any nonconfidential information that is relevant to its resource evaluation and action plan."[22]

Use a consistent set of assumptions or scenarios. Regulators can provide additional guidance on critical assumptions or scenarios that must be included in an IRP. In Michigan, the commission opens a proceeding, with stakeholder participation, to establish specific modeling scenarios and assumptions for planning that utilities must include in addition to the utility's own scenarios and assumptions.[23] The Michigan Department of Environment, Great Lakes, and Energy and other interested parties can provide input into assumptions including, but not limited to, projected costs of different fuels, planning reserve margins and local clearing requirements, and applicable state and federal regulations, laws, and rules.[24]

Increase stakeholder access to modeling assumptions. In addition to data transparency, utilities can provide visibility into their modeling process so that regulators and stakeholders better understand the decisions influencing resource portfolios. In response to their 2021 Integrated Grid Plan, the Hawaii PUC outlined specific directives for Hawaiian Electric to improve the access and quality of their modeling assumptions.[25] These included directing the utility to provide narrative explanations in plain language for all workbooks and other quantitative data sets, to share live and unlocked spreadsheets to allow users to understand the formulas, and to notify parties via email when there are updates to key documents.[26]

In some cases, stakeholders have developed their own alternative portfolios in response to a utility's plan. Alternative, stakeholder-driven portfolios can be an effective way to challenge assumptions and expose portfolio options the utility may not have originally considered that perform better on reliability, cost, or other policy objectives. If utility assumptions are not transparent and accessible to stakeholders, it may be more difficult for commissions to make an "apples to apples" comparison of utility and stakeholder-driven portfolios.

Utilities or regulators can reduce information asymmetry and support consistency by providing access to utility models so that stakeholders can accurately baseline their results against the utility's modeling. The Michigan Public Service Commission (MPSC), for example, requires that "modeling inputs and outputs in the model-dependent binary format should be made available to parties that obtain a license."[27]

Increasing stakeholder access to modeling means that more portfolio options may be generated and regulators must have the technical capacity and a clear approach to adjudicating different results. In a New Mexico proceeding to replace the retiring coal-fired San Juan Generating Station, utilities were ordered to provide access to modeling and stakeholders proposed alternative portfolios. As a result, stakeholders were able to provide evidence that their own portfolios met the same standards of reliability, with the same underlying assumptions. In the hearing examiner's recommendation, which the commission ultimately adopted, the hearing examiner described the factors for making decisions across cost, reliability, community benefits, environmental impacts, and meeting the policy objectives of the Energy Transition Act. The hearing examiner also identified where portfolios had consistent actions that should be implemented without regret (e.g., signing contracts for several solar projects) and where the differences in portfolios were (e.g., using battery storage or gas to meet reliability) that required further judgment.[28]

Open-access modeling

Open-access modeling is an emerging practice that has potential to enable stakeholders to provide meaningful input into modeling with fewer cost and access barriers than proprietary software. The term "open access" includes a wide array of modeling practices, ranging from models that are free and publicly accessible, to models that provide access to source code but may still require additional purchases or licensing to run.

The national labs, universities, and other organizations have developed and continue to improve open-access planning models. Some advocates are already using the open-source-and-access capacity expansion model GenX to model alternative pathways to utility plans.[29] Other examples include Switch 2.0, an open-source platform designed for resource plan modeling that has been used to model Hawaiian Electric's 100% renewable power system, and Breakthrough Energy's open-source production cost model.[30]

Although there are no known examples of utilities using open-access modeling in resource planning to date, this is likely to change soon. Notably, PGE Oregon plans to use GridPath, an open-source model, for its flexibility analysis in its next resource plan.[31]

Make plans accessible and relevant to a broad range of stakeholders. To achieve the benefits of increasing transparency, resource planning must also be understandable. Regulators and utilities can promote practices that ensure that objectives, process, data, and outputs are clear, organized, and useful. Several utilities have incorporated practices that improve the accessibility of their reports. These practices include:

- Summarizing key takeaways in accessible language at the beginning of each section and in executive summaries
- Incorporating simple and meaningful charts
- Embedding internal links to ease navigation
- Developing IRP websites or data clearinghouses to share additional information
- Hiring writers who can translate technical information for nontechnical audiences

Develop and track metrics across IRPs. Consistent metrics can be useful for tracking changes between IRPs or progress toward plans since the previous IRP. Every four years, utilities in Washington are required to develop clean energy implementation plans, in addition to their IRPs, that track the progress utilities are making toward state goals. Statute and administrative rules outline a detailed process to identify, develop, and track "customer benefit indicators" in partnership with highly affected communities and vulnerable populations. These include indicators that track "energy benefits, non-energy benefits, reductions of burdens, public health, environment, reduction in cost, reduction in risk, energy security, and resiliency."[32]

Outside of state requirements, utilities, regulators, or stakeholders can voluntarily report data to the Resource Planning Portal, maintained by Lawrence Berkeley National Laboratory, which seeks to make IRP information comparable across utilities and years with standard inputs.[33]

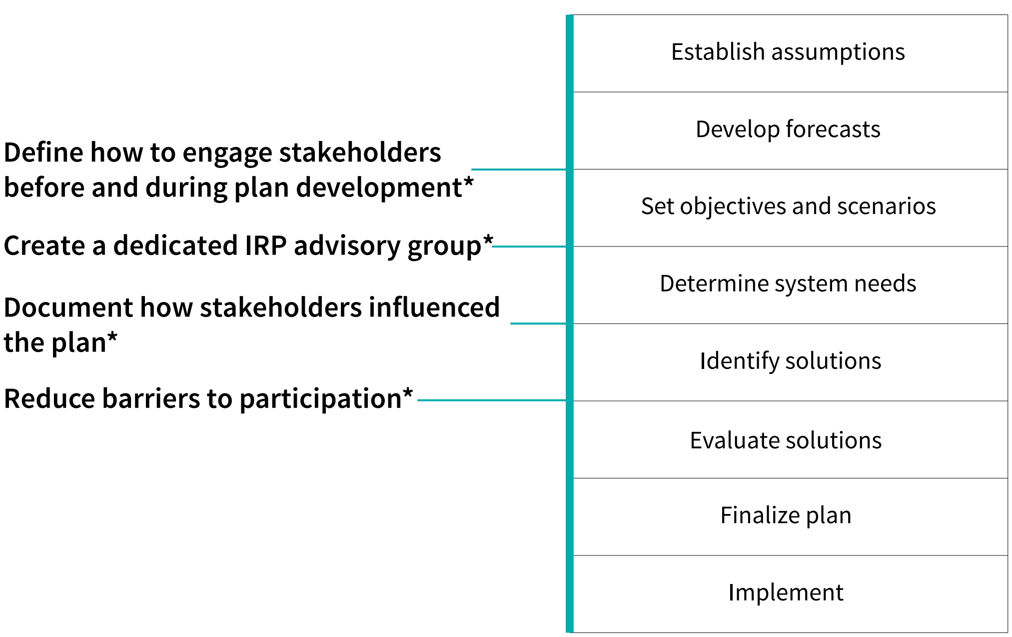
Meaningfully Engaging Stakeholders

Meaningful stakeholder engagement throughout the IRP process can improve planning outcomes. Stakeholders can provide a foundational understanding of what communities, businesses, and households need out of their future electricity system; data and information that result in more accurate cost and capability assumptions; and support for utilities and commissions in assessing whether the plan is aligned with the objectives in the jurisdiction.

Leading Practices and Examples

The following examples, and where they might be applied in the planning process, are summarized in Exhibit 18.

Exhibit 18 **Where options for meaningfully engaging stakeholders might be applied in the IRP process**



*Applied before and throughout the process

Source: RMI additions to the "Standard Building Blocks" from the National Association of Regulatory Utility Commissioners-National Association of State Energy Officials (NARUC-NASEO) Task Force on Comprehensive Electricity Planning, 2019

Define how to engage stakeholders before and during plan development. Engaging stakeholders can require a significant time investment from the utility, commission, and interested parties. In some states, regulators provide specific guidance about what IRP engagement needs to entail. The New Mexico Public Regulation Commission (PRC), for example, requires utilities to run a public advisory process and meet requirements for minimum outreach, such as notifying intervenors that participated in recent related proceedings (e.g., a previous IRP proceeding or general rate case), providing notice in a newspaper in each county it serves, and including billing inserts.[34]

Create a dedicated IRP advisory group. Creating an advisory group that meets consistently can lead to better feedback and more robust discussions as participants become familiar with the content and processes over time. Advisory groups can be especially valuable when there will not be a proceeding with the opportunity for comment or testimony before the plan is finalized or when seeking input from stakeholders that have been historically underrepresented in the IRP process.

The Arkansas Commission requires utilities to organize and facilitate a Stakeholder Committee that consists of retail and wholesale customers, independent power suppliers, marketers, and others who are interested.[35] Austin Energy, a municipal utility, works closely with a consistent advisory working group to inform its Energy Resource, Generation, and Climate Protection plan. The group ensures that the plan meets the city's environmental, efficiency, and affordability goals and includes traditional voices, such as commercial and industrial customers, as well as people who represent low-income communities.[36]

Utilities and regulators are also establishing advisory groups with the explicit goal of advancing energy equity, including in resource planning. The utilities in Oregon are setting up Utility Community Benefits and Impacts Advisory Groups, prompted by the enacted HB 2021, a major state climate law. The advisory groups are required to include representation from environmental justice communities and low-income ratepayers, and the commission is tasked with figuring out how utilities can compensate members for their participation.[37] While the groups are still being formed and guidelines are being finalized, commission staff see a future role for the advisory group in helping define metrics to quantify community impacts, which will be used to compare portfolios in the IRP.[38]

Document how stakeholders influenced the plan. Many utilities publish the number of stakeholder meetings hosted and track how many stakeholders attended, but these quantitative metrics are limited in capturing the impact stakeholders had on the final plan. In Washington, utilities are required to take a more comprehensive, qualitative approach to capturing stakeholder influence. Resource planning rules state that the utility must demonstrate how stakeholder input was used in the development of the IRP, including an explanation of how input was incorporated or why it was not.[39] This documentation can be seen, for example, in Appendix A of Puget Sound Energy's most recent IRP.[40]

Reduce barriers to participation. Resource plans and processes are complex and require stakeholders to invest significant time and resources to contribute meaningfully. Some states have adopted formal or informal practices to support wider engagement. Although these examples are not specific, in all cases, to IRPs, utilities and regulators may be able to adopt similar practices to support more diverse engagement in planning. These include but are not limited to:

- Compensating intervenors for their time[41]
- Identifying and defining communities that have been historically underserved and inviting members of those communities to advisory groups[42]

- Creating a linguistically and culturally accessible engagement strategy, including translating the IRP summary[43]
- Allowing sufficient time for stakeholders to plan and prepare for meaningful engagement (e.g., sharing materials with sufficient time for review before meetings and allowing sufficient time for additional stakeholder input after meetings)
- Selecting a neutral facilitator to develop workshops that support diverse engagement[44]

Exhibit 19 **Additional resources that support trusted resource planning**

Resource, authoring organization, when published	Overview
Access to Data, Advanced Energy Economy, September 2017	This report presents a case for data access to drive innovation for DERs and other utility programs, and provides recommendations for utilities and regulators for improving data access.
Advancing Equity in Utility Regulation, Berkeley Lab, November 2021	This report offers the perspectives of four authors on how to incorporate energy equity into utility regulation. The authors cover topics that are relevant to resource planning, such as intervenor funding and program design.
Equity in Evergy Kansas IRP Report, Synapse, September 2021	This report reviews Evergy's IRP and offers recommendations to the utility and the commission for better integrating energy equity.
Participating in Power: How to Read and Respond to Integrated Resource Plans, Regulatory Assistance Project (RAP), Institute for Market Transformation (IMT), October 2021	This report outlines specific strategies for local governments and other advocates to engage in IRPs and advance equity and social justice priorities and clean energy.
Public Utility Commission Stakeholder Engagement: A Decision-Making Framework, NARUC, January 2021	This report provides a framework to guide commissions in designing an effective approach to stakeholder engagement. The framework covers scope, facilitation approach, engagement approach, meeting format, timeline, engagement outcomes, and follow-up. It also profiles 11 examples.
"Resource Planning Portal," Berkeley Lab	This online resource organizes key data from utility resource plans in a standardized way, making data more comparable across utilities and plan years.

Resource, authoring organization, when published	Overview
Reforming Energy System Planning for Equity and Climate Transformation (RESPECT), Acadia Center, November 2021	This report outlines two solutions — comprehensive planning, and separating planners and owners — to address challenges in utility planning processes.
"**Stakeholder Engagement in Integrated Resource Planning**," Berkeley Lab, presented to the Michigan Professional Standards Commission, August 2017	This presentation provides an overview of eight states' rules and guidelines for stakeholder engagement in planning.

Source: RMI

5. Comprehensive

One of the core purposes of integrated resource planning is identifying a portfolio of resources and actions that can maintain desired utility performance under a range of possible futures. Striving to be comprehensive in the resources and actions considered within the plan can help utilities identify unforeseen risks and opportunities to save costs and prepare for major shifts.

In this section, we define comprehensive to mean that plans can accurately represent the costs, capabilities, system impacts, and values of the resources that might be available within the planning time horizon; and that plans can consider actions across transmission and distribution as portfolio options. We highlight several approaches (summarized in Exhibit 20) that utilities and regulators have used to make plans more comprehensive — from integrating planning across transmission and distribution, to implementing all-source procurement and adopting new approaches to better understand the capabilities of demand-side resources and emerging technologies.

Exhibit 20 Summary of enhancements to make planning more comprehensive

Enhancement	Leading practices and examples
Integrating resource, transmission, and distribution planning	• Implement a distribution-system planning process to complement resource planning • Establish clearer touchpoints between transmission planning and resource planning
Using all-source solicitations in planning	• Use all-source solicitation results to inform planning • Use the planning process to structure an all-source solicitation
Updating approaches for analyzing DER adoption, electrification, and demand-side value	• Model DER adoption and electrification forecasts more granularly • Model interactions among DERs, and integrate those into planning scenarios • Treat DERs, including energy efficiency, as a resource in planning • Value the reliability contribution of DERs in planning
Using models that can accurately represent emerging resources and their value	• Select models and use features that enable more spatial and temporal granularity • Include resource options that are expected to be available in the market within the planning horizon

Source: RMI

Integrating Resource, Transmission, and Distribution Planning

Many utilities and regulators have updated resource planning practices to better understand needs and options for investment across the transmission and distribution system and the impact those investments might have on resource portfolios.

Within the distribution system, utilities have historically scaled down load projections to the circuit level to understand the need for grid investment. As the adoption of DERs and electrified end uses increases, utilities and commissions are seeing a need to transition toward a planning framework that can characterize their impacts with additional complexity. Regulators and stakeholders are increasingly asking utilities to use well-vetted assumptions about DER adoption and analyze the opportunity to avoid supply-side resources with demand-side solutions.

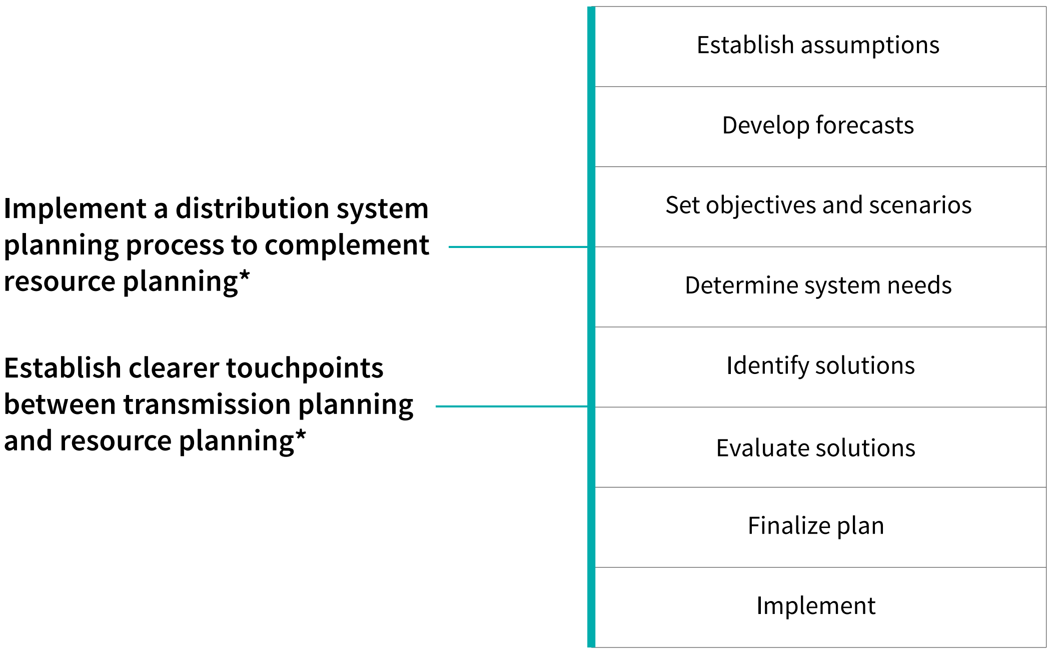
Transmission planning has largely taken place in regional planning processes at the regional transmission organization level. Yet transmission can be a key constraint or enabler in bringing new supply-side resources online. State commissions and FERC recognize that state and federal coordination on transmission planning is required to improve how projects are planned and paid for and kicked off a joint task force in 2021 to ensure cooperation.[45]

Leading Practices and Examples

Commissions are taking action on integrated planning, from opening proceedings that holistically reexamine the range of planning activities, to defining new distribution planning processes.[46] From 2019 to 2021, NARUC and NASEO facilitated a task force to develop visions and resources for comprehensive electricity planning with commissioners and state energy offices across the country. The task force resulted in five roadmaps with different options for integrating resource, distribution, and transmission planning in different utility and regulatory contexts.[47]

The following examples, and where they might be applied in the planning process, are summarized in Exhibit 21 (next page).

Exhibit 21 Integrating resource, transmission, and distribution planning might occur before or throughout the IRP process



*Applied before and throughout the process

Source: RMI additions to the "**Standard Building Blocks**" from the National Association of Regulatory Utility Commissioners-National Association of State Energy Officials (NARUC-NASEO) Task Force on Comprehensive Electricity Planning, 2019

Implement a distribution system planning process to complement resource planning. In at least 21 states, utilities are required to develop distribution system plans.[48] Distribution system planning has become a venue for understanding grid modernization needs by conducting analyses such as quantifying hosting capacity (how much DER can be added to a distribution circuit without upgrades while maintaining reliability), forecasting DER adoption, updating interconnection studies and process, and understanding the opportunity for non-wires alternatives. In some of these states, such as Oregon, distribution system planning has also become a venue for exploring local benefits and impacts, opportunities for new programs, community needs and customer preferences, and planning for resilience.[49]

In states that also have an IRP process, regulators and utilities are striving to make sure that inputs and scenarios are consistent. In Minnesota, current integrated distribution planning (IDP) requirements ask utilities to describe how IDP and IRP are coordinated.[50] In its most recent IDP, Xcel Minnesota reported that its EV and DER forecasts are now coordinated across the planning processes and that its consideration of non-wires alternatives is coordinated across the IRP and IDP.[51]

Rather than implement a separate planning process, some jurisdictions are creating an integrated planning process. Hawaii, for example, has developed an integrated grid planning process that characterizes grid needs at the distribution, transmission, and generation levels; analyzes those needs in conjunction with behind-the-meter forecast customer needs and resources; and recommends customer-sited programs and utility-scale projects for procurement.[52]

Establish clearer touchpoints between transmission planning and resource planning. There are also examples of how utilities consider the costs of new and necessary transmission in resource planning. In Colorado, utilities are required to evaluate current transmission capabilities and future needs as part of resource planning. The utility is tasked with estimating the cost of new transmission for any proposed resource acquisitions in the resource plan and considering the transmission costs and benefits provided by resources as part of the bid evaluation criteria.[53]

Similarly in Oregon, utilities are required to include fuel transportation and transmission costs for each resource considered in planning and to model existing and future transmission associated with proposed portfolios.[54] The Oregon PUC also requires utilities to consider transmission as a resource option on a "consistent and comparable basis" with other resources.[55] In outlining how transmission should be considered, the commission highlights traditional and nontraditional benefits, explicitly including the opportunity to make purchases and sales, the potential to reach less costly resources in remote locations, and improvements to reliability.[56] In its 2019 and 2021 IRPs, PacifiCorp used models that could endogenously consider costs and transmission capabilities associated with new resource additions within its six-state territory.[57] There is an opportunity to further explore ways to more fully integrate resource planning with regional and interregional transmission planning processes.

Using All-Source Solicitations in the Planning Process

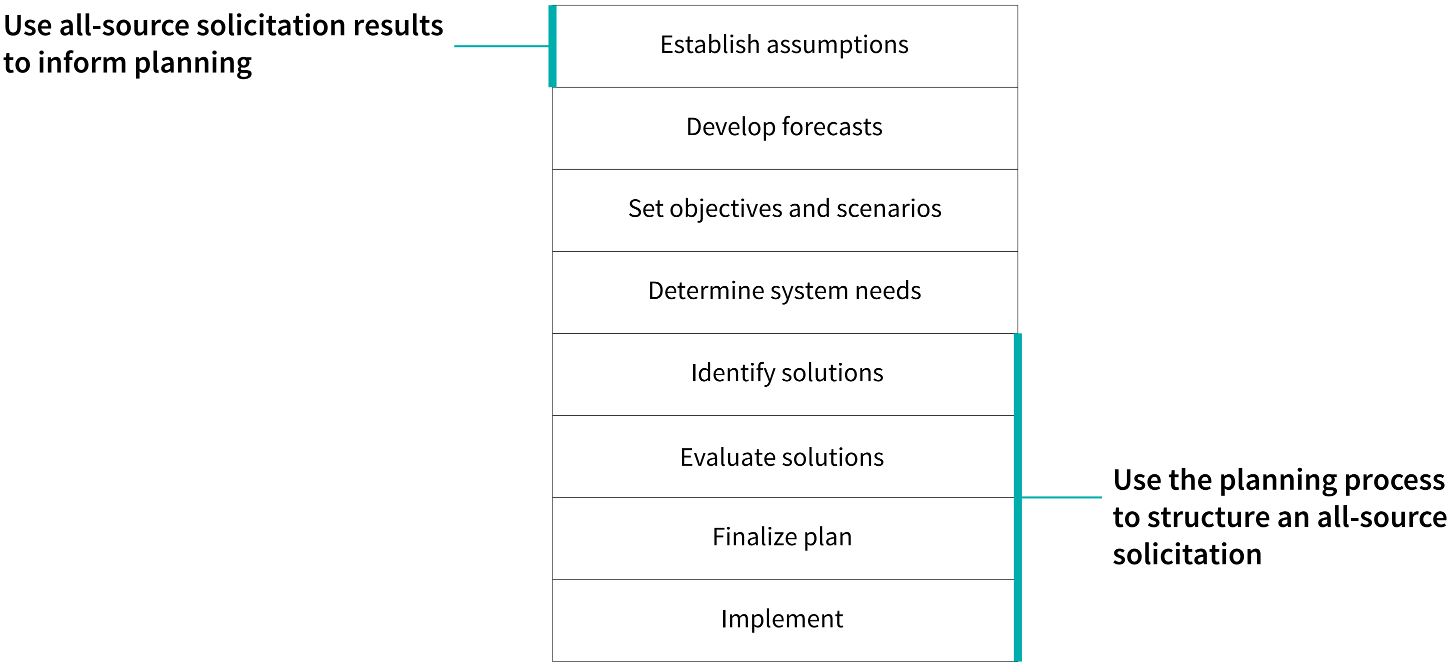
Traditionally, IRPs analyze the performance of portfolios with assumed resource costs and capabilities, and develop an action plan for procuring a set of near-term resources, if needed. In most states, procurement is an entirely separate process from planning, with utilities seeking approval to procure specific resources (e.g., solar or a gas plant) outside of the IRP (see Exhibit 11: How acknowledgment or approval of an IRP relates to procurement in 12 states, page 27). Utilities are often asked to justify the need for a new resource when seeking approval for procurement of a resource, referencing analysis in the IRP.

In contrast to the traditional approach of procuring a specific resource, all-source solicitations are requests for proposals that define the utility's need (e.g., in terms of energy, capacity, or flexibility services) and allow all resources to submit bids to meet the need. Effective all-source solicitations evaluate combinations of bids as portfolios to understand which combination of bids can meet the described need and perform best across solicitation evaluation criteria. The process of evaluating bid options as a portfolio is very similar in concept to portfolio analysis in an IRP, which has led utilities and regulators to seek out processes that can effectively combine them.

Leading Practices and Examples

Leading jurisdictions have updated rules or guidelines that redefine the relationship between planning and procurement and have required all-source solicitations as part of a planning process, as summarized in Exhibit 22 (next page). All-source solicitations are being used to support planning processes in two key ways: as the intended and integrated outcome of a planning process, or as a source of up-to-date and local inputs and assumptions.

Exhibit 22 **Options for building all-source procurement into the IRP process**



Source: RMI additions to the "Standard Building Blocks" from the National Association of Regulatory Utility Commissioners-National Association of State Energy Officials (NARUC-NASEO) Task Force on Comprehensive Electricity Planning, 2019

Use all-source solicitation results to inform planning. Michigan's statute requires utilities to issue a request for proposals for supply-side resources before beginning a planning process. The results of the request for proposals are intended to inform resource costs and capabilities used in planning, and the utilities are not required to adopt any proposals. If the plan identifies a need for new resources and is approved by the commission, the utility is required to finalize costs through an additional competitive bidding process before final approval.[58] Utilities in Indiana, including the Northern Indiana Public Service Company (NIPSCO), have also been using this approach of releasing all-source solicitations to inform their planning process over their past few planning cycles.[59]

Use the planning process to structure an all-source solicitation. In Colorado, resource planning rules require that an all-source, competitive solicitation be filed as a component of a utility's resource plan.[60] In Phase I of the Electric Resource Planning process, utilities establish assumptions, load forecasts, and test scenarios to identify system needs with a range of uncertainty and then develop the structure and evaluation criteria for an all-source solicitation that can seek resources to fill those needs. After the commission approves the Phase I resource plan, including the solicitation and its evaluation criteria, the utility will issue the all-source solicitation and receive bids. Bids are analyzed together during Phase II, as a portfolio, to determine the final cost-effective resource plan and approved portfolio for procurement.

Updating Assumptions for DER Adoption and Demand-Side Value

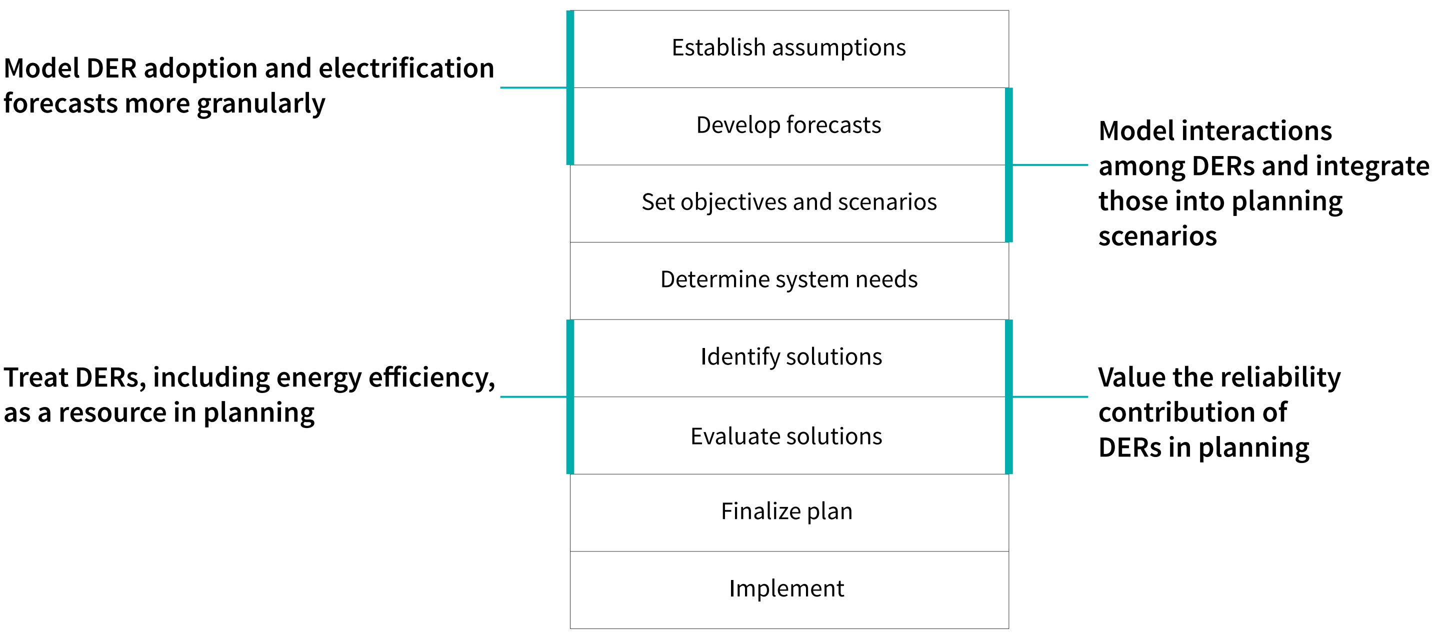
Distributed energy resources — including distributed generation, behind-the-meter storage, electric vehicles, and electrified building end uses such as heat pumps and heat pump water heaters — have long been a small component of utility load forecasts. Energy efficiency, which has been included in IRPs, has historically been applied as a reduction in load.

Today, utilities are seeing a need to proactively plan for distributed generation and electrification, and to update treatment of energy efficiency. Traditional methods may be insufficient in capturing locational value, impacts, and interactive effects among DERs.[61] Similarly, utilities and regulators are applying new methods that allow DERs, including energy efficiency, to be selected as a supply-side resource.

Leading Practices and Examples

The following examples, and where they might be applied in the planning process, are summarized in Exhibit 23.

Exhibit 23 Options for improving DER adoption and value in the IRP process



Source: RMI additions to the "Standard Building Blocks" from the National Association of Regulatory Utility Commissioners-National Association of State Energy Officials (NARUC-NASEO) Task Force on Comprehensive Electricity Planning, 2019

Model DER adoption and electrification forecasts more granularly. Utilities are developing new models or engaging with consultants to model adoption rates and patterns for DERs such as electric vehicles and distributed solar and storage. For states with economy-wide decarbonization targets or specific sectoral targets that may affect electrification rates such as an EV sales target, IRPs should reflect meeting those targets. In addition to modeling adoption, some of these tools are helping utilities understand potential system impacts and opportunities — ranging from avoiding building supply-side resources to deploying non-wires solutions to avoid grid upgrades.

DER forecasting and impact assessment tools are emerging in utility planning processes. Sacramento Municipal Utility District in California, for example, has worked with Clean Power Research to deploy WattPlan Grid in its IRP process.[62] Utilities in California and Minnesota have used a model called

LoadSEER from Integral Analytics.[63] PGE Oregon has developed its own in-house model called AdopDER.[64] NREL also has its own adoption model called dGen, which it used to model adoption in its decarbonization planning study for Los Angeles.[65]

Model interactions among DERs and integrate those into planning scenarios. Utilities are combining DER adoption and electrification forecasts to understand their interactive effects on net load. Utilities are combining adoption trajectories for individual DERs into scenarios that represent different levels and shapes of load growth. Hawaiian Electric, for example, has used low, base, and high scenarios for DER adoption, where the high scenario actually expands the market beyond what is addressable by current programs (such as for multifamily properties that are challenging to reach with DER programming). It then combines these various technology adoption scenarios into several load forecasts and sensitivities — including to create "bookend" scenarios that represent maximum or minimum load growth. The high bookend, for example, includes high EV adoption with unmanaged charging.[66]

Treat DERs, including energy efficiency, as a resource in planning. Utilities and regulators are reassessing how they account for costs of DERs, so that they can be selected as a resource in planning. One approach is to create a "supply curve" of DERs that can be selected by capacity expansion models, typically used to optimize portfolios in planning. The Indiana utilities, for example, are required by the commission to model demand-side resources in a way that is consistent and comparable to supply-side resources.[67] In IPL's 2019 IRP, for example, the utility (now known as AES Indiana) created demand-side management cost bundles that were selectable by their planning model.[68]

In addition to updating resource costs, utilities and regulators are reassessing the benefits and potential of demand-side resources and DERs. This includes updating cost-benefit tests, which are often used to determine the potential of demand-side resources or DERs that can be selected in an IRP.[69]

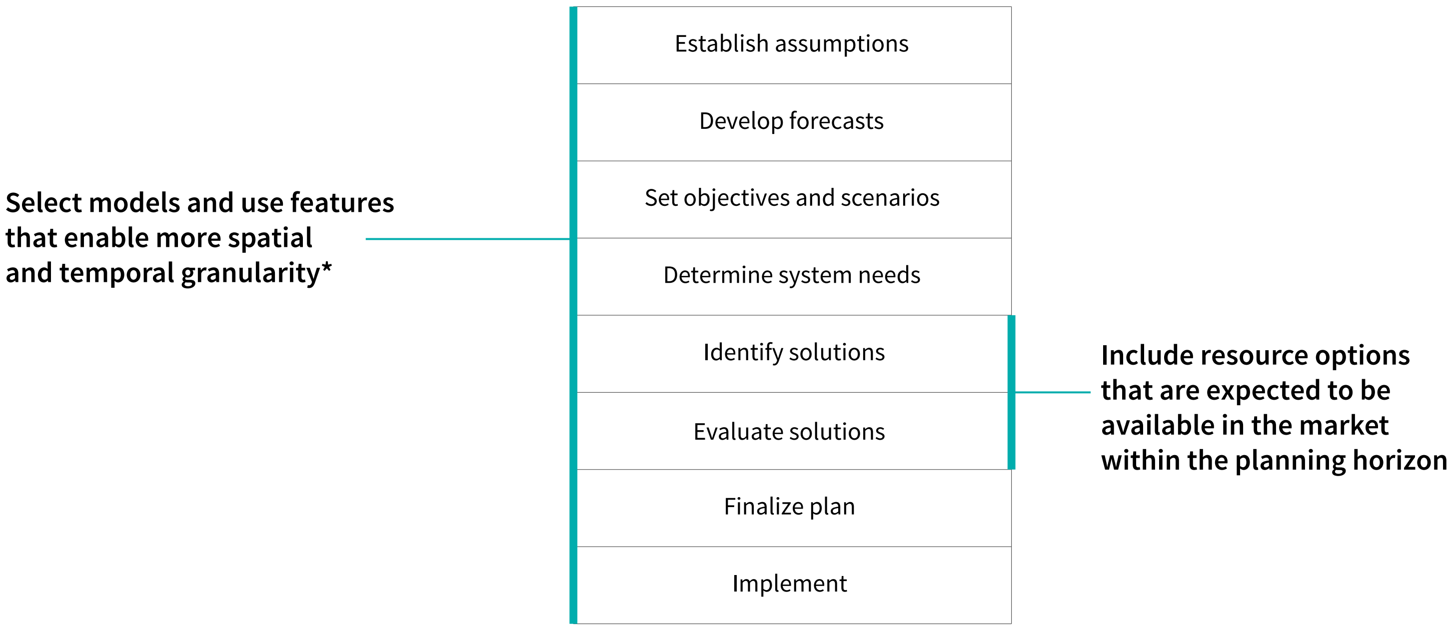
Value the reliability contribution of DERs in planning. DERs, including energy efficiency, can provide reliability services. California requires regulated utilities to include demand response in long-term procurement plans and in meeting resource adequacy requirements.[70] The California Public Utilities Commission (CPUC), in coordination with the California Independent System Operator (CAISO), establishes how demand response's resource adequacy contribution should be valued so that it can receive capacity credit or count toward utility resource adequacy requirements.[71]

Accurately Representing Emerging Resources and Their Value

A suite of emerging, low-carbon resource options such as hydrogen, carbon capture and storage, and long-duration energy storage, accelerated by incentives in the Inflation Reduction Act, will become commercially viable and economically competitive within utilities' planning horizons.[72] Utilities and regulators are updating modeling approaches and processes to consider, accurately value, and assess the opportunities and trade-offs of these emerging options.

The following examples, and where they might be applied in the planning process, are summarized in Exhibit 24 (next page).

Exhibit 24 **Options for representing emerging resources and their value**



*Applied before and throughout the process

Source: RMI additions to the "**Standard Building Blocks**" from the National Association of Regulatory Utility Commissioners-National Association of State Energy Officials (NARUC-NASEO) Task Force on Comprehensive Electricity Planning, 2019

Select models and use features that enable more spatial and temporal granularity. Many resource planning models today are capable of more temporally granular analysis than previously because of continuous improvement and advanced computing. Resources such as battery energy storage and demand flexibility can provide services sub-hourly in specific locations, and those values are often not captured by planning models.[73] Similarly, models that are able to optimize over the full year, rather than on sample days or other smaller periods, can make the value clearer for resources such as long-duration storage that provides several-day or even seasonal services.[74]

Sufficient spatial granularity can properly capture the benefits of diverse variable renewable resources spread out over a region. Furthermore, models should consider interactions between neighboring balancing areas or market regions, such as the availability of interregional power transfers.

Include resource options that are expected to be available in the market within the planning horizon. The long planning horizon for resource planning means that some resources that will be viable within the planning period are not commercially ready today. As such, utilities and regulators are are challenged with determining fair and informative ways to incorporate these potential technologies. Entergy shared draft IRP assumptions with stakeholders in advance of its anticipated 2023 filing. The assumptions included a comprehensive assessment of the technology maturity levels of all options the company might consider in its IRP. Entergy retained several options that were designated at the demonstration phase maturity for portfolio modeling, including hydrogen for co-firing in gas turbines, though it is not clear why it did not retain other emerging options, such as flow batteries or tidal energy, that were designated at the same level of maturity.[75] Conducting an all-source solicitation can also help discover the full range of resource options that may be available within the period of a need identified in an IRP.

Exhibit 25 **Additional resources that support comprehensive resource planning**

Resource, authoring organization, when published	Overview
All-Source Competitive Solicitations: State and Electric Utility Practices, Berkeley Lab, March 2021	This report provides a comprehensive overview of all-source competitive solicitations and details various design and implementation options and associated issues.
Determining Utility System Value of Demand Flexibility from Grid-Interactive Efficient Buildings, Berkeley Lab, April 2020	This report evaluates common and enhanced methods for valuing the economic benefits that flexible loads in buildings can provide the electric utility system to be used in resource planning.
Electric Distribution System Planning with DERs — High-Level Assessment of Tools and Methods, Pacific Northwest National Laboratory (PNNL), March 2020	This report outlines tools and methods that enable distribution planning with DERs and evaluates their capabilities and where advancements are needed.
How to Build Clean Energy Portfolios, RMI, RAP, September 2017	This online resource and accompanying report highlight best practices in procurement. They include stakeholder-specific recommendations, case studies of procurement processes, and a state-by-state review of procurement today.
"**Integrated Distribution System Planning**" web page, Berkeley Lab	This online resource has resources and presentations from past state, regional, and national trainings on integrated distribution system planning, and links to related publications.
"**The Integrated Energy Network**," Electric Power Research Institute	This online resource introduces the concept of an integrated energy network and aggregates a growing body of research to enable this pathway.
Making the Most of the Power Plant Market, Energy Innovation, April 2020	This report, geared toward regulators, recommends best practices for all-source electric generation procurement and reviews several case studies in depth.
Methods to Incorporate Energy Efficiency in Electricity System Planning and Markets, Berkeley Lab, January 2021	This report covers how utilities and markets can move beyond reducing load forecasts to represent efficiency, and toward analytical methods that consider energy efficiency as a resource that can compete with supply-side options.

Resource, authoring organization, when published	Overview
Methods, Tools and Resources: A Handbook for Quantifying DER Impacts for Benefit-Cost Analysis, National Energy Screening Project, March 2022	This handbook provides guidance on quantifying the benefits and costs of DER investments.
"NARUC-NASEO Task Force on Comprehensive Electricity Planning," 2018–20	This online resource is the product of a two-year collaborative initiative in which commissioners and state energy office participants explored options to better align distribution system planning and resource planning processes. It has additional context on the task force and a comprehensive resource library for planning. It includes resources such as a blueprint for state action and task force cohort roadmaps.
Opportunities to Improve Analytical Capabilities towards Comprehensive Electricity System Planning, NARUC-NASEO, February 2021	This working paper shares analytical gaps to comprehensive planning identified by the NARUC and NASEO task force.

Source: RMI

6. Aligned

Utilities and regulators across the country have demonstrated that planning can meet traditional objectives, such as maintaining system reliability under new risks, and analyze a variety of new objectives driven by state policy or customer needs, including emissions reductions and community impacts.

Exhibit 26 **Summary of enhancements to make planning more aligned**

Enhancement	Leading practices and examples
Updating approaches to planning for reliability	• Redefine the goals and metrics for assessing reliability in an IRP • Integrate resilience into planning • Improve alignment between portfolio optimization models and reliability analysis • Analyze the impacts of reliability-threatening scenarios, including those exacerbated by climate change • Understand regional reliability needs
Accounting for carbon emissions and decarbonization targets	• Develop capped emissions scenarios that constrain resource portfolio choices based on targets • Estimate the emissions of each portfolio over time to assess the likelihood of compliance with targets • Use economy-wide deep decarbonization studies to inform planning scenarios • Establish a default preference for renewable energy resources
Analyzing air quality and health impacts	• Publish pollutant values for existing assets and new resource options • Develop environmental and health cost scenarios, and analyze portfolio impacts • Work with environmental regulators to assess likelihood of compliance and impacts
Including affordability, jobs, and environmental justice	• Plan for community transition associated with asset retirements • Estimate comparative rate impacts of portfolios • Define and map disadvantaged communities to assess impacts • Factor community acceptance into resource availability and feasibility of plans

Source: RMI

Updating Approaches to Planning for Reliability

Demonstrating that a portfolio of future resources can operate reliably under expected future conditions has long been a core priority for resource planners.

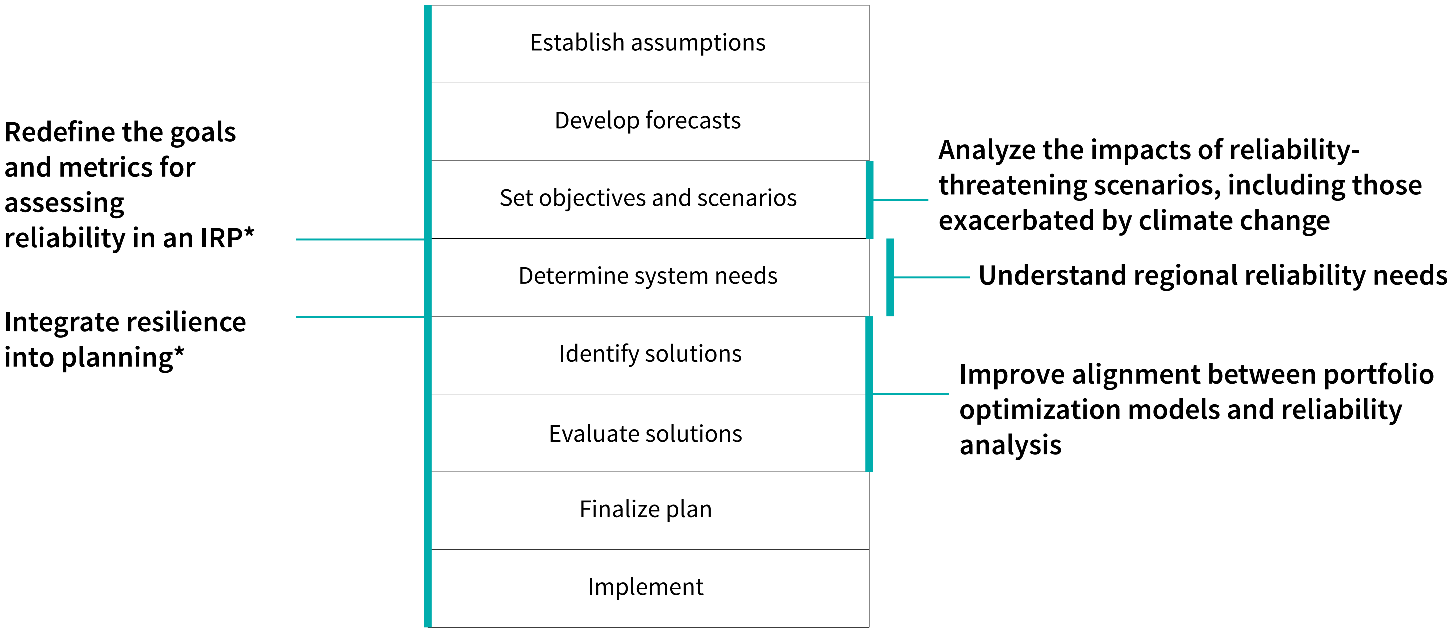
Although there are many components of reliability, resource adequacy has been the central focus within IRPs. Resource adequacy — having sufficient resources to meet projected load over a specified time and granularity and given a range of uncertainty for supply and load — typically determines whether a utility identifies a need to build new resources in an IRP. Many utilities today assess resource adequacy in IRPs by calculating whether the total capacity of their portfolio can meet peak demand plus an established reserve margin that accounts for uncertainties. Most commonly, the total peak capacity and reserve margin for planning are designed to meet a standard of 1-day-in-10-years loss of load, and future portfolios must demonstrate they can meet this standard.

Yet there is mounting evidence that when, why, and how reliability events occur are changing.[76] These changes in reliability threats — and the options for solutions that can mitigate them — are requiring resource planners to rethink traditional approaches to assessing reliability in planning processes.[77] In addition to updating approaches to resource adequacy, utilities and regulators are defining new ways of analyzing resilience in IRPs — another element of grid reliability.

Leading Practices and Examples

Utilities and regulators have updated reliability objectives and modeling approaches in resource plans to ensure that risks are more accurately characterized, quantified, and mitigated, and to assess how resource portfolios perform under a range of possible future conditions. In addition to more accurately characterizing risks, changes to how resource adequacy and resilience are assessed within an IRP can create the opportunity for a broader set of low-carbon technologies — such as long-duration storage and demand flexibility — to compete. These approaches, and where they might be applied in the planning process, are summarized in Exhibit 27 (next page).

Exhibit 27 Options for updating reliability modeling throughout the IRP process



*Applied before and throughout the process

Source: RMI additions to the "Standard Building Blocks" from the National Association of Regulatory Utility Commissioners-National Association of State Energy Officials (NARUC-NASEO) Task Force on Comprehensive Electricity Planning, 2019

Redefine the goals and metrics for assessing reliability in an IRP. Utilities and commissions have used a number of metrics quantify reliability-driven needs and characterize the reliability performance of portfolios across different scenarios. Oregon planning guidelines, for example, require utilities to assess expected and worst-case unserved energy in addition to loss of load probability and planning reserve margin.[78] These metrics are reported for each of the top-performing resource portfolios in PGE Oregon's 2019 IRP, for example.[79] Per a commission order on its prior IRP, PGE Oregon also conducted a "flexibility adequacy" study to understand the need for additional resources to meet ramping periods or to compensate for short-term forecasting errors.[80]

Integrate resilience into planning. Resilience, the ability to "anticipate, absorb, adapt to and/or rapidly recover from a potentially disruptive event," is a component of reliability that grid planners are increasingly integrating into IRPs.[81] In IRPs, utilities have identified threats and characteristics that support or hinder resilience in their jurisdictions and created methods to assess the resilience benefits of different resource options. In Green Mountain Power's (GMP) 2021 IRP, system resiliency was included as a core functional area within the implementation and action plan. GMP provided updates on four high-priority communities it is working with to improve resilience and set a goal for developing six "resiliency zones." Communities were identified based on reliability data and vulnerability, which included uncertain access to broadband and cellular service. GMP will work with the communities in the resiliency zones to deploy DERs and storage to improve reliability.[82]

Improve alignment between portfolio optimization models and reliability analysis. Capacity expansion models, which utilities use in resource planning to develop portfolio options, may not have the ability to test the reliability of portfolios across a large range of probabilistic weather and operational conditions.[vi] Thus, some utilities use production cost models or reliability-specific models to refine capacity needs and understand the reliability contribution of each resource type in planning. To harmonize these assumptions across its resource adequacy assessments and IRPs, CPUC provides a unified list of modeling inputs — load, generation, import, and transmission profiles. The inputs were developed using SERVM, a production cost model that includes probabilistic reliability assessment.[83]

Analyze the impacts of reliability-threatening scenarios, including those exacerbated by climate change. To comply with a 2020 update to the Washington Utilities and Transportation Commission's planning rules, PacifiCorp introduced a climate change scenario in its 2021 IRP and assessed the many impacts that climate change could have on planning assumptions.[84] To develop climate change data and scenarios, the company collaborated with the regional planning body, the Northwest Power and Conservation Council, and identified the impact of temperature to load and availability of hydro resources. The climate change scenario increased near-term summer peak by less than 1%, rising to nearly 3% by 2040. There was also a large impact on energy generation (decline of 7%) from declining hydro, pointing to potential future cost and risk.[85]

Con Edison in New York has developed approaches to assessing the impacts of climate change on system planning in response to requirements from the commission and legislature.[86] The utility downscaled global climate modeling results for its territory to look at impacts from flooding, heat, and extreme events. In addition to load impacts, the company found that the frequency and severity of reliability-threatening events would increase and sought to identify strategies that could improve resilience and adaptation in its service territory.[87]

Understand regional reliability needs. Understanding the regional reliability context can be key to identifying additional risks or mitigation opportunities in an IRP. Regional reliability studies can be useful for utilities to assess the total scope of investment across the region to avoid overbuilding or overbuying new resources. In the Southwest, for example, E3 recently conducted a study that was funded by several utilities demonstrating that utility IRPs in aggregate would be able to maintain resource adequacy in the region and that no further investment beyond what current IRPs specified was required.[88] The study also modeled increased loads due to climate change.

For vertically integrated utilities in regions with centrally organized wholesale electricity markets, regional approaches to assessing reliability adequacy are being incorporated into utility IRPs. For example, Midcontinent Independent System Operator's (MISO) resource adequacy planning process determines utility and local requirements, which utilities are required to demonstrate they can meet through their plans. This is done by assigning each resource that might be considered in utility portfolios an annual effective load carrying capacity, which is a probabilistic measure of its ability to perform on peak. MISO is also evolving its own reliability planning approach in ways that will affect utility resource plans — such as considering how to provide resource adequacy targets on a seasonal basis.[89]

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vi Probabilistic, in this context, means incorporating an assessment of the likelihood of a weather or operational condition to occur. Probabilistic in the IRP context, more broadly, means attaching a probability or likelihood of occurrence to factors with uncertainty.

Accounting for Carbon Emissions and Decarbonization Targets

Utilities and regulators have developed a variety of approaches to accounting for carbon emissions in resource planning. For many utilities and regulators, this is driven by the need to meet mandatory state policy targets. Beyond mandatory carbon reduction targets, many utilities have set their own voluntary carbon reduction goals or are facing pressure to help meet the goals of the local jurisdictions and companies in their service territory.

Many utilities have historically accounted for emissions and climate policy risk in their resource plans by analyzing scenarios that include a cost of carbon or the federally defined social cost of carbon. The value and impact of carbon prices on how portfolios are selected have varied widely by jurisdiction. As examples:

- Duke Carolinas analyzed a base case portfolio in its 2020 IRP with and without a carbon price. The plan assumes a carbon price of $5 per ton starting in 2025 and increasing $5 each year afterward but does not detail how that cost was determined.[90]

- In New Mexico, a standardized cost of carbon must be included as an operating cost; low, medium, and high price sensitives were determined starting in 2010 and increase each year by 2.5% ($8, $20, and $40, respectively).[91] Utilities may also propose other carbon price sensitivities or approaches.

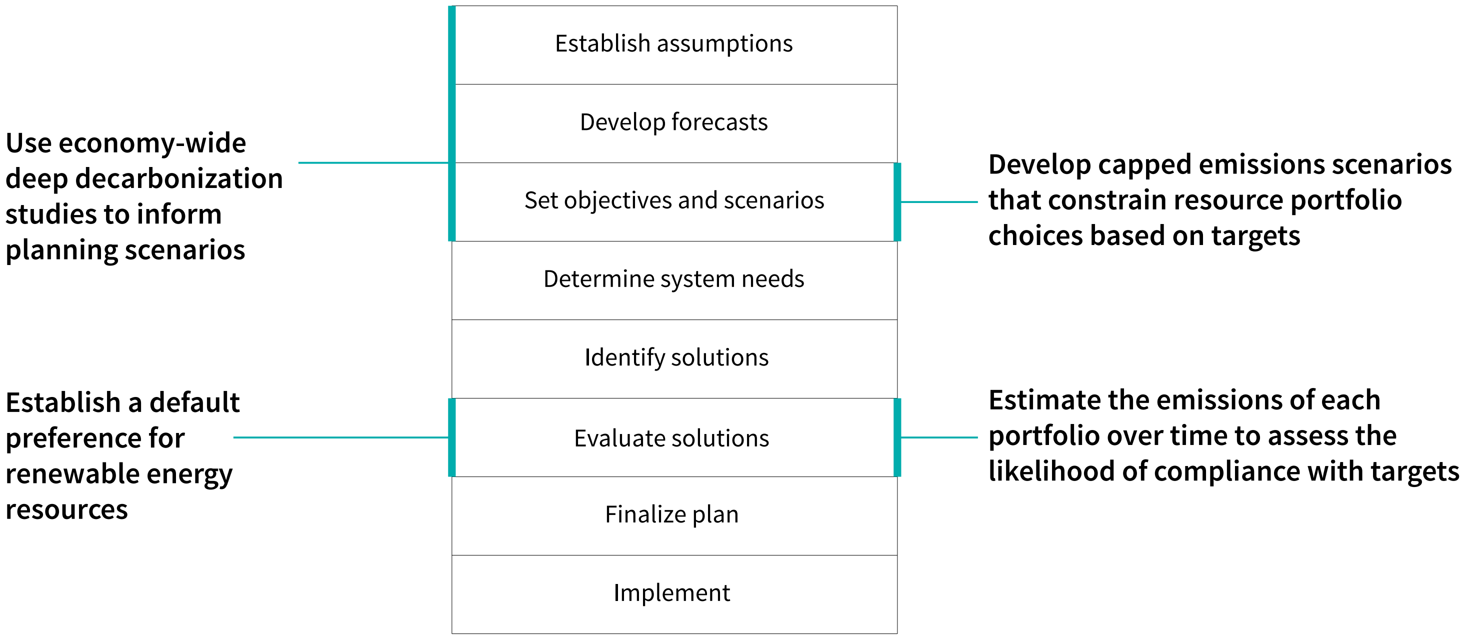
- PacifiCorp developed five "price-policy" scenarios with varying assumptions for carbon prices in its 2021 IRP. In these scenarios, carbon prices start at $10 per ton and approximately $21 per ton for medium and high cases, respectively. The utility developed an additional policy scenario to evaluate performance with a social cost of carbon, which started at about $45 per ton.[92]

- In Oregon, utilities are required to include at least one "trigger point" CO_2 price, defined as a price that would lead to choosing a substantially different resource portfolio.[93] IRPs in Oregon also have included a carbon price in their reference case scenarios, which can have a significant impact on the plans.

Leading Practices and Examples

To further account for emissions targets and climate policy risk of resource portfolios, utilities and regulators have evolved approaches within IRPs. Some states now require separate processes and documentation adjacent to IRPs, as is the case with CEIPs in Washington, which are filed in addition to IRPs and detail how the utility will meet interim targets, including deployment of renewables, energy efficiency, and demand response.[94] The following examples, and where they might be applied in the planning process, are summarized in Exhibit 28 (next page).

Exhibit 28 **Options for accounting for emissions and decarbonization targets throughout the IRP process**



Source: RMI additions to the "**Standard Building Blocks**" from the National Association of Regulatory Utility Commissioners-National Association of State Energy Officials (NARUC-NASEO) Task Force on Comprehensive Electricity Planning, 2019

Develop capped emissions scenarios that constrain resource portfolio choices based on targets. In California, a statewide planning process ensures that plans for the electricity sector's greenhouse gas (GHG) emissions are aligned with state policy. First, the California Air Resources Board develops a scoping plan that considers options for the state to meet economy-wide carbon targets and outputs a range of emissions targets for the electric sector. Then, the CPUC determines a system-wide GHG emissions target and models a reference system plan, which represents the full system and performs within the set targets. Utilities then file their own resource plans that align with the emissions caps. If the preferred portfolio does not align with the utility's portion of the emissions targets, written justification must be provided.[95]

Estimate the emissions of each portfolio over time to assess the likelihood of compliance with targets. Utilities with decarbonization targets are working with their environmental regulators to assess the likelihood of compliance given utility actions in IRPs and to establish emissions accounting methodologies. In Colorado, the commission has established a process to evaluate whether utility resource plans are aligned with the statewide GHG emissions reduction targets set by statute. The utilities are required to include projected emissions of owned and planned resources and assess the costs and benefits of a resource portfolio that is aligned with reducing CO_2 emissions by 80% of 2005 levels by 2030, a sectoral target suggested in the state's Greenhouse Gas Pollution Reduction Roadmap.[96]

Use economy-wide deep decarbonization studies to inform planning scenarios. Some utilities are incorporating deep decarbonization planning models, which analyze impacts of decarbonization across multiple sectors of the economy, into their plans to understand how their resource planning fits into the larger state decarbonization roadmap. As one example, PGE Oregon engaged with energy consultants to run a decarbonization study. The study explored how decarbonization of the local economy would affect electricity demand under three scenarios: high electrification, low electrification, and high DER penetration.[97] PGE Oregon then incorporated the modeled impacts of EV adoption, energy efficiency, and electrification into a load profile for a "decarbonization scenario" and tested IRP portfolios against this modified demand.[98]

Establish a default preference for renewable energy resources. In pursuit of effectuating state policy, some states require utilities to provide explicit justification when proposing new fossil fuel resources in their resource planning. In Minnesota, a 2022 statute prevents the commission from approving either new or refurbished nonrenewable generation in resource plans unless it's demonstrated that the renewables option is not in the public interest.[99] In determining "public interest," the commission must consider factors such as whether the resource plan is aligned with prior established GHG reduction goals, whether there are reliability impacts, and any utility and ratepayer impacts.[100] Similarly, in California, utilities must demonstrate why a lower-emitting or zero-emitting resource could not "reasonably" meet the identified need in order to propose a new or re-contracted natural gas plant.[101]

Analyzing Air Quality and Health Impacts

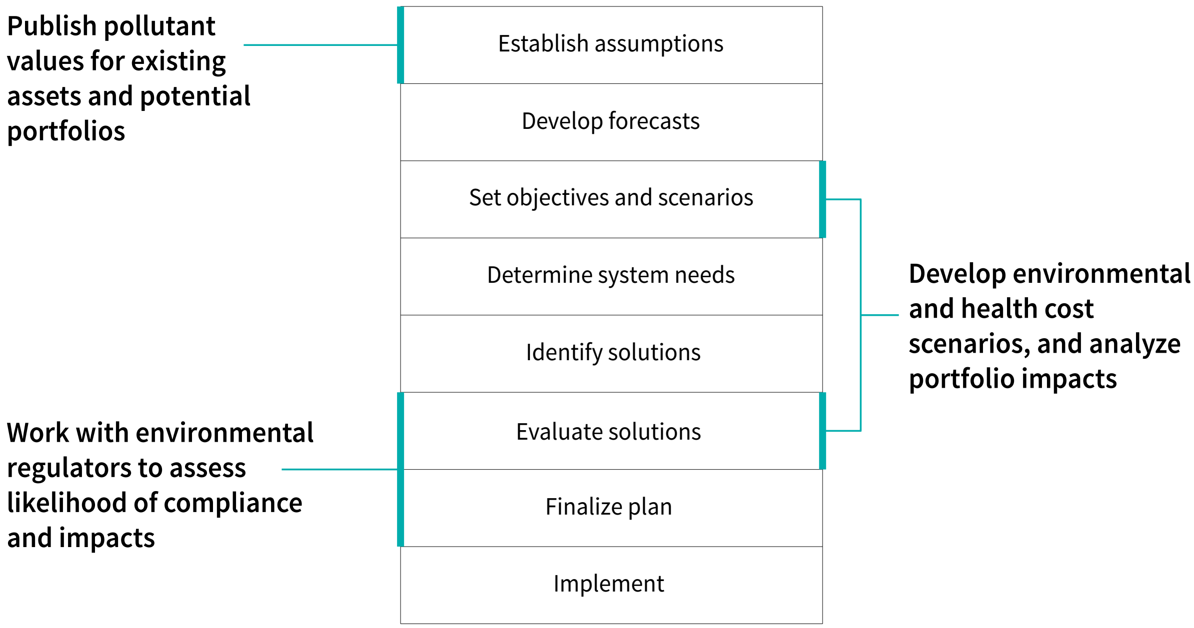
In addition to accounting for CO_2 emissions, leading states and utilities are developing more robust approaches to characterize the health trade-offs of different resource plan options. These approaches have most commonly been in response to state climate laws that prioritize environmental justice, reduce harm to historically disadvantaged communities, and move toward energy equity.

Most states that have resource planning requirements include language around assessing the environmental impact or compliance of existing resources and new resource options, such as demonstrating they can meet national or state air quality standards.

Leading Practices and Examples

Leading states and utilities are adding specificity to the requirements for assessing air quality impacts within resource plans, as summarized in Exhibit 29 (next page).

Exhibit 29 Options for analyzing air pollution and health impacts within the IRP process



Source: RMI additions to the "Standard Building Blocks" from the National Association of Regulatory Utility Commissioners-National Association of State Energy Officials (NARUC-NASEO) Task Force on Comprehensive Electricity Planning, 2019

Publish pollutant values for existing assets and potential portfolios. In New Mexico, resource planning rules require utilities to file with their IRP a description of existing resources, which includes emissions rates of criteria pollutants (NO_x, SO_x, CO, CO_2, and PM2.5) and mercury where possible.[102] Additionally, utilities are required to identify emissions assumptions for potential supply-side resource options.[103] Public Service Company of New Mexico's (PNM) 2021 IRP, for example, includes these values for each asset.[104] In addition to requiring that these values be provided, the New Mexico's IRP rules also state that "for resources whose costs and service quality is equivalent, the utility should prefer resources that minimize environmental impacts."[105]

Develop environmental and health cost scenarios, and analyze portfolio impacts. In Minnesota, the state statute applicable to resource planning requires the commission to, "to the extent practicable, quantify and establish a range of environmental costs associated with each method of electric generation."[106] Utilities are required to use these commission-defined values in evaluating and selecting options in their resource plans. In Xcel's Upper Midwest Energy Plan, for example, the utility includes values for "externalities," broken out by where impacts would occur (e.g., urban versus rural). In addition to including externality costs as sensitivities calculated across portfolios, the utility ran scenarios in which externalities were included in the model's optimization.[107] One of the five factors that the commission must balance in its approval of resource plans in Minnesota is minimizing "adverse effects on the environment," and optimizing portfolios that include quantified externalities encourages the commission to weigh this factor in its decision.[108]

Work with environmental regulators to assess likelihood of compliance and impacts. Utility commissions and environmental regulators are working together to redefine air and environmental impact requirements for resource plans. Michigan's resource planning statute, implemented in 2017, requires the commission to update the planning rules every five years through collaboration with the Michigan Department of Environment, Great Lakes, and Energy (EGLE). The statute also directs the commission to seek an advisory opinion from EGLE to evaluate how the utility's proposed plan will affect criteria pollutants and whether the plan can reasonably achieve environmental compliance.[109] The commission and EGLE are currently working together and with stakeholders to update the resource planning rules and consider what additional analysis should be included in EGLE's advisory opinion and the utility's plans.[110] Proposed updates under discussion include providing asset- and portfolio-level emissions data, conducting an analysis of vulnerable community impacts from fossil fuel generators, and assessing health impact estimates for PM2.5.[111]

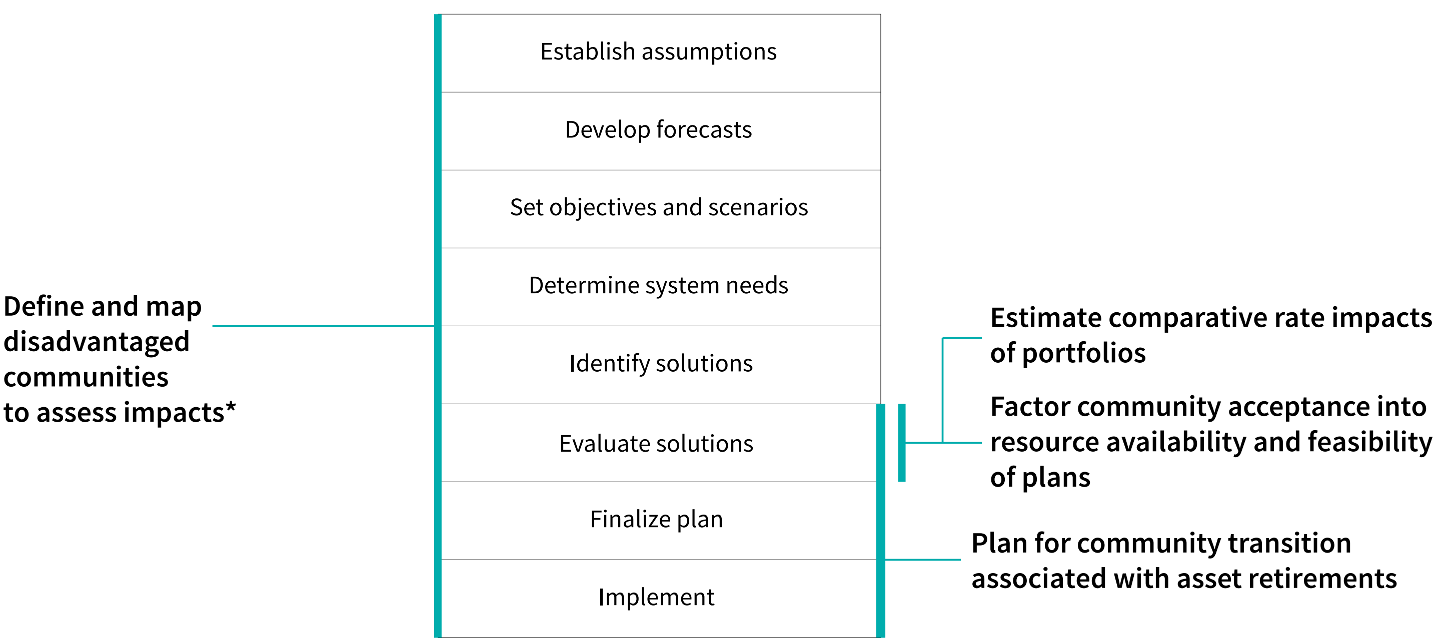
Including Affordability, Jobs, and Environmental Justice

Resource planning has, for the most part, focused on analyzing potential portfolios' ability to meet system needs. However, utilities and regulators are increasingly connecting the potential human impacts of utility plans to portfolio options within an IRP. Not only does this help utilities and regulators to understand and quantify potential human impacts, but it also outlines for people within a utility's service territory how different portfolios might affect them. Even if these impacts do not influence the development of the portfolios, understanding the impacts up-front can be a first step toward helping utilities, advocates, and regulators understand trade-offs and plan to mitigate some of the potential risks.

Leading Practices and Examples

The following examples, and where they might be applied in the planning process, are summarized in Exhibit 30.

Exhibit 30 **Options for including affordability, jobs, and environmental justice in resource planning**



*Applied before and throughout the process

Source: RMI additions to the "Standard Building Blocks" from the National Association of Regulatory Utility Commissioners-National Association of State Energy Officials (NARUC-NASEO) Task Force on Comprehensive Electricity Planning, 2019

Plan for community transition associated with asset retirements. IRPs model specific plant retirements and establish plans to address resulting system impacts. In Minnesota, utilities must also consider the human impacts of these plant closures in their IRPs. Specifically, a statute requires any utility that has scheduled an in-state retirement to collaborate with workers and worker representatives to create a plan to minimize the resulting employee dislocations.[112]

Estimate comparative rate impacts of portfolios. Changes to customer rates are determined in rate cases, separately from resource planning. However, estimating potential impacts of different scenarios or portfolios in an IRP can help regulators, customers, and consumer advocates interpret how planning decisions might affect energy affordability. PacifiCorp estimates several costs and risks across its portfolios, including rate impacts. In the 2021 IRP, PacifiCorp calculated nominal annual revenue requirements for each of its top portfolios and compared these with a benchmark portfolio.[113] This process does not calculate a specific bill impact but highlights the relative differences among potential plans.

Define and map disadvantaged communities to assess impacts.[vii] Before being able to evaluate whether and how utility services are serving disadvantaged communities, utilities must understand who and where these customers are. Several states require utilities to map disadvantaged communities in their planning processes, as a precursor to evaluating specific impacts of the plan on those communities. As one example, CPUC requires utilities to identify which disadvantaged communities they serve.[114] This information is then used to identify specific environmental justice issues that these communities face and to support compliance with the statutory requirements to minimize air pollution in disadvantaged communities.[115]

Factor community acceptance into resource availability and feasibility of plans. In its integrated grid planning process, Hawaiian Electric uses "renewable energy zones" to assess the potential for development and estimate transmission costs associated with resources that could be selected. Many stakeholders commented that the zones should be constrained in line with community acceptance. As a result, the commission has required Hawaiian Electric to propose a community engagement plan and to describe the impact of the community engagement on the constraints.[116]

vii Language differs by state. Disadvantaged communities are, as defined by the CPUC, "the areas throughout California which most suffer from a combination of economic, health, and environmental burdens. These burdens include poverty, high unemployment, air and water pollution, presence of hazardous wastes as well as high incidence of asthma and heart disease" (**https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/infrastructure/disadvantaged-communities**). This terminology is also used by the White House Council on Environmental Quality.

Exhibit 31 **Additional resources that support aligned resource planning**

Resource, authoring organization, when published	Overview
"**Climate Change and the 2021 Power Plan Workshop**," Northwest Power and Conservation Council, May 2019	This online resource shows the agenda from the System Integration Forum's Climate Change and 2021 Power Plan workshop with live links to resources that describe climate impacts on planning.
Considerations for Resilience Guidelines for Clean Energy Plans, for the Oregon PUC and Oregon Electricity Stakeholders, September 2022	This report, prepared for the Oregon PUC, provides an overview of approaches to incorporating resilience in planning.
"**Electricity Reliability & Resilience**" website, Berkeley Lab	This online resource has past projects and publications on electricity reliability analysis and includes such topics as improving reliability performance data and metrics, evaluating reliability trends, and assessing the economic value of reliability to customers.
Redefining Resource Adequacy for Modern Power Systems, Energy Systems Integration Group (ESIG), 2021	This report provides six guiding principles for practitioners to use when redefining resource adequacy to meet the needs of the grid under changing chronological grid operations and correlated events.
"**Integrated, Resilient Distribution Planning**," NARUC webinar, May 2020	This presentation has technical information, frameworks, and resources for improving resilience in distribution system planning.
"**Innovations in Electricity Modeling: Planning for Climate Variability**," National Council on Electricity Planning (NCEP) and Berkeley Lab, October 2021	This online resource has a four-part series of virtual trainings, one of which covers planning for climate variability: • Load forecasting for transmission and distribution system planning • Resource, asset, and contingency planning
"**Interruption Cost Estimate (ICE) Calculator**," Berkeley Lab	This online tool supports reliability planning and can be used to estimate interruption costs and the value of reliability improvement.
"**Multi-objective Decision Planning (MOD-Plan) for Equity, Resilience, and Decarbonization**," Sandia National Laboratories, US Department of Energy (DOE), and PNNL	This project is intended to develop a framework for multi-objective decision-making across traditional planning objectives and energy justice and equity, resilience, and decarbonization.

Resource, authoring organization, when published	Overview
Resource Adequacy Primer for State Regulators, NARUC, July 2021	This report outlines different state and market approaches to resource adequacy and concludes with two current and emerging issues: measuring resource adequacy with an evolving resource mix and changing demand characteristics and the interplay between regional and state planning.
Utility Investments in Resilience of Electricity Systems, Berkeley Lab and others, April 2019	This report is one of a series of DOE-funded reports that reflects different perspectives of electricity system stakeholders on critical questions; this report is on resilience investments and includes questions of cost, responsibility, planning strategies, and future opportunities from state regulators, utilities, and consumers.

7. Conclusion

Ultimately, we hope that utilities and regulators will use this opportunity — when their resource planning processes are being stretched and challenged — to consider how resource planning may need to be reimagined.

To ensure that IRPs can remain trusted, comprehensive, and aligned, utilities and regulators have an opportunity to take a step back and realign on the purpose, scope, roles, and tools used in planning before making many piecemeal enhancements.

After aligning on priority enhancements, look to examples across the country that other utilities and regulators have tested. Yet the list of questions that are coming up in the process of reimagining planning is constantly growing, and the list of examples we've shared is incomplete. Utilities and regulators should continue to ask big questions about the future of resource planning, try new approaches, and share their results.

Appendix: Resource Tables

State	Region	Sources
Alabama	South	• State Guide to Utility Energy Efficiency Planning • Commission Order: "Consideration of Sections 532 and 1307 of the Energy Independence and Security Act of 2007"
Colorado	West	• Rules Regulating Electric Utilities
Georgia	South	• Rules and Regulations: Integrated Resource Planning
Michigan	Midwest	• Commission Opinion and Order • "Section 460.6t Integrated resource plan"
Minnesota	Midwest	• Minnesota Administrative Rules • 2022 Minnesota Statutes
New Mexico	Southwest	• PRC Ruling: "Integrated Resource Plans for Electric Utilities"
North Carolina	East	• NCUC Rules
Oregon	Pacific Northwest	• IRP Guidelines • IRP Administrative Rules • Competitive Bidding Rules
South Carolina	South	• South Carolina Code of Laws: "Energy Supply and Efficiency"
Utah	West	• Utah Code: "Resource Plans and Significant Energy Resource Approval"
Washington	Pacific Northwest	• Washington Administrative Code: "Content of an Integrated Resource Plan" • Washington Clean Energy Transition Act
Wyoming	West	• Guidelines Regarding Electric IRP • Administrative Rules

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