

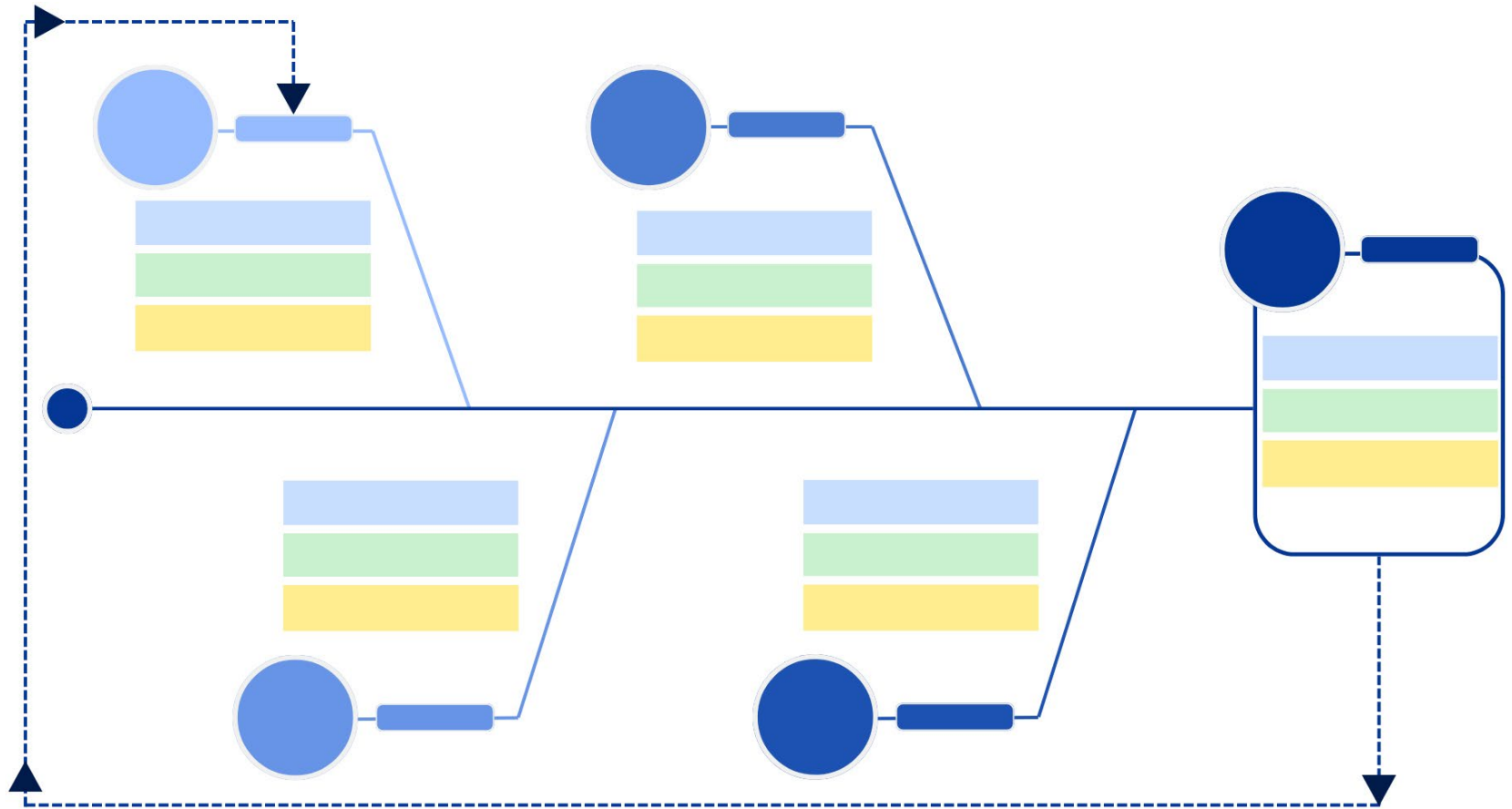


NARUC

National Association of Regulatory Utility Commissioners

Clean Energy Cohort Roadmap

NARUC Task Force on Natural Gas Resource Planning



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Introduction

This roadmap describes a vision for an idealized planning process for a natural gas distribution utility (gas LDC), from a public utility commission perspective, designed to align with state policy goals for clean energy. Developed by commissioners and commission staff members in the NARUC Task Force on Natural Gas Resource Planning Clean Energy Cohort, with input from subject matter experts, the roadmap presents a planning process that a Commission could use as a model for advancing clean energy goals into gas utility planning processes. Specifically, the roadmap identifies key planning elements that the Commission will evaluate to ensure that the gas LDC's long-term planning process supports the state's ambitious clean energy goals.

The roadmap incorporates representative data types, alternatives, analyses, and planning steps that would enable the Commission to understand and properly evaluate the LDC's plans. The roadmap includes:

- A flowchart of the entire planning process
- Descriptions and explanations of each step of the planning process
- Guidance, resources, and examples that can augment understanding and offer starting points for action

Please note that this roadmap is not intended to endorse the pursuit or adoption of any particular state goal. Commissions are not policymaking bodies and clean energy goals generally come from the executive or legislative branches. To that end, a fictional state persona was created to guide the development of this roadmap. Comparable roadmaps have been produced by other NARUC cohorts focused on the state policy goals of [affordability](#), [reliability](#), and [economic development](#). These roadmaps do not focus on electricity system planning related to gas-fired power generation;¹ the focus is on in-state gas distribution utilities.

How to Read this Roadmap

This roadmap describes activities contained in an **idealized** planning process for a gas LDC located in a fictional state with ambitious clean energy goals. **Steps** are largely sequential; outputs from each step serve as inputs to subsequent steps (though iteration is expected). Many of the steps involve gathering information or data from the gas LDC or from customers, state agencies, or other stakeholders to provide evidence to support eventual regulatory decisions.

Comprehensive stakeholder engagement throughout the planning process is key to an informed, robust process that ultimately arrives at decisions that further state policy goals and the public interest. To that end, where appropriate, the descriptions of each step note when and how stakeholders can provide input or otherwise engage in the planning process.

This roadmap describes an **idealized planning process, not an actual one**. While this exact process might not be implemented in any instance and any actual process must, of course, be adapted to the particular situation at hand, some Commissions have implemented portions of this process for gas or other regulated utilities. The Cohort expects that the roadmap could offer a starting point for considering state-specific implementation, so where possible, the roadmap notes relevant resources and examples from across the U.S. that can be referenced and adapted as helpful.

Finally, the roadmap does not contain a timeline for the planning process, as timing could vary widely across states based on the particular situation.

¹ Please see the NARUC Gas-Electric Alignment for Reliability (GEAR) Task Force [report](#) (November 2025) for recommendations from a diverse group of commissioners and industry stakeholders about how to improve electric and gas coordination at the wholesale level.

About the Clean Energy Cohort's State

The fictional, representative state that the Clean Energy Cohort is supporting has some key characteristics that provide context for the cohort's vision of an ideal planning process. As with all aspects of the

idealized planning process, the divergence between this fictional state and a real state could result in deviations from the gas planning process offered as a potential starting point.

Geography and Economy

- The population is split between urban and rural areas: densely populated urban cores and large rural tracts. The gas system is concentrated in urban and suburban areas; rural areas generally do not have gas.
- The state has a cold climate with significant winter heating needs. Winter heating drives high winter gas demand.
- Overall, the economy and the population are both growing. Specifically, the manufacturing sector is expanding.
- The state is not a gas producer.

Infrastructure

- The gas distribution system has aging and often leak-prone gas pipes that must be mitigated.
- There is an ongoing leak-prone pipe replacement program that is 50 percent complete at this point.
- Buildings are predominantly gas heated, particularly in urban and suburban areas; delivered fuels are more common in rural areas.
- Electrification is the primary driver of load growth on the electric system; the electric system is decarbonizing through adoption of renewables. The electricity system is currently summer peaking.
- The state provides some incentives for electric heat pumps.

Utility Demographics

- The state primarily has gas-only utilities with different territories, but there are a few dual-fuel utilities in-state as well.
- Gas utilities are required to develop integrated resource plans.
- Rates are trending upwards leading to affordability concerns.
- Wholesale commodity prices are relatively stable.
- The state is still using historic rate designs which have not been examined recently. Rates are mostly volumetric.

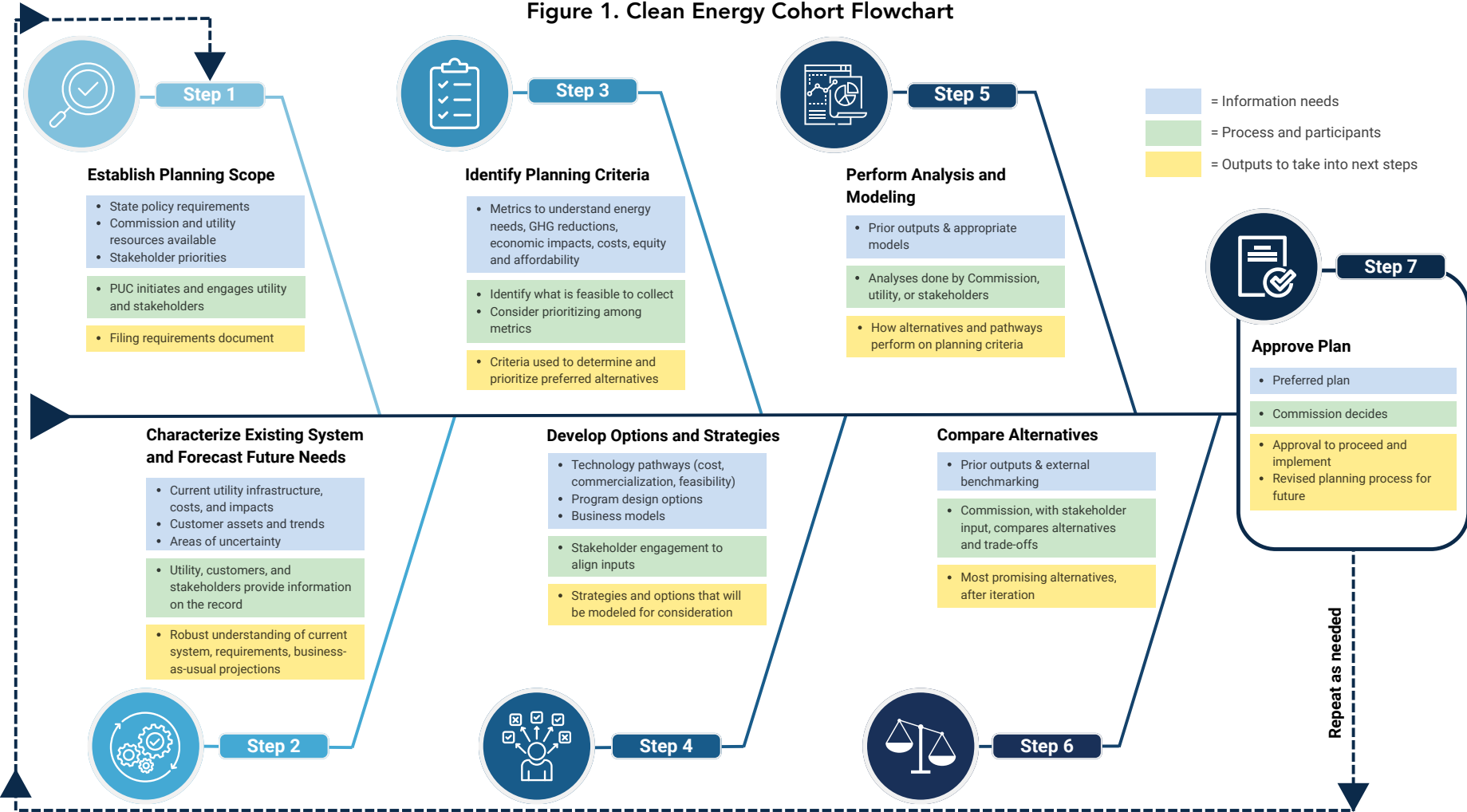
Customer Characteristics

- The state has a mix of residential, commercial, and industrial customers.
- There are a significant number of low-income customers in particular areas (low-income gas customers are mostly in urban areas).

Roadmap Features

The flowchart shown in **Figure 1** outlines a series of steps designed to gather and process relevant information that would aid in developing a comprehensive clean energy plan for a gas LDC. The seven steps in the Clean Energy Cohort’s roadmap are: (1) Establish Planning Scope, (2) Characterize Existing System and Forecast Future Needs, (3) Identify

Planning Criteria, (4) Develop Options and Strategies, (5) Perform Analysis and Modeling, (6) Compare Alternatives, and (7) Approve Plan. Each step is described in more detail in the following sections, which highlight information needs [in blue], processes and participants [in green], and outputs to take into the next step [in yellow] along with



relevant resources and examples. See the [NARUC Task Force on Natural Gas Resource Planning website](#) for supplementary materials such as expert presentations, data sources, and regulatory tools.

The planning process is intended to be iterative, with periodic reassessments during which utility regulators, utilities, and stakeholders identify opportunities for refinement and improvement. The plan, once completed, will be reviewed and approved or acknowledged by the utility regulator and will serve as a resource going forward for all stakeholders.

Regulatory decisions are based on state law and evidence submitted by utilities and stakeholders. During the planning cycle, the Commission may need to evaluate new tools or services to customers even in cases where available evidence is limited. Evidence will change over time as technologies and customer preferences evolve, so the completed plan and its future iterations will likely be dynamic.



Step 1. Establish Planning Scope

The first step of the planning process establishes details related to the planning scope and process in which the utility and stakeholders can expect to be involved.

- State policy requirements
- Commission and utility resources available
- Stakeholder priorities

- PUC initiates and engages utility and stakeholders

- Filing requirements document

Information needs

The intention of this roadmap is to outline a planning process related to in-state gas utility service for customers (not gas-fired electricity generation) that will achieve clean energy and other state policy goals. Within the planning scope step, the Commission will establish specific goals, parameters, and expectations for all who will be involved in the planning process. The Commission will make determinations about:

- **State policy goals, requirements, and jurisdiction:** Which state policy goals or mandates are targeted for achievement? Are there milestones that must be considered (e.g., 40 percent reduction in greenhouse gas

(GHG) emissions by 2040, 80 percent reduction by 2050)? Are there additional policy goals that are aspirational (e.g., executive order, commission policy statement) and how should these be addressed (e.g., in options or strategy development, where uncertainties are considered, etc.)? Are there relevant policy requirements that will limit options (e.g., legal definition of “obligation to serve”)? What jurisdiction and authorities does the Commission have?

- **Relevant planning horizon:** What is the relevant horizon for the planning effort (e.g., based on investment / infrastructure life, number of utilities and frequency of filings, rate case cycles, opportunities to change / affect customer rates, others)? Is this effort focused on issues that require a long horizon, and within that, can or should there be shorter-term plans with greater detail?

TIP: Cohort members recommend longer-term planning to address clean energy policies because it may involve significant changes in long-lived infrastructure (e.g., through mid-century and beyond). Still, given the long-term direction, much attention may be focused on nearer-term (e.g., five-year) action plans and nearer-term “critical path” actions and uncertainties that put the utility on the right path initially to achieve long-term goals.

- **Approach to risk or uncertainty:** Will the planning process articulate multiple scenarios, quantify risk, provide ranges of values to capture uncertainty on inputs, or share qualitative assessments of certainty?

TIP: To enable thorough analysis while examining a range of possibilities, consider limiting consideration to four or five scenarios for possible futures / uncertainty planning.

- **Iteration:** What kind of iteration should be expected for inputs, metrics, uncertainties, analyses, and alternatives? Will iterations be conducted within the current planning cycle or across multiple planning cycles? Where will the feedback loops occur? Where in the iterative process will stakeholders have input?
- **Boundaries of plan:** What is in scope vs. out of scope (e.g., full gas sector, LDCs, customer infrastructure, electric utility impacts,

emergency repairs)? How does this planning process relate to other proceedings (e.g., energy efficiency programs, general rate cases, depreciation cases)?

- **Stakeholder process:** At many stages of planning, there may be opportunities to solicit stakeholder input and / or communicate interim information with stakeholders. Determine whether, when and how to engage stakeholders, considering:
 - Whether and how to engage in culturally specific access to new, key stakeholders (e.g., get access to under-represented groups via key intermediaries)
 - Whether and how to offer intervenor compensation to facilitate participation from otherwise unfunded or underfunded groups²
 - How different kinds of stakeholder input (e.g., technical vs. experiential) will be used at the various stages of the planning process (e.g., early in process vs. as plans are taking shape) and who the primary recipient will be (e.g., utility planners vs. Commission)
 - Approaches that could be used for gathering stakeholder input (e.g., technical conferences led by commissioners and / or staff, working groups co-chaired by utility and consumer advocate, listening sessions)
- **Venue for planning:** Who is the lead planning entity (e.g., the LDC plans on behalf of customers, the Commission oversees)? Where will most planning engagements take place (e.g., at the Commission, in communities, at utility offices, virtually)?
- **Commission resources available:** What level of expertise and capacity exists within the Commission and its staff? What time commitments can be made? How much funding is available for consultants? What options are there for training staff on how to interpret plans (e.g., peer support from other states)? The Commission may need to take an inventory of what efforts are currently underway and to identify resources available and examine past proceedings for leverage options.

2 See NARUC, [State Approaches to Intervenor Compensation](#), December 2021.

TIP: The Commission will need to ensure that Commission staff and / or outside consultants have sufficient engineering and economic expertise to analyze the issues likely to arise (e.g., pipeline safety concerns, options for addressing repairs and replacements, economic modeling skills to analyze implications for rates and ratepayers, etc.).

- **Transparency:** What level of transparency will be expected by the Commission (i.e., what is the Commission’s default position on sharing information)? What are stakeholders’ expectations? What types and frequency of updates (on progress and sticking points) should be provided throughout the process and to whom? Will data sharing agreements be encouraged, developed, and / or required?

Critically, cohort members suggest that the Commission consider aligning gas and electric utility planning periods and filing deadlines to enable better informed decision making, given the interdependencies of gas and electric distribution planning for meeting clean energy goals. Because most gas and electric utilities have at least some service territory areas that overlap with unaffiliated utilities, Commission-approved data sharing agreements between (or within) gas and electric utilities might be necessary and should be initiated as early as possible because it will take time to develop those, likely in a separate process.

Under the Quebec government’s Green Economy Plan, Énergir and Hydro-Québec have a [partnership](#) (Dual-Energy or “bi-energy” solution) to reduce GHG emissions from heating in residential, commercial, and institutional buildings by switching from 100 percent natural gas heating to a system where electricity is used for about 70 percent of the heating loads and natural gas is used during cold peaks. The program offers financial assistance to help customers purchase dual-energy heating systems and specialized rates for electricity usage under this dual-energy system. To implement the program, both utilities need to exchange data on electricity and gas demand profiles for the dual-energy equipment, displaced natural gas consumption, and GHG emissions reductions, as well as other program participation and power and gas system metrics.

Process and participants

The Clean Energy Cohort assumes that an LDC is leading the plan development with oversight from the Commission and input from stakeholders. These and other details will need to be specified at the outset of the planning process before information gathering begins, though some iteration is possible as all parties gain a better understanding of the gas system.

- **Expectations for the LDC:** Throughout the planning process, the Commission will need to provide clear instructions and expectations for the LDC regarding planning in the context of clean energy goals. Such planning will involve planning steps, technologies, participants, etc. that go well beyond what is seen in the typical business-as-usual gas planning process and thus will be unfamiliar to both the utility and the Commission. Traditional expectations around planning practices will be the natural default assumption, so it will require proactive action by the Commission to establish a different and mutually understood set of expectations about gas planning in the context of meaningful clean energy goals.

The cohort envisions a stakeholder engagement process at this step to gather input from entities beyond the utility. Details about who will lead that process will be determined by the Commission based on numerous factors. See NARUC, [Public Utility Commission Stakeholder Engagement: A Decision-Making Framework](#), 2021, for some considerations and examples.

Outputs

In some Commissions, the results of this step will be articulated in filing requirements for the gas LDC.



Step 2. Characterize Existing System and Forecast Future Needs

This step establishes a baseline understanding of the existing natural gas distribution system, projects key external variables that will be inputs to the analyses undertaken later in the process, and articulates how the LDC and Commission will handle inevitable uncertainties.

Information needs

Significant information gathering will occur during this step. Three main categories are discussed below: (A) a baseline understanding of the natural gas distribution system, (B) external data, and (C) uncertainty scenarios.

- A. Having a baseline understanding** of the natural gas distribution system helps inform the changes that will be needed in the future to achieve clean energy policy goals.

Current information and initial projections about the system that cohort members think could be necessary to receive from the gas utility are:

- Physical system attributes and condition
 - Pipe age, material, condition
 - Maps of the gas system with reasonable geographic resolution of pipes, planned pipe maintenance / replacement³
 - Interstate pipeline and storage resources

- Current utility infrastructure costs and impacts
- Customer assets and trends
- Areas of uncertainty

- Utility, customers, and stakeholders provide information on the record

- Robust understanding of current system, requirements, business-as-usual projections

³ Some of these data requests could include critical energy infrastructure information, which will need to be shared in line with the Commission's data sharing guidelines. Data sharing that is allowed, encouraged, or required varies by utility and Commission along with protection strategies and data transfer protocols for different types of information. For example, relevant customer information is often aggregated and/or anonymized prior to sharing. Non-disclosure agreements are commonly used with intervenors for sharing particular sensitive information. Although originally designed for decision-making about electric data, the NARUC 2023 [Grid Data Sharing Framework](#) could provide a helpful framework for Commissions to establish expectations about scope, granularity, resolution, and audience if they do not have data access procedures already in place.

- System demand
 - Baseline throughput: Current energy usage across the year and on peak days, as well as related weather data. Include actual sales figures
 - Projected gas demand across a range of relevant scenarios, along with information about assumed drivers. Demand forecasts should extend at least through the planning horizon (acknowledging uncertainty, which can be captured with scenarios) and include extensive information about assumptions and methodologies to enable understanding by the commission and stakeholders
 - Energy efficiency programs and their results, including historical data and projections at different funding levels
- System costs
 - Existing book of gas system assets (e.g., carrying charges, current value of undepreciated rate base and how that is projected to change over time)
 - Cost of potential pipeline replacements (e.g., if needed due to risk assessment), expansions, repairs, etc. that may be considered in strategies to be developed. These may be estimates or averages (e.g., dollars per mile for main installation, replacement or repair, dollars per service for new services, etc.)
 - Current line extension tariffs
 - Commodity price (gas price) forecast

The utility will use these data to develop a range of complete forecasts and share the detailed methodology(ies) with the Commission and stakeholders.

- B.** In addition, **external data** (e.g., from the Commission, other regulated entities, state agencies, stakeholders) that could be valuable for understanding the baseline and forecasts could include:
- Electricity system capacity (from electric utilities or Commission records)

- Existing and projected capacity on the electric distribution grid (at appropriate geographic resolution) in baseline, peak, and winter to identify available headroom to accommodate electrification of gas loads
- Approved investment plans and associated capacity additions
- Cost projections or estimates for further electric system expansion
- Environmental attributes (from federal or state environmental agencies)
 - Air quality impacts from gas combustion or electricity generation (e.g., GHG emissions, criteria pollutants)

In addition, it will be important to gain insights into customer and economic characteristics such as:

- Customer demographics (from other state agencies, from utility)
 - Income level, location, environmental justice communities, etc., including geographic distribution
 - Density of customers per mile of pipe (geographic distribution if possible)
- Housing stock (from other state and federal agencies or universities)
 - Current age and condition of housing stock, including by income and geography
 - Current age of gas appliances in buildings, including by income and geography
 - Market trends / building construction projections (volume and to what extent is new construction gas and electric or all electric)
 - Customer trends in adoption of electric appliances
 - Estimates of building upgrade costs (e.g., appliances, insulation / building shell, electrical panel upgrades)
- Economic development (from other state or federal agencies)
 - Current proportions of customer types and energy uses
 - Economic development projections by type (e.g., NAICS codes)

Please refer to the modeling tools section of the [Resource Library](#) for publicly available data sets that are relevant for this step of baselining the system.

C. The cohort recognizes that there will be significant **uncertainty** with many projections (including business-as-usual). Cohort members suggest acknowledging the uncertainty in the planning process, yet recognizing that decisions must be made and actions taken nonetheless. Establishing scenarios and using sensitivity analyses (e.g., low, medium, high gas commodity prices) are considered essential and should be used throughout the planning process.

Members suggest that utilities and stakeholders identify and prioritize the key uncertainties, noting that pathways studies can help identify possible scenarios and sets of challenges and variables with each (some preliminary analysis may be necessary to identify which uncertainties are most important). Variables that could be important to project, acknowledging the uncertainties, include:

- Quantitative projections based on historical trends routinely published by a variety of sources: demand, economic growth, inflation, technology cost / performance, cost for pipeline installation, commodity prices

The New York State Public Service Commission's [long-term gas planning rules](#) require the LDCs in the state to file long-term (20-year) gas plans on a rolling three-year basis. Utilities are required to present different scenarios to evaluate ways the utility can help the state achieve the emission reduction targets set out in the state's Climate Leadership and Community Protection Act. The utilities can propose different scenarios, but one must evaluate no new traditional gas infrastructure. The utilities receive extensive feedback on their initial and revised plans from commission staff and stakeholders, which can result in additional scenarios and sensitivities to inputs and assumptions in the modeled scenarios. The utilities publish a final plan forming the basis for the utilities' actions over the next three years. They must report their progress to the commission in annual filings.

TIP: Experts noted that demand projections are likely to be accurate only in shorter timeframes, and that commodity prices are unlikely to be predicted accurately and should not be considered foundational.

- Qualitative and quantitative estimates for local economic and societal factors that will influence scenarios: supply chain and labor availability to scale up electrification options for customers, upfront costs to customers for electrification, customer propensity to adopt electrified technologies, customer awareness of gas alternatives, implementation friction in the transition from gas to electrified end uses

Process and participants

The Commission will likely need to support the utility and stakeholders in limiting data requests to those most important to facilitate decision-making within the multi-step planning process. Cohort members note that valuable data will come from disparate sources and could be complicated to obtain and organize. Having a clear plan for analyzing the data requested and narrowing the scope of data requests to those necessary for analysis will make this step in the planning process more manageable.

The Cohort envisions a **stakeholder engagement** process at this step to gather data and information from entities beyond the utility and also offer feedback about utility data. Specifically, Commission staff might actively reach out to other state agencies and local governments to request data to inform the planning process. Stakeholders may be invited to provide supplemental information and / or make data requests (explaining the value / use of the requested data). To ensure the process is streamlined and efficient, the Commission may make the ultimate determination about which data requests to advance. Details about who will lead the stakeholder engagement process will be determined by the Commission based on numerous factors. See NARUC, [Public Utility Commission Stakeholder Engagement: A Decision-Making Framework](#), 2021, for some considerations and examples.

Additional data needs may arise throughout the planning process, particularly to meet the demands of operators and analysts. Commission and utility engineers, finance staff, safety staff, stakeholders, and other key decision makers at multiple levels of the organizations may be involved.

As noted, data may be available from a variety of sources: from the LDCs, independent experts, economists, public data sources, state agencies (e.g., governor's office, legislators, environmental regulators), delivered fuel providers, environmental advocates, local governments, and a range of customer types (residential, small businesses, commercial/industrial groups). Some of these inputs need only be directionally correct to be useful, while others could have a substantial impact on outcomes, which may be determined later in the planning process. The Commission may need to weigh in on the relative merits of different data sources, inputs, and assumptions now or at later stages in the planning process.

TIP: Depending on the LDC's infrastructure management and data practices and what data state and local entities collect and maintain, some of these data could be time consuming to obtain initially so a phased plan for providing the data could also be helpful (e.g., establishing different expectations during the first time through the new planning process vs. during the second or third time through).

Outputs

This step results in a robust understanding of the current system and its impacts based on business-as-usual projections and specified areas of uncertainty.



Step 3. Identify Planning Criteria

In this stage of the planning process, the Commission and utility must determine how to translate the state's policy goals and requirements into metrics and criteria that will form the basis for evaluating options and ultimately selecting investments in the final gas resource plan. For this cohort, safety, reliability, and affordability are minimum expectations with the added requirement of achieving the state's clean energy goals. Additional goals will vary by state (per Step 1).

- Metrics to understand energy needs, GHG reductions, economic impacts, costs, equity and affordability

- Identify what is feasible to collect
- Consider prioritizing among metrics

- Criteria used to determine and prioritize preferred alternatives

Information needs

For the clean energy cohort, criteria to track and report will likely include benefits and costs of options and alternatives, particularly:

- **How energy needs** are being met for customers, inclusive of gas / electric / alternative fuels / dual fuel, to ensure safe and reliable energy delivery and support for customers still using the gas system.
- **Greenhouse gas reductions** that demonstrate progress towards clean energy goals, and which could include information on economy-wide reductions resulting from the plan, percent increase in renewable fuel use, distribution system-specific emission reductions, or other metrics. Related, what will be the definition of greenhouse gas reductions (e.g., gross emissions, per capita emissions)?
- **Understanding of costs** at multiple levels of granularity and scope to include any stranded costs, utility company lost margin, customers costs (all customer classes), plus transition costs. Transition costs will be a significant question throughout the planning process and metrics; calculations to track those must be identified and revisited at different stages in the planning process.

- **Equity and affordability impacts**, particularly for low-income customers, including avoiding disproportionate impacts, reducing overall energy burden, and identifying benefits to customers. Also, tracking which customers remain on the system, their income, housing type, appliances, and other data, to avoid an inequitable transition where those least able to afford the transition away from business-as-usual are stuck without cost-effective options.

TIP: As the Commission considers affordability during gas planning, it might make sure that all such dockets with interrelated issues are connected. Targeted working groups could be established to tackle different issues related to affordability with appropriate participation from consumer advocates. For example, in Pennsylvania, advocates participate in all public statement hearings and a new small business advocate group was established to ensure representation from that constituency.

- **Local economic impacts**, such as expected job impacts, the effects of selected solutions (investments) on the economy, and opportunity costs of alternative investments.

The Commission might also request that the utility and stakeholders suggest benefit-cost analysis methodologies to be used in later steps, including how qualitative inputs (non-energy benefits) will be quantified or otherwise considered and how benefits and costs will be treated symmetrically.

In New York State Department of Public Service [Case 19-G-0066](#) Consolidated Edison (New York) developed a Benefit-Cost Analysis (BCA) handbook to evaluate a broad range of resources across multiple policy contexts, such as energy efficiency and non-pipeline programs. The handbook sets out the applicable BCA methodologies, explains how to calculate individual benefits and costs for proposed solutions, and outlines the cost-effectiveness tests required for a complete analysis. It also addresses broader considerations and key issues relevant to project- and investment-benefit assessments.

Process and participants

These criteria will be reported comparably across all scenarios and alternatives developed through future steps in the planning process and used to prioritize and select options while iterating to determine the preferred alternative among possible solutions.

Key planning criteria will often be quantitative, acknowledging that in some cases, it may be difficult to quantify outcomes and goals. For some criteria, the Commission could be seeking significant granularity about potential impacts from options and alternatives (e.g., customer class impacts).

The Commission may need to rank criteria into tiers of priority, assign differential weights, and / or determine appropriate tradeoffs when evaluating solutions. The Commission might also choose to identify thresholds for some or all of the metrics.

In Minnesota, the Public Utilities Commission articulates how plans will be evaluated, based on their ability to:

- Maintain or improve the safety, adequacy, and reliability of utility service
- Keep the customers' bills and the utility's rates as low as practicable, given regulatory and other constraints
- Minimize adverse socioeconomic effects and adverse effects upon the environment
- Enhance the utility's ability to respond to changes in the financial, social, and technological factors affecting its operations
- Limit the risk of adverse effects on the utility and its customers from financial, social, and technological factors that the utility cannot control
- Include cost-effective energy savings as the preferred energy resource

The Clean Energy Cohort expects that the utility, the Commission, and contracted subject-matter experts will determine how to quantify the Commission's goals into metrics that will be used throughout the planning analyses and as part of broader stakeholder engagement.

It will be valuable for the utility to have insight into the Commission's selection criteria for options prior to the detailed work of building strategies for meeting demand and setting up modeling. The metrics will be reported to the commission and stakeholders during Step 6.

Outputs

During this step, criteria and metrics are being determined, but the values for these metrics will be reported for the options and alternatives being considered in Step 6.



Step 4. Develop Options and Strategies

The key objective of this step is to develop potential options for meeting forecasted gas demand as well as clean energy goals, across a range of scenarios. These options will then be modeled and evaluated in subsequent steps of the planning process.

Information needs

The Clean Energy Cohort suggests soliciting options and strategies that consider:

- Evolving business models of gas LDCs (e.g., provide alternative energy services)
- A variety of fuel types and delivery modes, recognizing that appropriate strategies might differ across customer classes (residential, commercial, industrial) and current fuel types (gas, propane, diesel)

- Technology pathways (cost, commercialization, feasibility)
- Program design options
- Business models

- Stakeholder engagement to align inputs

- Strategies and options that will be modeled for consideration

- Workforce transition pathways (e.g., for pipefitters, steel workers, other unions)
- Geographically targeted solutions (e.g., pruning, electrification, networked geothermal)
- Rate design options for both gas and electric customers

Key inputs will include details and projections of technology options and technology pipelines (e.g., products, their performance, and timelines), which will need to be considered specific to the jurisdiction. Establishing a common understanding of these projections will likely require state or utility-specific potential studies with adequate detail, accounting for potential competing "buyers" (from other sectors and / or geographies) that could impact availability and cost. Studies should include analyses of options including: electrification (heat pumps), renewable natural gas (RNG), hydrogen (H₂), demand response (DR), energy efficiency (EE), ground-source heat pumps, networked geothermal, and perhaps other technologies across customer classes.

Process and participants

These options will likely be developed by the LDC, though informed by input from the Commission and key stakeholders, including intervenors, local governments, customers, and others in an open process.

The complexity of scenarios and interdisciplinary nature of meeting clean energy goals for the gas system yield a significant challenge. The planning

In the Massachusetts Department of Public Utilities 20-80 [Investigation Assessing the Future of Natural Gas proceeding](#), the state utilities and their consultants hosted a series of stakeholder meetings to explain pathways modeling, scenario design, and different gas decarbonization technologies. This provided a common understanding of the analyses being performed and drove significant and meaningful input from stakeholders during the proceeding. A similar approach was followed in the Rhode Island Public Utilities Commission's [Investigation into the Future of Gas docket](#).

scope described in Step 1 will need to be referenced throughout these efforts to define what potential solutions warrant consideration; these will likely go well beyond the types of options typically considered in business-as-usual gas planning. Solution sets could range from explicit alternative projects (e.g., whether to build infrastructure project A or B) to more general approaches (e.g., whether new customer demand should be met via electrification options or low carbon fuels). Iteration will be a necessary part of the process, particularly as involved participants highlight the potential risks and uncertainties of various options.

Furthermore, coordination beyond traditional boundaries will be warranted: for example, coordinating gas system planning with electric system planning, and also perhaps across geographies (other utility territories, other states) and other parties (state agencies, alternative heat providers). Participants will need to develop a shared language for describing and understanding the (location-specific) effects on gas and electric demand resulting from the various options, and for considering ways to transition customers to

alternative energy sources. Dedicated stakeholder engagement sessions might be needed to enable this shared vocabulary.

From a process perspective, the cohort suggests an iterative process of identifying promising alternatives, comparing options to external benchmarks, soliciting input from participants, and where relevant, consideration of combining attractive aspects of several alternatives. External benchmarking (reviewing what other states, utilities, and others have done) should be a feature throughout the process as well. Readers might also want to review other [NARUC Gas Planning roadmaps](#).

Options the Cohort explored are divided into four categories shown in the deep dive: (a) new pathways for LDCs, (b) rate design strategies, (c) minimizing stranded costs, and (d) ensuring affordability. In a planning process, Commissions, utilities, and stakeholders may expand on the options outlined or look at alternative technologies or regulatory pathways to achieve clean energy policy goals.

STEP 4 DEEP DIVE: Options for Consideration

a. New pathway options for LDCs: Cohort members are concerned about the ultimate business model for gas LDCs with declining throughput and customers. Ideas considered in some jurisdictions that resonated with the cohort include:

- Mergers between gas and water utilities due to experience with underground pipes, monopoly utility service, rights of way, state and federal regulation
- Alter throughput in pipes: renewable natural gas, hydrogen, possibly networked geothermal
- Consider continued gas (RNG, hydrogen) supply just for industrial / commercial customers with hard-to-electrify end uses
- Leverage a smaller gas system as a resource to support peak energy needs on the coldest days with clear mechanisms for the gas LDC to be compensated (e.g., by electric utility, by customers)

b. Rate design options that would ease the burden of transition:

The cohort is very focused on avoiding inequities when achieving clean energy policy goals. Ideas considered in some jurisdictions that resonated with the cohort include:

- Electric heating rates with a focus on heat pumps or heat pump-specific rates
- Rates might be seasonal and /or include lower commodity charges
- Offer on-bill financing for electrified heat (air source or geothermal heat pumps)
- Rate designs offering carve-outs or discounts for low-income customers
- Reallocate more costs into fixed charges, rather than primarily volumetric rates
- In a “hybrid heating” approach, providing a “capacity credit” to the gas system for mitigating the electric system’s winter peak

- Rate designs incorporating emissions levels / emitter contribution (e.g., rate design that nudges customers who can convert to electricity to do so)
- Conduct a substitutes analysis before determining rates for industrial customers, to ensure economically viable transition options are available before subjecting these customers to rates that promote electrification.

c. Minimizing stranded costs to support affordability: Cohort members are seeking the most cost-effective approaches to meeting near- and long-term clean energy goals while ensuring continuous, reliable provision of energy services (not necessarily gas service) to customers.

When considering the potential for stranded assets, the cohort is focused on ways to safely minimize further capital expenditures on gas infrastructure that might not remain used and useful for the full normal life of the assets. The cohort notes that many decisions about these questions will be grounded in how much new vs. old pipe exists on the gas system and how aggressive the state's emissions goals are (which will vary across states).

Ideas to limit stranded costs considered in some jurisdictions that resonated with the cohort include:

- Limit or terminate gas line extension allowances
- Encourage accelerated depreciation of existing capital costs while the number of customers and gas volumes are still high
- Require new depreciation studies to reduce negative net salvage values
- Reduce capital expenditures by favoring repairs, relining, and non-pipeline alternatives rather than asset replacement (which may require reconsidering the business model and mechanisms for cost control)
- Target areas for prioritized electrification to enable pipeline decommissioning; focus may be on areas with low gas

concentration, those otherwise needing capital investments, and/or geographic locations where the electric system can absorb new customer loads

- Treat baseload vs. peaking gas assets differently. Focus on avoiding further capital expenditures for peak to limit stranded assets.
- Distinguish between capital spending that addresses true safety concerns (without alternative solutions) vs. other capital spending, and ensure cost containment incentives are in place
- Seek legislative / taxpayer support for a share of costs, to avoid a rising cost burden for a shrinking customer base and falling gas volumes.

d. Ensure that the customers left on the gas system aren't those least able to afford it:

The cohort is very focused on avoiding inequities when pursuing clean energy policy goals. Most likely, affordability and equity assessments for gas will need a parallel process on the electric side and then a separate assessment when considering changes to the two systems. Ideas considered in some jurisdictions that resonated with the cohort include encouraging utilities or other program administrators to:

- Electrify low- and moderate-income customers first, with generous incentives; potentially offer full cost of electrification and rate discounts to historically overburdened communities or customers
- Use community-level planning and partnerships with municipalities / city governments / community-based organizations to enable geographic targeting with outreach and incentives, especially for low-income customers and renters
- Unless heat pump or discounted electric rates are available for low- and moderate-income customers, consider program options for dual fuels and insulation to improve current affordability (although be cognizant of trade-offs such as the potential for fuel lock-in once these investments are made).

Outputs

This step produces a finite number of agreed-upon strategies and options that will be modeled and evaluated for further consideration.



Step 5. Perform Analysis and Modeling

The utility will need sophisticated modeling capabilities to conduct analyses on potential strategies for meeting the state's energy goals, leveraging the information gathered during prior steps about the baseline, forecasts, and options. The output of this step will be a review of the modeling results for all options relative to the planning criteria.

- Prior outputs & appropriate models
- Analyses done by commission, utility, or stakeholders
- How alternatives and pathways perform on planning criteria

Information needs

All information from prior steps will be critical to inform the analysis and modeling step.

In light of the likely longer horizon of the analyses and the broad set of options considered, it will be important to consider all relevant costs, including those that may be delayed but not necessarily avoided by current actions. For example, near-term gas infrastructure investment may avoid the need (and the associated costs) to electrify customers

In Minnesota, the commission and utilities have begun a path towards gas-electric coordination in planning. The Minnesota Public Utilities Commission (PUC) [Gas IRP](#) directs CenterPoint, MERC, and Xcel to work with electric utilities in their service territories to understand, to the extent possible, the electric system impacts on resource options in the natural gas IRPs. However, the PUC is not requiring the gas utilities to engage with every electric provider in their service territory; the gas utilities have the discretion to determine the breadth and depth of their engagement.

now. But those conversion costs might not be avoided entirely, just deferred, if those customer conversions are ultimately needed to achieve clean energy goals. The deferred conversion costs should be considered in evaluating options; this is one reason a longer time horizon may be appropriate when considering clean energy policies.

In a planning approach that is not yet common, the cohort envisions that the LDC's modeling will also consider ancillary impacts to the electric system regarding supply infrastructure, cost, and workforce implications. Particularly because utility territories rarely align exactly, this effort might need to be facilitated by the Commission and / or represent a separate sub-step to be coordinated with the relevant electric utilities occurring alongside the analysis and modeling stage of the gas planning process.

Process and participants

The Clean Energy Cohort expects that the utility will be the primary entity with sufficient system modeling capabilities and will lead the analytical exercises necessary to compare solution sets identified in the prior step. The analysis and modeling will compare all agreed-upon options across

As part of its strategic effort to align gas and electric grid investments, Eversource is adopting an [integrated approach to distribution system planning](#). This includes developing ten-year forecasts that account not only for traditional electric load growth, but also for factors such as distributed energy resource adoption, electric vehicle growth, and fuel switching (e.g., transitioning from gas heating to electric). Eversource evaluates the interdependencies between systems, such as how increased electric demand from heat pumps reduces gas usage but raises electricity needs, or how gas supply constraints may affect electric generation and heating. This work involves close coordination across Eversource's gas, electric, and regulatory teams, as well as active engagement with regulators and other key stakeholders to align forecasts, priorities, and trade-offs. By integrating gas and electric system planning, Eversource aims to lower costs, improve reliability, and support Massachusetts' clean energy transition.

the multiple dimensions of planning criteria specified in Step 3. Analysis and modeling may also involve determining how various options would respond under different scenarios and uncertainties.

The Clean Energy Cohort expects that utilities, the commission, and contracted subject-matter experts will closely coordinate the analysis and modeling, which will be examined by a broader set of stakeholders in the subsequent step of comparing across alternatives.

Outputs

This step will provide an understanding of how various clean energy investment options perform across planning criteria identified in Step 3.



Step 6. Compare Alternatives

The planning process has been transparently building to the point of the utility presenting to the Commission a subset of solution alternatives that are able to meet the energy needs of its customers while accomplishing state policy goals and aligning with the Commission's direction on priorities.

- Prior outputs & external benchmarking
- Commission, with stakeholder input, compares alternatives and trade-offs
- Most promising alternatives, after iteration

Information needs

Tradeoffs among options and alternatives are inevitable, but the solution options should be well-characterized through the scenario and solution development process. The alternatives that the utility ultimately presents to the Commission will include quantitative evaluations according to the planning criteria specified in Step 3 to the extent possible (some dimensions might include qualitative metrics instead or in addition). The categories of metrics articulated in Step 3 are:

- Meet energy needs
- GHG reductions
- Local economic impact

- Understand costs
- Equity and affordability

In addition to seeing quantified planning criteria and metrics, the Commission may also want to understand how the solution alternatives relate to:

- What other states are doing (benchmarking)
- Effect on the gas LDC / options for evolving the business model
- Other state policy or regulatory requirements impacting the gas utility
- Effect of options on the electric system

Process and participants

The cohort envisions a critical stakeholder engagement process at this step to gather input from entities beyond the utility. Details about who will lead that process will be determined by the Commission based on numerous factors. See NARUC, [Public Utility Commission Stakeholder Engagement: A Decision-Making Framework](#), 2021 for some considerations and examples.

Stakeholder engagement will be an important aspect of this stage of the planning process to support consideration and weighing of options and tradeoffs towards determining the preferred plan. It could be that the Commission, utility, and stakeholders review options and request that particular projects, programs, or investments be iterated and recombined to reduce tradeoffs and maximize benefits. The cohort expects that a wide range of stakeholders such as customers, small businesses, community groups, other state agencies, and more will want to weigh in on the solution sets offered and the proper trade-offs among criteria prior to the utility's final filing and the Commission making a decision.

Outputs

This step will result in a preferred plan informed by utility, Commission, and stakeholder input.



Step 7. Approve Plan

This roadmap establishes a structured process for defining the scope of the planning process, characterizing the existing system and the external environment to assess system needs, identifying and evaluating potential solutions, and selecting among them to best align utility investments with regulatory and policy objectives. It serves as the first stage of what may be a multi-year effort that will likely involve a fair amount of iteration to converge on a useful plan that evolves over time.

- Preferred plan

- PUC decides

- Approval to proceed and implement
- Revised planning process for future

Information needs

Selection of a preferred plan happens in this step.

Process and participants

The selection of the plan from this planning cycle will instigate a variety of next steps. Cohort members particularly note two important steps: refining and implementing rate designs that may have been selected through the planning process and exploring the possibility of taxpayer (vs. ratepayer) subsidies or incentives for customers that could be established by the legislature to support affordability.

Depending on the outcomes of initial work to establish the planning process scope and identify related proceedings, the utility might soon begin rate recovery as well. Cohort members note that historical test years will not be useful for rate recovery in this environment, and that alternative ratemaking may be required. Where possible, decoupling plus incentives, symmetrical incentives, shared savings, performance incentive mechanisms, and other tools could be valuable to support achievement of the preferred plan.

TIP: Performance incentive mechanisms (PIMs) can be designed to align a portion of a utility's financial returns with performance outcomes or public policy objectives, including safety, reliability, customer service, cost efficiency, and GHG emissions reduction. In the regulated monopoly model, gas utilities may face limited competitive pressure to innovate or manage costs; PIMs address this gap by linking revenues or profits directly to measurable performance metrics. PIMs have been implemented across the U.S. to incentivize utilities to develop and implement energy efficiency and other demand-side management programs. Such programs can help reduce GHG emissions even in jurisdictions without GHG emissions reduction mandates. The [RMI PIMs Database](#) includes a list of gas and electric utility PIMs.

Of course, the plan and the planning process will need to be reassessed periodically, with renewed stakeholder engagement. As technologies advance, policies shift, and new risks emerge, recurring cycles of planning will be essential to ensure that the gas system continues to serve customers well, aligning with broader public goals such as safety, reliability, affordability, and clean energy policies. Any state's planning process will be revised based on lessons learned from actual implementation experience. Regular updates to data collection, planning criteria, forecasting methodologies, and investment strategies will need to be incorporated.

By committing to an iterative approach, regulators, utilities, and stakeholders can maintain a dynamic, resilient, and forward-looking clean energy framework that protects customers and supports the state's long-term energy and environmental objectives.

Outputs

This step provides Commission approval to the utility to proceed and implement a new gas plan with direction to the utility about where and when cost recovery will be considered, as well as a revised planning process for future use.

Additional Resources

Below is a compiled list of additional resources and examples that may be helpful to consider when implementing a clean energy-focused natural gas distribution utility planning process. Resources are offered for: rate design and incentives, decarbonization technologies, integrated system planning, pathways modeling, and databases.

Rate Design and Incentives

- Advanced Energy United's 2025 [Massachusetts Study on Time-Varying Rate Design to Enable Electrification](#) demonstrates how a time-varying rate design approach, coupled with energy efficiency measures, can help advance the state's electrification goals while mitigating rate increases for all homes.
- E3's 2024 [Near-Term Rate Design Study](#), with the Massachusetts Interagency Rates Working Group (IRWG), evaluates near-term rate design strategies that could be developed prior to the rollout of Advanced Metering Infrastructure (AMI) to help improve customer economics for electrification relative to existing rates. E3's 2025 [Long-Term Ratemaking Study](#) assesses the rate design strategies that may be implemented in the 2030s after the rollout of AMI.
- A 2025 Lawrence Berkeley National Laboratory (LBNL) Study on [Distribution Planning for Load Growth: Buildings](#) provides considerations and results of electrification rate designs.
- The Brattle Group's 2023 whitepaper for ESIG on [Heat Pump-Friendly Cost-Based Rate Designs](#) evaluates the role of "cost-based" and "cost-reflective" rates that may help improve heat pump economics by reducing their operating costs.

Decarbonization Technologies

- [Several studies](#) have been published by the Renewable Thermal Collaborative addressing barriers and opportunities for adoption of different clean energy technologies including:

- [Utility Engagement Playbook for Industrial Customers: Addressing Power Sector Barriers to Electrification](#) (2024)
- [Thermal Batteries: Opportunities to Accelerate Decarbonization of Industrial Heat](#) (2023)
- [Case Study: AstraZeneca and Vanguard Renewables U.S. RNG Agreement](#) (2024)
- The Brattle Group's 2025 whitepaper for the New York State Energy Research and Development Authority on [Considerations for Low-Carbon Alternative Fuel Use in New York State](#) evaluates a wide range of low-carbon fuels, examining their end uses, production pathways, infrastructure needs, emissions impacts, and supply chain considerations.
- Building Decarbonization Coalition's 2024 study on [The Future of Heat: Thermal Energy Networks as an Evolutionary Path for Gas Utilities Toward a Safe, Equitable, Just Energy Transition](#) explores the potential of utility thermal energy networks (UTENS) for decarbonization and recommends legal and regulatory innovations to support UTEN development.

Integrated System Planning

- Pacific Northwest National Laboratory and LBNL's 2024 study titled [Review of Literature and Utility Commission Proceedings Relevant to Integrated System Planning: Annotated Bibliography](#), prepared to support the Washington Utilities and Transportation Commission, compiles research and reports, and state examples of coordinated gas and electric planning, future of gas, and future of heat proceedings.
- [A Regulator's Blueprint for 21st Century Gas Utility Planning](#) (2023) prepared by Strategen for Advanced Energy United discusses the strengths and drawbacks of existing gas system planning frameworks.

- [Xcel CO's 2024 – 2027 Clean Heat Plan](#) is another example of system planning. The utility now earns a return on incentives as part of this plan (e.g., for heat pump incentives).

Pathways Modeling

- E3's 2024 Report on [Decarbonization Pathways Modeling](#) discusses the role of pathways modeling in gas proceedings and provides considerations for Illinois's future of gas evaluations.
- The 2022 [Massachusetts Clean Energy and Climate Plan for 2025 and 2030](#) outlines specific strategies, policies, and implementation goals and benchmarks for the state to reduce emissions in a cost-effective and equitable manner using decarbonization pathways modeling conducted by Evolved Energy Research.

Databases

- The National Lab of the Rockies (NLER)'s [ResStock](#) and [ComStock](#) tools are building-stock energy modeling platforms designed to represent the residential and commercial building stocks in the U.S., respectively. They provide modeled data about how the existing building stock currently uses energy and how it might use energy under various efficiency / electrification / retrofit scenarios.

- The U.S. Department of Energy's interactive [Buildings Technology Innovation Opportunities Dashboard](#) offers detailed mapping of current and projected U.S. building energy use and costs. It provides national-level and more geographically granular results by building type, building vintage, and technology type.
- The U.S. Environmental Protection Agency (EPA) [ENERGY STAR](#) program maintains a comprehensive product database that lists all products certified to meet ENERGY STAR's energy-efficiency standard. Information from the database can be used to benchmark the performance of different gas and electric appliances.
- The U.S. EPA [Air Quality System](#) program collects, standardizes, and publishes air quality measurements using a network of thousands of monitoring sites across the U.S. The database tracks criteria pollutants such as ozone, particulate matter, and lead.
- The [American Community Survey](#) conducted by the U.S. Census Bureau contains state-level information about housing stock characteristics, including heating fuel type, which can be used to develop baselines for clean energy transition pathways.
- [Argonne National Lab RNG Database](#) provides a comprehensive list of biogas projects that are upgrading gas for pipeline injection or use as vehicle fuel.

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