7.1 Electricity Resource Planning and Procurement

Policy Description and Objective

Summary

Most states require utilities to engage in a form of electricity resource planning to substantiate that the utility's plans for meeting demand for electricity services are in the public interest. Planning processes vary greatly across states, but are most commonly accomplished through processes that consider costs, benefits, and risks over the long term, including integrated resource planning or integrated resource plans (IRP) and power plant investment preapprovals through a Certificate of Public Convenience and Necessity (CPCN).[56]

> As part of electricity resource planning, utilities compare options for meeting customer demand for electricity services. Electricity resource planning includes power plants, electricity delivery, and end-use demand.

State public utility commissions (PUCs) include electricity resource planning as part of docketed proceedings[57] that encourage public involvement and transparency. The PUC's role is to review and evaluate plans, and its goals include providing reliable, least cost electricity service to customers. Incorporating energy efficiency, renewable energy, and combined heat and power (CHP) in electricity resource planning is consistent with these goals.

Electricity resource planning decisions are typically long-term in nature, having implications for decades. Effective planning and procurement policies may help parties evaluate the impact of market changes and regulations on existing and new electricity resources, and mitigate short-term cost fluctuations by developing robust and diverse resource portfolios that include energy efficiency, renewable energy, and CHP.

For utilities that own and operate electricity generation, transmission, and distribution, resource planning may be part of both IRP and planning for discrete resource approvals (such as through CPCN). For load-serving utilities in restructured electricity markets, resource planning also informs how these utilities procure electricity supply for default customers (i.e., those who do not purchase electricity from competitive electricity suppliers). For more information on electric utility ownership and electricity market structures, see the electricity grid overview provided in the introduction to Chapter 7.

A successful electricity resource planning approach typically includes:

- Rigorous and meaningful participation of diverse stakeholders, including the utility, utility regulators, consumer advocates, and environmental advocates.
- Development and vetting of key analysis factors, such as demand forecasts, commodity price forecasts, and available resource options.

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[56] The CPCN dates back to the 1870s and is a legal term that applies to regulatory regimes governing public service industries (Jones 1979). While most states continue to call this legal process "CPCN," some use the abbreviation "CCN" and others use a different name altogether. In Minnesota, for example, the process is referred to as Advance Determination of Prudence and in Vermont it is referred to as Certificate of Public Good.

[57] Here, a docketed proceeding refers to the process through which a utility formally files a request or a proposed plan with the state PUC. The PUC reviews the submission and ultimately makes a final determination. When the initial submission is filed, the PUC opens a docket where the initial filing and subsequent stakeholder comments, amendments, revisions, and decisions are stored. PUCs typically make these dockets accessible to the public electronically.

- Use and vetting of one or more correctly scaled and structured electricity system models.

This chapter discusses several policy options to encourage decision-makers to consider all resources in electricity resource planning. The information presented about these policies and their implications is based on the experiences and best practices of states that have implemented planning policies, as well as other sources, including local, regional, and federal agencies and organizations; research foundations and nonprofit organizations; universities; and utilities (SEE Action 2011; Synapse 2013; Tellus 2010).

Objective

Most states require electric utilities to engage in transparent and public planning processes to achieve a mix of energy resources that cost-effectively and reliably meet customers' demand for electricity service in the near- and long-term with due consideration for state priorities and risk. Given the economic, environmental, and other benefits of energy efficiency, renewable energy, and CHP, states are adopting specific policies to encourage utilities to more fully incorporate these resources into their plans. Utilities have expertise in electricity resource planning, but other stakeholder perspectives are also useful to ensure that broader public interests are served.

Benefits

By adopting policies to fully integrating energy efficiency, renewable energy, and CHP into electricity resource planning, states help ensure that utilities consider a broad range of electricity resource options and avoid investment in more expensive electricity supply or delivery infrastructure that may not be consistent with state objectives for least cost and reliable electricity service. In addition, increasing the penetration of low- or no-emission resources may reduce the cost to comply with existing and future environmental regulations. Utilities, their customers, and the public benefit from a more diverse resource mix that leverages the multiple benefits of energy efficiency, renewable energy, and CHP (see Chapter 1, "Introduction and Background"). They also benefit from greater certainty that utility regulators will allow the recovery of costs from investing in energy efficiency, renewable energy, and CHP.[58]

Background on State Electricity Resource Planning

States use rate case proceedings to set electricity rates that allow utilities to recover costs, such as fuel procurement, operational, maintenance, and capital expenses. In a traditional rate case, a utility must prove that investments and commitments made on behalf of ratepayers were reasonable. The utility must also consider any resource portfolio or performance standards that the state might have in place (see p. 7-7-20 for additional discussion). Electricity resource planning and resource procurement processes are designed to mitigate the utilities' risk of planning imprudence; share information; and offer regulators, consumers, and other stakeholders an opportunity to influence utility decisions.

From the late 1980s through the mid-1990s, IRP processes were common in the electric industry. With vertically integrated[59] electric utilities responsible for generation, transmission, and distribution services for their customers, integrated resource planning was a useful tool for developing the most efficient resource

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[58] Cost recovery is determined in separate proceedings that typically allow cost recovery when a utility's investment decisions are demonstrated to be in the public interest (usually least cost/least risk).

[59] Vertical integration refers to a situation where the same entity (a utility) owns and operates generating units (power plants), transmission lines, and distribution of electricity to customers. Some states and utilities still largely follow this model, while others have decoupled generation, transmission, and distribution through restructuring. See the introduction to Chapter 7, "Electric Utility Policies," for more discussion about various types of utilities and market structures.

portfolio. In 1992, 36 states had IRP requirements in place. After electricity market restructuring, the prevalence of ratepayer-funded energy efficiency programs declined significantly as the focus of resource planning shifted to short-term commitments. States either rescinded their IRP regulations or ceased requiring utilities to comply with them. However, many states are returning to IRP processes as a tool to ensure a variety of public goals.

Today, most states require one or more forms of electricity resource planning. Planning requirements differ significantly from state to state, and even within a state. Some regulations require that utilities use distinct methods of analysis or consider specific resources in planning. To the extent that utilities must create more than one resource plan in the same state in order to comply with separate regulations, they may have different processes for creating those plans, and thus they may arrive at significantly different conclusions, despite being governed by the same regulators. The varying definitions of electricity resource planning processes generally fall into four categories: IRP, discrete resource approvals through CPCN, default service (also referred to as Standard Offer Service), and long-term procurement planning (LTPP). Table 7.1.1 summarizes these policies, and Table 7.1.2 identifies which policies are in place in each state. Descriptions of each policy follow. Some of these policies are specific to either regulated or restructured (sometimes called deregulated) states; see the introduction to Chapter 7 for an overview of these concepts.

Table 7.1.1: Electricity Resource Planning and Procurement Strategies at a Glance

Strategy	Overview	Applicability	Legal Status
Integrated Resource Planning	Integrated resources planning results in utility plans for meeting forecasted annual peak and energy demand through a portfolio of supply-side and demand-side resources over a specified future period.	With some exceptions, IRP rules typically apply to generation and transmission owners in regulated states.	State PUCs conduct a formal review of IRPs, but these reviews are generally not legally binding.
Discrete Resource Approvals Through a CPCN	A CPCN is a docketed proceeding before a state utility commission in which a utility provides justification for a large capital investment in generation or transmission infrastructure.	A CPCN is required for owners of generation and transmission projects. It occurs in both regulated and restructured states, as required by state law.	A CPCN proceeding is a litigated process. An approval gives permission, but does not require, a utility to take the requested action.
Default Service	Default service provisions—also known as Standard Offer Service—ensure that load-serving utilities procure electricity for those customers who have not elected to choose a competitive energy provider.	Default service applies to distribution-only utilities operating in restructured states.	Procurement of electricity for default service customers is required by law.
LTPP	LTPP refers to utility plans that solicit market-based supply offers over a shorter time period than traditional IRPs.	LTPP applies to distribution-only utilities operating in restructured states.	In states where it occurs, LTPP is required by law.

Table 7.1.2: States with Electricity Resource Planning Processes, as of December 2014

State	Integrated Resource Planning	Discrete Resource Approvals Through a CPCN	Default Service	LTPP
Alabama	a	✓		
Alaska	b			
Arizona	✓			
Arkansas	✓	✓		
California			✓	✓
Colorado	✓	✓		
Connecticut	✓		✓	✓
Delaware	✓		✓	
District of Columbia			✓	
Florida		✓		✓c
Georgia	✓	✓		
Hawaii	✓			
Idaho	✓			
Illinois	✓		✓	✓
Indiana	✓	✓		
Iowa	✓d			
Kansas		✓		
Kentucky	✓	✓		
Louisiana	✓	e		
Maine			✓	
Maryland		✓	✓	
Massachusetts			✓	✓
Michigan	✓		✓	✓
Minnesota	✓	✓		
Mississippi	✓	✓		
Missouri	✓			
Montana	✓			
Nebraska	✓			
Nevada	✓	✓		
New Hampshire	✓		✓	
New Jersey			✓	
New Mexico	✓	✓		
New York			✓	
North Carolina	✓	✓		
North Dakota	✓	✓		
Ohio			✓	
Oklahoma	✓	f		
Oregon	✓		✓	
Pennsylvania			✓	
Rhode Island			✓	
South Carolina	✓			
South Dakota	✓			
Tennessee	g			

Table 7.1.2: States with Electricity Resource Planning Processes, as of December 2014

State	Integrated Resource Planning	Discrete Resource Approvals Through a CPCN	Default Service	LTPP
Texas			✓	✓
Utah	✓	h		
Vermont	✓	✓		i
Virginia	✓			
Washington	✓			
West Virginia		✓		
Wisconsin		✓		
Wyoming	✓	✓		

Note: Planning requirements vary by state.

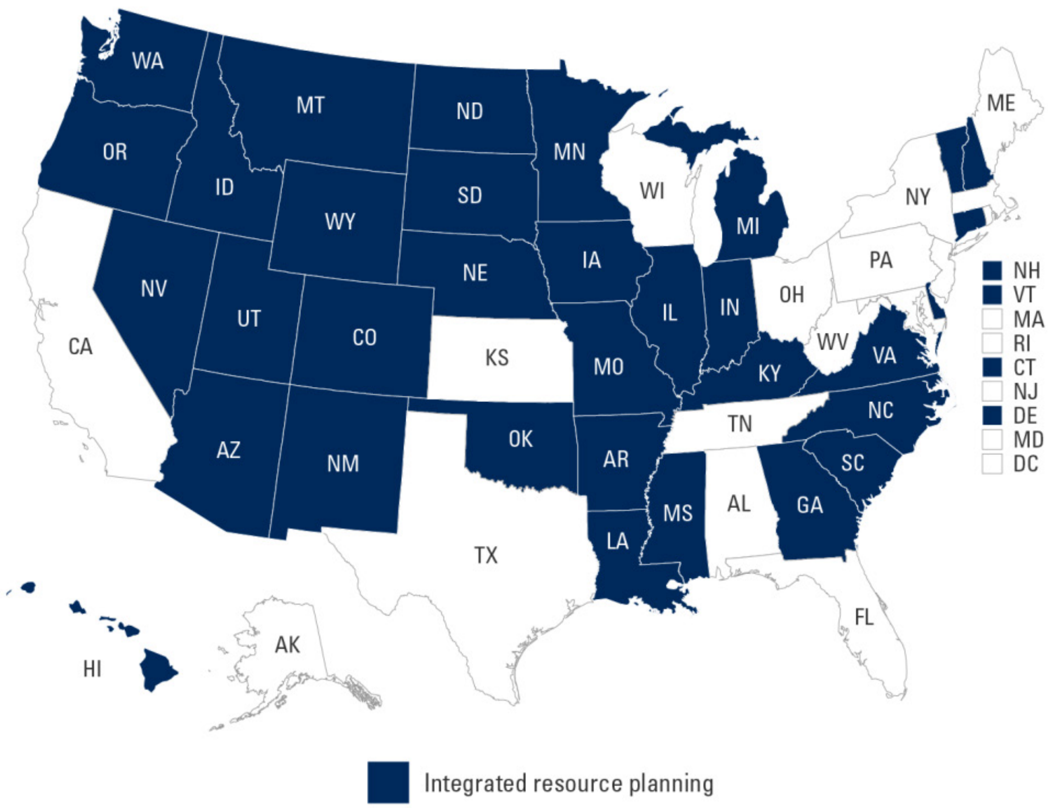
a As a subsidiary of the Southern Company, Alabama Power (the state's largest electric supplier) engages in integrated resource planning. The Public Service Commission (PSC) has not formally adopted an integrated resource planning standard, but notes that it has "ongoing knowledge of and involvement in Alabama Power's IRP process" (Alabama PSC 2007).
b As a response to a directive from the Alaska Legislature, the Alaska Energy Authority produced a regional IRP in 2010, but there is no formal process or IRP rule.
c Ten-year site plans (generation expansion and site planning) are presented to the PSC on an annual basis.
d There is no statute or rule relating to integrated resource planning; however, the Iowa Utilities Board may request a resource plan on an as-needed basis, and utilities do file them as part of docketed proceedings.
e Utilities may voluntarily file with the PSC for preapproval to construct new resources or modify existing resources.
f Utilities may voluntarily file with the PSC for preapproval to construct new resources or modify existing resources.
g While there is no IRP rule, the Tennessee Valley Authority (TVA) has voluntarily participated in integrated resource planning. TVA's most recent resource plan was released in March 2011; the plan prior to that one was released in 1995. TVA plans to start the process again in 2015.
h Utilities may voluntarily file with the PSC for preapproval to construct new resources or modify existing resources.
i Vermont's Sustainable Priced Energy Enterprise Development Program establishes a mechanism for the rapid procurement of renewable power by state utilities.

Source: Research conducted for EPA's Energy and Environment Guide to Action by Synapse Energy Economics

Integrated Resource Planning

IRPs are utility plans for meeting forecasted annual peak and energy demand, along with some established reserve margin, through a portfolio of supply-side and demand-side resources over a specified future period. As of early 2015, integrated resource planning is required or present in more than 30 states, including most vertically integrated states. See Figure 7.1.1 for a map of states with integrated resource planning, and see the introduction to Chapter 7 for an indication of which states have vertically integrated utilities. IRP processes vary in their degree of rigor, stakeholder feedback process, and degree to which they are subject to regulatory scrutiny. In states that conduct integrated resource planning, the process provides an opportunity to examine how energy efficiency, renewable energy, and CHP affect utility operations, customer costs, system reliability, and risk. State PUCs generally do not require or enforce specific findings or outcomes as part of the IRP development or vetting process. Thus, IRPs are generally not legally binding. Instead, regulatory commissions have formal proceedings to approve the content of the IRP, acknowledge that IRP processes were followed, or both. These proceedings differ by state. State PUCs may expect or require that significant deviations from IRPs be justified in rate cases or preapproval processes. IRPs do not negate the need for discrete resource approvals and should form the framework for other resource processes and decisions. Table 7.1.2 shows that many states have provisions for both integrated resource planning and discrete resource approvals, such as CPCNs.

Figure 7.1.1: States That Require IRPs



Source: Research conducted for EPA's Energy and Environment Guide to Action by Synapse Energy Economics, updated from Synapse 2013.

Discrete Resource Approvals

Discrete resource approval refers to a proceeding before a state utility commission in which a utility provides justification for a large capital investment in generation or transmission infrastructure. If the utility succeeds in justifying their investment, they are granted a CPCN. Some regulatory commissions or state statutes require that significant power plant additions, new plants, or large capital investments above a certain threshold go through this process. At least one state (Vermont) also requires large and lengthy power purchase contracts to get such an approval because of the potential financial risk and impact on customers. As of early 2015, at least 19 states have some form of CPCN (see Table 7.1.2), although not all states regularly exercise these statutes. Some states (such as Louisiana and Utah) without these statutes offer a parallel voluntary process. These processes maintain many of the same analytical and planning elements of integrated resource planning, but they include regulatory review by intervenors[60] rather than an interactive and potentially contested stakeholder process. Unlike integrated resource planning, CPCN processes are not a utility forum for gathering and disseminating information. Rather, they are a mechanism for utilities to justify discrete actions prior to regulatory approval. CPCNs are litigated processes argued before a state's public utility commissioner or

[60] Intervenors might include attorneys general, industrial groups, generation owners, transmission owners, land owners, consumer advocates, environmental groups, and other citizen action groups.

hearing official. CPCNs are legally binding and enforceable: a utility that obtains a CPCN from a PUC has generally proven, to the satisfaction of that PUC, that a plan is prudent.

The definition of when a CPCN is required differs from state to state. States that require CPCN or a similar proceeding for the acquisition of large new capital investments include Georgia, Indiana, Kentucky, Minnesota, West Virginia, and Wisconsin, among others. A CPCN provides the opportunity for state entities to ensure that energy efficiency, renewable energy, and CHP are considered on par with other capital investments. For example, the Vermont PUC requires this comparison as part of its discrete resource approval process, called a Certificate of Public Good.

A CPCN does not necessarily guarantee that a utility will recover the costs of a capital investment in rates; instead, it establishes that the choice to move forward with a capital investment is prudent at the cost, or cost range, established in the plan. To mitigate the risk of not recovering capital investments in rates after a project is in service, some states allow for preapproval or cost riders, through which utilities can begin recovering costs prior to the project being constructed. Even in this situation, the utility's project management is subject to review to ensure that any money wasted through poor project oversight is not charged to customers. Preapproval dockets are often coupled with CPCNs in a litigated process. By ensuring recovery, preapproval processes shift the risks inherent in planning to ratepayers; preapprovals generally release the utility from further regulatory review of discrete projects, unless costs are above utility expectations. States that have exercised preapproval or cost riders for generation additions include Indiana, Georgia, Kentucky, Kansas, Wisconsin, and West Virginia; other states may have unexercised provisions.

State Energy Planning Processes

States also maintain a regular or occasional executive or legislative-driven statewide energy planning process, wherein the state reviews policies and practices targeted towards specific outcomes such as resource utilization, economic development, or climate or other environmental goals. These plans may be completely independent of utilities—examining long-term and general policy measures with a particular end-goal—or may explicitly engage utilities and require companies to meet specific performance requirements (NASEO 2013a). By early 2013, at least 20 states were updating existing state energy plans or developing new plans, and at least 45 states will have operational state energy plans (NASEO 2013b). In addition, states may also conduct a form of planning to inform the development of specific state policies, such as renewable portfolio standards; energy efficiency resource standards; and funding levels for energy efficiency, renewable energy, and CHP programs.

Default Service

In restructured states, customers still have their electricity *delivered* by a regulated utility that operates the distribution network (i.e., a load-serving utility), but they may be able to choose the *source* of their electricity by comparing products and rates from a variety of companies. This process is known as retail choice, and the suppliers are called competitive retail suppliers (or something similar). Default service provisions ensure that load-serving utilities procure electricity for those customers who have not elected to choose a competitive retail supplier. In many of these states, default service is the primary supply option for residential and small commercial and industrial customers. As of April 2015, 15 states and Washington, D.C., offered whole or partial retail choice (EIA 2015) (see Figure 7.2 in the introduction to Chapter 7). Virginia and Oregon offer limited retail choice to large customers (Oregon 2001; Virginia 2007). Though retail choice has been an option for customers in these states for many years, the majority of residential load in these jurisdictions is served through procurement by a regulated utility (Aspen 2008).[61]

[61] Texas is one exception, as retail choice is required in this state. Eligible residential customers must choose a competitive supplier or they will be assigned one; however, customers in utility service areas outside of the Electric Reliability Council of Texas are not eligible, and municipally and cooperatively owned utilities may opt out of the program.

Default service requirements vary among jurisdictions. However, one common theme across requirements is the use of laddered contracts to minimize exposure of the default service load to price volatility. Under the ladder structure, only a fraction of the default service load is exposed to current market prices. Default service procurement typically reviews supply for periods as short as 6 months, or as long as 5 years. Therefore, default service planning requirements typically do not require long-term assessments of supply options outside the procurement period.

In some states such as Illinois and Maine, default service requirements specifically require that default service products meet state renewable portfolio standard (RPS) requirements. Because regulatory commissions approve default service rates, additional policies may be recommended in regulatory proceedings that could provide further price and stability benefits to customers. These could include cost-effective energy efficiency, renewable energy, and CHP carve-outs for a portion of the load dedicated to long-term contracts.

Long-Term Procurement Planning

LTPP requires that utilities prepare plans soliciting market-based electricity supply offers over a shorter time period than traditional integrated resource planning (typically 10 years or fewer). State policies that promote renewable energy resources have led to a return to these long-term resource planning practices, even in some restructured states with default service. When retail competition was introduced, utilities halted long-term planning efforts and relied on market competition to keep electricity prices low. However, when RPS policies began to be introduced, renewable resources often had higher capital costs and costs of delivered energy than conventional generation, and investors were hesitant to support these projects without guaranteed cost recovery well beyond the default service procurement window. As a result, regulators in many states began to require that utilities engage in LTPP. Unlike IRPs, procurement plans must often be updated every year. While some states like California allow load-serving utilities to own generation, LTPP processes usually evaluate purchases[62] for capacity and energy, as well as energy efficiency and other demand-side management programs. Default service states and states engaging in LTPP processes are shown in Table 7.1.2.

States with Existing Policies to Encourage Energy Efficiency, Renewable Energy, and CHP in Electricity Resource Planning

In addition to requiring resource planning, many states have enacted laws that require or encourage utilities to incorporate energy efficiency, renewable energy, and/or CHP into electricity resource planning. These policies range from requirements that all cost-effective energy efficiency be incorporated into planning to assessing the long-term risks and costs of new and existing fossil-generation stations. Electricity resource planning can be accomplished through a variety of modeling mechanisms, tuned to specific questions, as well as utility and regulatory requirements. The use and design of planning models are generally guided by best practices rather than explicit policies. With this in mind, the policies discussed in Table 7.1.3 also include those that states have taken to ensure that energy efficiency, renewable energy, and CHP are fairly considered in modeling. The last three policies are designed to ensure that planning processes are rigorous and lead to the actions for which they are intended.

[62] "Purchases" are distinguished from "acquisitions" with regard to the ultimate ownership of the resource. In an acquisition, the utility takes ownership of a resource and responsibility for that resource through its lifetime. A purchase agreement is a financial transaction for access to energy and/or capacity or other services through a specified time period.

Table 7.1.3: Policies States Use to Integrate Energy Efficiency, Renewable Energy, and CHP in Electricity Resource Planning and Procurement

Policy	Description	State Examples
Require third-party energy efficiency potential studies.[a]	Require, or have required, utilities to commission energy efficiency potential studies as part of planning process, or perform a statewide study for use in planning.	AR, CA, IA, IN, MA, OR, WI
Mandate all cost-effective energy efficiency in planning.	Require that utilities plan for all achievable cost-effective energy efficiency, or demonstrate that all supply-side and demand-side resources have been evaluated on a consistent and comparable basis.	CA, IN, MA, OR, Northwest[b]
Update assumptions for renewable energy capacity value, and supply and integration costs.	Require or explicitly note that renewable energy costs and attributes change over time, and should be kept up to date.	AZ
Quantify reasonably expected environmental regulations.	Have policies requiring cost consideration for future environmental regulations.	IN, OR, WY
Tie investment decisions to planning process and follow up on action plans.	Require that integrated resource planning result in an action plan with resource activities the utility intends to undertake over the next 2 to 4 years. Test investment decisions against integrated resource planning results.	IN, OR
Leverage existing knowledge from state utility and environmental regulators.	Have mechanisms for coordinating environmental permitting and utility electric planning.	CA, CT
Promote meaningful stakeholder involvement.	Provide funding opportunities for public interest stakeholders and intervenors in planning cases.	IN, ME, NY, OR, WI

States have also required one or more utilities to perform their own energy efficiency potential studies for use in planning processes. Example states include CA, CO, GA, IA, ID, IL, KS, KY, MA, MI, MN, MO, NM, NV, NY, OR, PA, TN, TX, UT, VT, WA, WI, and WY.

The Northwest Power and Conservation Council is mandated by the Northwest Power Act to incorporate all cost-effective energy efficiency into its regional electricity resource planning across Idaho, Montana, Oregon, and Washington.

Require Third-Party Energy Efficiency Potential Studies

Energy efficiency potential studies investigate new savings opportunities for specific measures and end-uses, customer segments, building types, and costs (see Chapter 2, "Developing a State Strategy," for details). While these studies are often used to develop short-term savings targets and budgets, they may also be used to inform utilities and policy-makers of long-term energy savings opportunities, which may then be used in utility integrated resource plans or long-term resource plans at the state or regional level. For example, the Northwest Power and Conservation Council (NWPCC) conducts energy efficiency potential studies for the entire region as part of its regional power plans, which seek "an electrical resource strategy that minimizes the expected cost of, and risks to, the regional power system over a long period of time" (NWPCC 2010b). Comprehensive energy efficiency potential studies provide the basis for setting near-term planning expectations and reasonable long-term trajectories in resource plans. For instance, Efficiency Maine Trust, the efficiency program administrator in Maine, commissioned energy efficiency potential studies to develop multi-year efficiency plans and goals (EMT 2012). Groups that specialize in the development of these studies are able to leverage experiences of multiple states, including those that have already evaluated achieved savings (PSC Wisconsin 2014; Vermont DPS 2011).

Mandate All Cost-Effective Energy Efficiency in Planning

Energy efficiency can provide a long-term, reliable, and low risk electricity resource. Efficiency avoids near-term energy and emissions, and it also avoids long-term capacity and transmission expansion requirements (see Chapter 1 for information on energy efficiency benefits). Some states have required utilities to develop long-term electricity resource plans that rigorously review opportunities to acquire and pursue all cost-effective energy efficiency. In some states, a comprehensive estimate of the avoided energy cost (as well as capacity and emissions) is used to characterize the amount of energy efficiency that is cost-effective (AESC 2013).[63] Other states, such as Oregon, require that "to the extent that a utility controls the level of funding for conservation programs in its service territory, the utility should include in its action plan all best cost/risk portfolio conservation resources for meeting projected resource needs, specifying annual savings targets" (OPUC 2007). In 2003, California adopted a "loading order" for new resource requirements, which gives significant preferential treatment to energy efficiency as the primary mechanism for reducing and meeting new demand (California 2003).

Energy Efficiency Avoided Costs

To evaluate energy efficiency programs, states require the development of avoided costs to quantify energy efficiency benefits. Avoided costs are what would have been spent in the absence of the energy efficiency.

Avoided costs incorporated into planning processes include projected costs for electricity. Some states have expanded avoided costs to include emissions compliance, price effects, other resources (such as fuels and water), renewable energy certificates, transmission and distribution costs, and/or other non-energy benefits.

Update Assumptions for Renewable Energy Capacity Value and Supply and Integration Costs

As the market for renewable energy technologies expands, manufacturing and installation costs decline. Projecting a flat present-day cost and performance for renewable energy options may be an overly conservative estimate, undervaluing the likely contribution and benefit of these resources over the period of the electricity resource plan. In particular, if outdated costs and performance data are used, the plan may not even reflect contemporary costs—much less the expected declining costs in the future. In a recent review, the National Renewable Energy Laboratory (NREL) found that "most [interviewed] utilities had forecast a declining cost curve in their planning assumptions, only to see the actual costs decline much more steeply than anticipated" (NREL 2013). In a 2011 IRP, Portland General Electric found a significant decline in the cost of wind since its 2009 IRP (PGE 2011). In a 2011 IRP, Idaho Power asserted that declining solar photovoltaic (PV) costs would likely make this resource a more significant part of its portfolio in the future (Idaho Power 2011).

Quantify Effects of Reasonably Expected Environmental Regulations

Environmental regulations that are already promulgated and implemented may impose known costs or operating restrictions. Predicting the impact of regulations that are not yet finalized can be more difficult, but is still a critical element of prudent planning.[64] Oregon rules require utilities to account for regulatory compliance costs for carbon dioxide (CO_2) and criteria pollutants (OPUC 2007). Arizona requires that utilities

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63 For this reason, avoided costs are extremely important to an IRP, as they help determine the amount of customer demand that can be met by energy efficiency and the amount that must be met by supply-side resources. Assumptions about costs for energy efficiency and demand response should be updated frequently to ensure that the amount of cost-effective energy is accurately represented as costs for these measures decline over time.

64 For example, PacifiCorp states that with regard to integrated resource planning, "in parallel to administration of the Regional Haze rules, state agencies and EPA must also ensure compliance with other environmental regulations including the recently enacted Mercury and Air Toxics Standards (MATS), and emerging regulations for coal combustion residuals (CCR) handling and storage, Clean Water Act §316(b) cooling water intake rules, and effluent limitation guidelines (ELG). The Company must therefore assess not only currently known obligations, but must also assess reasonably foreseeable compliance obligations in its analyses" (PacifiCorp 2013).

"analyze and address in their plans environmental impacts related to air emissions, solid waste, and other environmental factors and reduction of water consumption and to address the costs for compliance with current and projected environmental regulations" (AZCC 2010). Similarly, draft integrated resource planning rules in Indiana require an analysis of how the plan conforms to the "utility-wide plan to comply with existing and reasonably expected future state and federal environmental regulations" (IURC 2012). Planning processes give utilities the opportunity to work with both the state and the stakeholder community as they address future environmental regulations.

Tie Investment Decisions to Planning Processes and Follow Up on Action Plans

Resource planning processes should be tied to anticipated real actions and activities performed by electric service providers. In many IRPs, the resulting near-term plan is termed the action plan, an explicit list of activities and procurements that the utility intends on completing based on the IRP. In some states, the approval of an IRP implies approval of near-term utility actions; in other states, approval of an IRP signals that the IRP's intent is reasonable, but the actual decisions may be contested at a later date, such as through a CPCN process. Regardless of the intent, states have found that utilities file action plans to make explicit their intent following planning proceedings, and states follow up on action plans to assess if the planning process has resulted in expected outcomes. State requirements for action plans vary. Georgia requires that utilities provide "a description of the major research projects and programs the utility will continue or commence during the ensuing three-year period, and the reasons for their selection" (Georgia 1997). At a more detailed level, Arizona requires that "with its resource plan, a load-serving entity shall include an action plan, based on the results of the resource planning process, that: (1) includes a summary of actions to be taken on future resource acquisitions, (2) includes details on resource types, resource capacity, and resource timing, and (3) covers the three-year period following the Commission's acknowledgement of the resource plan" (AZCC 2010).

Leverage Existing Knowledge from State Utility and Environmental Regulators

Some states leverage existing knowledge and expertise between utility regulators and environmental regulators to help inform utility plans. Permits issued by environmental regulators may explicitly shape utility actions and planning outcomes. Therefore, states have found significant benefits from enhanced dialogue between utility and environmental regulators (RAP 2013). In particular, this communication can help inform coherent, multi-pollutant-aware permitting processes, help PUCs respond and prepare for existing and emerging environmental regulations, and ensure that decisions from agencies do not work toward cross-purposes.

States that explicitly coordinate utility and environmental regulators do so using a wide variety of mechanisms. In 2011, the Oklahoma Corporation Commission opened an inquiry to examine current and pending federal environmental regulations, drawing on expertise from state environmental regulators and stakeholders (OCC 2011). Similarly, Oregon has opened a planning process with public input for the Clean Power Plan; comments by Oregon Department of Environmental Quality were submitted in cooperation with the Department of Energy and PUC (ODEQ 2014). In a more formal move, the Colorado Clean Air Clean Jobs Act explicitly requires the approval of the state Department of Public Health and Environment, and requires that "the Commission shall not approve a plan except after an evidentiary hearing and unless the Department has determined that the plan is consistent with the current and anticipated requirements of the federal [Clean Air] Act" (Colorado 2010). Recognizing the value of collaboration, the Connecticut Department of Energy and Environmental Protection (CT DEEP) was created in 2011, merging the Department of Environmental Protection, the Department of Public Utility Control, and energy policy staff from other areas of state government. The new DEEP oversees the roles of utility and environmental regulators to "integrate energy and environmental policies and programs in a more systematic, proactive and coherent manner" (CT DEEP 2014). CT DEEP and the

Connecticut Energy Advisory Board are required to prepare a statewide Comprehensive Energy Strategy every 3 years (CT DEEP 2013).

Promote Meaningful Stakeholder Involvement

States have found it useful to consider mechanisms of funding or supporting public interest and environmental interest intervenors in utility planning procedures. Stakeholder processes can help ensure that the concerns of ratepayers and environmental advocates are taken into consideration, and often represent some of the strongest, continually engaged parties advocating energy efficiency, renewable energy, and CHP options. Some states offer intervenor funding through application, where funding is drawn from regulated utilities. In Oregon, the PUC establishes an agreement wherein energy utilities provide "financial assistance to organizations representing broad customer interests" (OPUC 2012a). Wisconsin provides for intervenor funding for individuals or organizations that are affected by the proceeding, have a material interest, and are unable to participate if not otherwise funded (WI PSC 1995). In Indiana, the Utility Rate Payer Trust was established through the settlement of litigation regarding a canceled project; the Trust is overseen by a five-member committee (IN OUCC 2013). Typically, intervenor funds are allocated to public interest groups who advocate for views not adequately represented by utility or large industrial consumers.

Designing Effective Electricity Planning Policies

In many states, specified planning and procurement processes help to level the playing field for energy efficiency and clean energy supply. This section describes key components of an effective planning and procurement process, including participants, timing and duration, and consideration of key factors that can affect the results of utility planning analyses.

Participants

Planning is not typically conducted in a vacuum: utilities engage with stakeholders, intervenors, regulators, and the public through either collaborative or litigated processes. Various electric system planning and procurement processes engage a range of participants, including those who conduct, review, and ultimately approve the process.

- *Utilities.* Load distribution companies (LDCs) and utilities can either be investor-owned utilities (IOUs), municipal government entities, cooperatively owned utilities run by industrial and residential consumers, or even federal entities (as in the case of the Tennessee Valley Authority [TVA] and Bonneville Power Association). Generally, rates and costs at IOUs are regulated by state PUCs, while a municipal government operates and oversees municipally owned utilities; member-owners oversee cooperatives. Under most circumstances, IOUs have the greatest degree of state oversight through integrated resource planning, CPCNs and preapproval dockets, and ultimately rate cases. In some states, municipally and cooperatively owned utilities may not be required to submit plans for state review (except environmental permitting).
- *Regional transmission organizations (RTOs)*. RTOs are responsible for the reliability and adequacy of the transmission system, which directly affects the planning process. Adequacy needs focus on load forecasting and studies to address retirements and new resources. Reliability needs focus on regional and specific planning studies commissioned by the RTO. State agencies often engage and participate at the committee and sub-committee levels within the RTO.
- *State PUCs*. State PUCs and their technical staff oversee, engage in, and/or monitor most state planning processes, including integrated resource planning, CPCN, and—in retail-choice states—default service or similar procurement proceedings. PUCs are concerned with costs, risks, rate impacts, reliability, and

continuity of service. Many PUCs do not have direct knowledge of environmental regulatory matters or permitting processes, and may rely on utilities and other regulated entities to present that information. The PUCs' primary enforcement mechanism is the regulation of rates and financial incentives or penalties to utilities. PUCs generally have a wide range of latitude in these matters.

- *State environmental regulators.* State environmental managers and air offices have extensive expertise in the regulation of effluents and emissions. Their responsibilities, which include permitting and setting emissions standards for electricity generators, influence utility electricity resource decisions. Environmental regulators may also be able to provide information about proposed or pending environmental regulations. Thus, some states have found benefits in strengthening relationships and communication between environmental regulators and PUCs.
- *State legislatures, governors, and energy offices.* Elected state representatives may create state policies that either incentivize or require particular actions from LDCs (such as an energy efficiency resource standard [EERS] or RPS) or generators (such as carbon regulation in the Regional Greenhouse Gas Initiative and California), or provide guidance or requirements to PUCs (such as the guaranteed recovery of rates for environmental expenditures). State representatives and governors may not directly engage in specific utility plans. In some states, the governor is indirectly represented through the Attorney General's office or a state ratepayer advocate, and/or through the participation of state energy offices, which are charged with implementation of state policies and aligning those policies with those enacted at PUCs.
- *Stakeholders and intervenors.* Where planning and procurement processes occur, they are reviewed, commented upon, and/or audited by a variety of stakeholders and intervenors. In most states, a consumer advocate office represents the interests of residential (and sometimes commercial) ratepayers; these advocates may or may not have an interest or opinion regarding the procurement of energy efficiency, renewable energy, and CHP. Industrial consumers are actively engaged in state planning processes, usually to minimize impacts on large consumers. Finally, environmental advocacy groups are increasingly engaged in both statewide planning processes and specific utility planning proceedings, including integrated resource planning, CPCN, preapproval, and default service dockets.

Timing and Duration

Both integrated resource planning and portfolio management for default services occur on a regular planning and/or solicitation cycle, which can range from 1 to 5 years depending on the state. CPCN and preapproval dockets are triggered by specific utility actions, changes in commodity or market prices, or regulatory compliance obligations, and do not necessarily adhere to a regular or predictable schedule. IRPs typically take anywhere from a half year to a full year to complete, depending on the stakeholder engagement processes, and in certain instances can extend into the next IRP cycle. In contrast, docketed processes—such as CPCN, preapprovals, and default service proceedings—may pass through a regulatory proceeding in as few as 3 months to as long as 6 months or more.

Planning and portfolio management typically requires reviewing decisions and investments with long lives or extended spending; portfolio costs and risks are thus reviewed over a long term, from 10 to 30 years. In IRPs, short-term "action plans" usually include specific near-term actions or investments that are likely to result from the IRP. These action plans range from 1 to 5 years forward from the IRP.

Some states provide or require intracycle IRP updates or reviews, in which prices, regulatory conditions, and model results are updated and checked.[65]

Interaction with State, Regional, and Federal Policies

Utility and electricity generator operations, planning, and financial decisions are governed by state and federal rules and regulations. In addition, RTOs and independent system operators (ISOs) engage in regional transmission planning that may affect utility decisions. States have found it useful to consider these state, regional, and federal policies in electricity resource planning. In turn, findings from electricity resource planning are also considered in the design and implementation of related policies. Standard planning practice requires that utilities and generators follow legal requirements for emissions, system reliability, renewable procurement, and efficiency investments, among other considerations.

Energy Efficiency Resource Standards and Renewable Portfolio Standards

Some states maintain EERSs and/or RPSs, or minimum requirements for utilities (see Section 4.1, "Energy Efficiency Resource Standards," and Chapter 5, "Renewable Portfolio Standards"). Because these standards generally represent a rule of law governing utility operators, states require their inclusion in electricity resource planning. States have also found it useful to consider and model pending portfolio or efficiency standards or goals, although pending or voluntary measures may be modeled as a sensitivity or uncertainty instead of as the reference case. Some states require that EERSs and/or RPSs be treated as a floor, rather than as a default procurement level that utilities should meet but not exceed. For example, Oregon requires that utilities seek all cost-effective energy efficiency regardless of whether the utility or a third party administers efficiency programs.[66] Utility planning processes can also consider other state policies that may be in place, such as interconnection and net metering standards that govern the integration of onsite generation resources (see Section 7.3, "Interconnection and Net Metering Standards"), as well as other policy types discussed elsewhere in this chapter.

Environmental Regulations

States typically require that utility resource planning include existing state and federal environmental regulations governing utility or generator operations. Including proposed, pending, and emerging regulations in utility planning ensures that social and environmental costs are reasonably anticipated and their effects quantified. In return, electricity resource planning can sometimes help to inform environmental planning, as some environmental compliance plans leverage electricity resource planning to find a reasonable least cost mechanism for meeting environmental requirements. For example, recent experience in regional haze planning in some western states has sought alternative compliance measures requiring tradeoffs between generators. EPA recently approved a Regional Haze State Implementation Plan (SIP) revision in New Mexico that calls for unit shutdowns at San Juan Generating Station and lower cost compliance at remaining units rather than more stringent controls across all units (EPA 2014b). This plan resulted from utility planning that indicated a lower cost for an equally rigorous alternative SIP than the original promulgated Federal Implementation Plan.

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[65] For example, utilities in South Carolina must submit IRPs to the PSC every 3 years and update them annually (South Carolina 2011).

[66] The Oregon PUC's "Investigation into Integrated Resource Planning" mandates that utilities "Determine the amount of conservation resources in the best cost/risk portfolio without regard to any limits on funding of conservation programs" (OPUC 2007).

Regional Transmission Planning

RTOs and ISOs engage in long-term transmission planning. Decisions regarding the maintenance or enhancement of transmission facilities have important consequences for the development of generation and energy efficiency resources. Electricity resource planning may consider not only the generation resources that are available with the existing transmission system, but also those that could be accessible via new or upgraded transmission lines. Planning processes can also consider whether costly transmission upgrades and enhancements can be deferred or avoided due to increased energy efficiency, distributed renewable energy, and CHP. The transmission planning process requires that the RTOs/ISOs understand which resources are likely to be available in future years, including energy efficiency, renewable energy, and CHP. In some regions, such as ISO New England (ISO-NE), energy efficiency programs are explicitly considered in transmission planning. States engage in RTO/ISO planning via representatives on market rules committees and by providing feedback in regional transmission plans.

Consideration of Key Factors in Analysis

States have found that the most effective planning processes require appropriate treatment and documentation of key assumptions used in utility analyses. Key assumption categories that may significantly alter planning analysis results are discussed below. Many assumptions used in planning are considered proprietary by utilities, potentially including load forecasts, fuel price forecasts, costs of demand- or supply-side resource options, transmission costs, emissions costs, models, and more. States differ as to what information they require to be made public. In the case of proprietary data, only those intervenors signing protective agreements are granted access to these data.

Load Forecast

A load forecast (annual peak and energy) plays a key role in determining the need for new and existing resources, as well as the type of those resources; it provides the fundamental basis for any energy planning process. For example, a utility that expects to retire a power plant can forecast customer demand first and then assess electricity supply options to determine whether all retirements must be replaced with new, similarly sized generators in order to meet demand.

In vertically integrated states, the utility often develops its own demand projection. Because a utility's demand forecast is so important to the resulting resource plan, states may require utilities to base forecasts of future load on realistic assumptions about local demographic changes and local economic factors (i.e., the movement of industry and housing), and to fully document these assumptions. Forward-looking resource requirements can change quickly, based on changing economic realities, energy prices, and projection methods. Frequent updates to load forecasts allow for reasonable planning.[67]

In states with restructured electricity markets, demand projections are developed jointly between utilities and RTOs. This regional long-term load forecast is one foundation to help ISOs/RTOs determine the need for future transmission projects. Some regions, like New England, develop load forecasts of peak demand and energy requirements based upon econometric models. ISO-NE's forecasts of annual energy for New England as a whole and for each individual state and load zone is based on previous usage along with real electricity price,

[67] In 2009, the Michigan Planning Consortium conducted a load forecasting survey for the Michigan Public Service Commission designed to help improve the planning process for electricity infrastructure projects. Survey responses were received from ITC, Wolverine, Detroit Edison, Consumers Energy, Indiana Michigan, Michigan South Central Power Agency, Alepna Power, ATAC, PJM, and MPPA. When asked about load forecast frequency, the majority of respondents said that load forecasts are updated at least annually and some more frequently (MPC 2009).

real personal income, gross state product, and heating and cooling degree days. ISO-NE adjusts its forecast based on its expectations of energy efficiency program effects (ISO-NE 2014a).

Regulatory Environment

Numerous policies and regulations that affect electric utilities have been promulgated at the federal, regional, and state levels, with several others either proposed or under consideration. As previously discussed in this section, key policies interacting with electricity resource planning include EERSs, RPSs, environmental regulations, and regional transmission planning. These policies and regulations, both individually and in combination, have the potential to dramatically change the electric power industry. Existing rules may affect utility operations in the present, and rules that have been proposed or that are under consideration will likely affect utilities at some future date.

Because electricity resource planning examines and evaluates scenarios over the long-term—inclusive of any rules or regulations that will affect a utility over the planning period—several states effectively require utilities to analyze the impact of promulgated, proposed, planned, and emerging environmental regulations on the costs, benefits, and risks of proposed resource portfolios.[68] In 2013, Georgia Power Company submitted an IRP evaluating plant decommissioning and new plant additions; the utility's analyses detailed how future regulatory considerations could affect financial decisions made in 2013 (Georgia Power 2013).

States have found that consideration of these rules may result in a utility including an emissions allowance price in its analysis, planning for the installation of one or more pollution control technologies, changing the operations of one or more generating units, or procuring alternative types of supply- and demand-side resources needed to meet demand.

Supply Options

Across resource types, capital costs, operation and maintenance expenses, and variable fuel costs, if any, will vary. How often the resource will generate electricity, as well as how new or modified generation assets are financed, can also affect supply option inputs. States have found that electricity resource planning provides an opportunity to examine a wide range of options for meeting consumer requirements, including traditional generating resources, energy efficiency, renewable energy, CHP, and storage options. Resource planning may, by default, review only traditional resources and either exclude or make *a priori* assumptions for renewable energy supply options based on either regulatory requirements or a premise of achievable outcomes.

Improvements in renewable energy technologies have driven capital costs down while increasing the capacity factors of these intermittent resources (ACEEE 2014). The installed costs of solar PV modules continued their precipitous decline through 2013: the cost of residential and commercial modules dropped another 12 to 15 percent from 2012 costs, while achieving efficiencies of 14 to 16 percent; meanwhile, installed prices dropped by more than a third from 2009 to 2013 for utility-scale PV projects, while the capacity factor across all utility-scale projects has grown to 27.5 percent (LBNL 2014c).[69] The evolution of wind projects has been no different: nationwide, wind projects averaged a capacity factor of 32.1 percent from 2006 to 2013, even reaching 38 percent in the Interior in 2013. Meanwhile, costs have continued to fall, both for project developers—the capacity-weighted average installed cost of projects in 2013 dropped to $1,750/kilowatt—and for power purchasers. According to the U.S. Department of Energy (DOE), "wind PPA [power purchase agreement] prices

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[68] This rule may not be reflected in written regulation, but experienced state regulators have recognized that a failure to account for impending regulations puts ratepayers and utility decisions at risk.

[69] The project-level range of capacity factors is 16.6 to 32.8 percent (LBNL 2014d).

have reached all-time lows," falling to an average of $25/megawatt-hour (MWh) nationwide (LBNL 2014a). Nevertheless, many of these resources may still be overlooked in utility resource planning.

To ensure reasonable planning, many states require that utilities: 1) not place limits on renewable energy options without rigorous justification, and 2) examine non-traditional resources such as CHP, onsite generation, and demand-side management with the same rigor as traditional resources. For example, Oregon requires that utility IRPs consider a full range of resource options, typically including renewable energy, storage, and traditional fossil generation.[70]

The availability and costs of raw materials and skilled labor, construction schedules, and future regulations can all present uncertainties. Because these cost uncertainties can affect technologies in different ways, states have found it useful to require utilities to model a range of possible costs and construction lead times for supply alternatives. In addition, some states require utilities to evaluate supply technologies that are not currently feasible from a cost perspective, but may become so later during planning periods, which typically last a decade or more. Hawaii, for example, requires that utilities consider all feasible supply- and demand-side resource options available within the years encompassed by the IRP horizon (Hawaii PUC 2011).

Some states have found that when significant renewable energy procurement is planned, utilities might have concerns about the integration of variable resources. In these cases, planning for renewable integration may be a critical component of achieving more substantial renewable energy. Renewable energy integration studies are engineering documents that help specify what types of other system resources are required to stabilize energy delivery and transmission. The results of these studies may partially guide supply choices and/or the costs of incremental renewable energy. Arizona Public Service, for example, analyzed and presented integration costs for renewable resources in the portfolios it evaluated in its 2012 IRP (APS 2012).

Finally, economic retirements of existing resources are part of electricity system planning. Some states have found it useful to require utilities to consider retiring and replacing existing resources with a single resource or a portfolio of resources. In a 2013 IRP, Georgia Power Company evaluated the economic benefit of maintaining and retrofitting each of its existing coal-fired generators against a replacement option. Since 2011, PacifiCorp (a northwestern utility) has evaluated the economics of select coal units in addenda to IRPs.[71]

Demand-Side Resources

Some states require electricity resource planning to include an evaluation of energy conservation and/or efficiency. However, the extent to which demand-side resources are actually considered varies from state to state. A number of utilities consider energy efficiency as a competitive resource relative to supply-side options in their long-term planning, but others assume either a regulatory minimum or a series of modest efficiency goals. States with rigorous energy efficiency planning—such as Massachusetts,[72] Minnesota,[73] and

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[70] Oregon PUC Order 07-002 on IRP Guidelines requires "identification and estimated costs of all supply-side and demand-side resource options, taking into account anticipated advances in technology" (OPUC 2007).

[71] For example, see PacifiCorp's 2013 IRP Update regarding Cholla Unit 4 (PacifiCorp 2014).

[72] Massachusetts requires that electric and gas distribution utilities acquire all available cost-effective energy efficiency resources under An Act Relative to Green Communities (Massachusetts 2008). These utilities are also required to file 3-year energy efficiency plans with the Department of Public Utilities on a triennial basis beginning in 2012.

[73] Minnesota's Next Generation Energy Act of 2007 (Minnesota Statutes 216B.241) established an energy savings goal of 1.5 percent of average retail sales for each electric and gas utility beginning in 2010. Utilities must file Conservation Improvement Program (CIP) plans every 3 years, detailing programs offered to assist residential and business customers to become more energy-efficient. Utilities report their actual CIP spending and savings on an annual basis.

Washington[74]—require utilities to submit efficiency potential studies, budgets, savings targets, and evaluations for approval by regulatory commissions.

States have found that credible and independent energy efficiency potential studies of demand-side resources can be critical to state and utility plans and acceptance. These studies identify and examine the technical, economic, and achievable potential of new energy efficiency within a market. These data inform decision–makers, and the outcome of an energy efficiency potential study may be incorporated directly into electricity resource planning and state energy planning processes.

Some states require all cost-effective energy efficiency to be included in electricity resource planning. The mechanism by which energy efficiency is valued is highly relevant to its incorporation in planning. If only utility costs are assessed, some states have found it reasonable to review only utility benefits (i.e., the ability of energy efficiency to avoid higher cost supply options), but if both utility and participant costs are assessed, planning processes may also review participant and societal benefits. Massachusetts, a leading state for implementing energy efficiency, requires the Total Resource Cost test as part of its 3-year planning process (MA DPU 2009). For more information on cost-effectiveness tests, see Section 4.2, “Energy Efficiency Programs.”

Transmission and Distribution

As discussed in the electricity grid overview in the introduction to Chapter 7, utilities rely on an extensive network of transmission and distribution lines in order to deliver electricity to customers. States generally require utility electricity resource planning to reflect constraints in existing transmission (and sometimes distribution) systems; these constraints may limit the location or types of supply resources that can be added to (or removed from) the system. In highly constrained systems (i.e., where transmission is binding through multiple hours of the year), resource planning may be oriented around overcoming such constraints through transmission improvements, demand-side management, and strategically placed generators. For example, Indianapolis Power and Light used the PROMOD IV model to analyze five possible locations for a new gas-fired combined cycle generating unit. The model examined the potential transmission congestion costs associated with each location to help determine the optimal location for siting the new generating unit (IPL 2013). Models will vary in the extent to which they represent specific localized transmission constraints. Modeling also typically assumes additional cost and construction timing if new interconnection infrastructure is required, such as new transmission lines to reach new wind farms.

Transmission constraints may play a role in procuring renewable energy, particularly when utilities consider how to integrate more significant blocks of variable renewable energy (such as wind and solar). Such questions are generally addressed through technical integration studies. Because demand-side management programs generally do not require transmission (as they are implemented at load, rather than across wires), states have found that these programs can pose a significant quantifiable benefit for transmission constraints—a benefit that can be considered in resource procurement and planning.

[74] Washington voters passed Initiative 937 in 2006, which calls for electric utilities serving more than 25,000 customers to undertake all cost-effective energy conservation. This Initiative was enacted into law as the Energy Independence Act. Qualifying utilities must pursue all available energy efficiency that is cost-effective, reliable, and feasible. Utilities are required to identify efficiency potential through 2019, submit reviews and updates every 2 years for the subsequent 10 years, and establish and meet biennial conservation targets (WA Initiative 2006).

Planning can also account for, and accommodate, inevitable generator outages and transmission failures. RTOs typically review supply, demand, and transmission infrastructure to estimate a "planning reserve margin," a measure of how much the system must be overbuilt to maintain reliability under adverse conditions.

Commodity Prices

The expected future prices of fuel, electricity purchased from regional markets, and emissions can influence the economic consideration of existing and new resources, and thus the relative economics of avoiding those resources through the use of energy efficiency, renewable energy, and/or CHP (see text box on p. 7-7-16 for further discussion of avoided costs). In some regions, energy efficiency, renewable energy, and CHP must compete in an open market; the degree to which these resources are considered competitive depends on commodity price assumptions.

- *Fuel prices*. The economic viability and hourly dispatch of power plants is highly sensitive to fuel price forecasts. Fuel prices represent an important, if not primary, component of the overall cost of generation for facilities using gas, coal, or biomass, as well as the relative competitive value of clean energy resources that do not consume fuel. Because prices change over time, sometimes dramatically, an up-to-date fuel price forecast is critical. In some states, utilities review multiple third-party fuel price projections and present a range of potential outcomes. For example, the Wisconsin Public Service Company incorporates regular updates to its fuel price forecasts; PacifiCorp updates its fuel price forecasts on a quarterly basis (PacifiCorp 2005; WI PSC 2011).
- *Electricity and capacity market prices.* Electricity market prices refer to the wholesale cost of energy (in $/MWh) available to resources that either sell on an open spot market or sell to other utilities. In organized markets (PJM, Midcontinent ISO [MISO], ISO-NE, Electric Reliability Council of Texas, California ISO, and Southwest Power Pool), past market prices are published (PJM 2015). In other regions, market prices are implied, but represent the price that a utility could command by selling its excess energy to a neighboring utility. Capacity prices refer to the wholesale cost of maintaining capacity (in $/megawatt [MW]) for the purposes of meeting peak load. In PJM, ISO-NE, and, to a lesser extent, MISO, capacity is sold on a wholesale market.[75] Energy prices are directly related to fuel prices, but an electricity system model is required to derive market prices. States have found value in updating energy price forecasts with fuel prices. Capacity market prices are established through different mechanisms, and are the subject of continued debate.[76]

Modeling Approach

All electricity system plans require some level of electricity system modeling. Electric system models are designed to answer different types of questions, from large-scale regional or national models, to highly detailed electricity generator-specific dispatch simulation models. In general, larger scale, long-term models[77] are designed to evaluate different federal or regional policies and forecast how these policies will affect multiple electricity generators. Simulation dispatch models (also commonly referred to as "production cost" models) are designed to determine how one or more individual generators will dispatch into the electricity grid on an hourly (or even 15 minute) basis over a period of months, and how specific generators compete against each other. Policy-scale models simplify dispatch and individual unit operations, and detailed models generally

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[75] See for example: PJM (2014), ISO-NE (2014b), and MISO (2012).

[76] Recent rule changes by the Federal Energy Regulatory Commission, for example, may significantly change the future of capacity prices in regions with an open capacity market.

[77] For example of larger scale, long-term models, see EPA (2014a) and EIA (2014).

look at shorter, well-defined timeframes and conditions. Between these two extremes are models designed to determine what types of generators a utility may want to invest in, called capacity expansion models, and models designed to review how uncertainty in forecast prices or conditions affects individual generators.

Integrated resource planning, CPCN, default service, and LTPP are not restricted to the use of one of these models, although capacity expansion models are commonly used to evaluate which resource choices best meet customer requirements for a utility. In some states, models are used in sequence to define regional outcomes, then electricity market prices, and then individual electric generating unit (EGU) behaviors. Each model will have its own strengths and weaknesses when it comes to answering a particular question or reflecting particular behaviors of the power system. It is important to note that almost all of the models used for these purposes are licensed by model vendors and require significant expertise to operate and vet. Input assumptions about individual generating units (such as ramping ability or maintenance outages) may be considered proprietary information. Thus, while models are the framework in which assumptions are used, they are often also the most complex and opaque components of utility planning. Model structures are discussed in more depth in EPA's Technical Support Document entitled "Projecting EGU CO_2 Emission Performance in State Plans" (EPA 2014c). For examples of how various states have applied models for integrated resource planning, see the Lawrence Berkeley National Laboratory's "Survey of Western U.S. Electric Utility Resource Plans" (LBNL 2014b).

IRP and CPCN Outcomes

IRPs are designed to produce a single "preferred" set of resources to serve customer requirements, including new resources, changes to existing resources, and demand-side resources expected to be required over the planning period. Capacity expansion modeling typically results in one or more sets of suitable resource mixes for a utility—i.e., resources that meet customer requirements and, under some set of circumstances, are least cost. Further analyses of these resource mixes, which examine total cost, risk and uncertainty, and (sometimes) rate impacts, produce a single preferred portfolio. Portfolios are evaluated under different scenarios, which represent distinct policy or risk outcomes, and different sensitivities, which represent uncertainty around specific input variables. In its 2011 IRP, for example, PacifiCorp defined input scenarios for portfolio development, examining alternative transmission configurations, types of CO_2 regulation, and renewable resource policies. Sensitivity cases that were analyzed included varying fuel costs, load forecasts, and demand-side management resource availability. PacifiCorp modeling resulted in 100 simulation runs, and top resource portfolios were determined after an examination of the resulting portfolio costs (PacifiCorp 2011). The short-term investments and utility changes either indicated or implied by this portfolio may be translated into an "action plan," which describes the next steps to be pursued by the utility and/or regulators.

CPCN evaluation structures are designed to review the costs, benefits, and risks of a discrete action or set of actions, such as the acquisition of a new resource or significant modification of an existing resource. The planning and analysis of CPCNs are very similar to IRPs, except that rather than resulting in one or more sets of suitable resource mixes, the purpose of the CPCN is to estimate the utility and/or customer cost with and without the acquisition of the resource under scrutiny. Instead of producing a set of resource mixes, the CPCN reviews a set of discrete resource options and again views them through the filter of total cost, risk and uncertainty, and (sometimes) rate impacts. In 2011, for example, Northern States Power in Wisconsin filed an application requesting a CPCN for a proposed upgrade to the existing transmission line system, adding a new 161 kV line to the existing 69 kV line between two of its substations (NSPW 2011). The company's application detailed the preferred route for the lines, two alternate routes, and the projected costs, impacts, and benefits of the project. The final outcome from a utility's CPCN application is the selection of the resource and recommendation for the CPCN.[78]

Implementation and Evaluation of Electricity Resource Planning

Much of electricity planning consists of ensuring that the right framework and assumptions are in place to develop a reasonable and cost-effective plan. Planning implementation is the development of these assumptions and the vetting of the framework—a process that is effective when utilities, regulators, and other stakeholders are involved in implementation.

Administering Body

In most states, the utility is generally responsible for implementing the planning or procurement policy. State PUCs oversee the utility planning processes in their states. Typically, the commissions solicit comments and input as they develop planning and procurement practices from a wide variety of stakeholders, including generation owners, default service providers, competitive suppliers, consumer advocates, renewable developers, environmental advocates, and energy efficiency advocates. The utility regulator may also play a role in reviewing and approving utilities' planning procedures, selection criteria, and competition solicitation processes. PUCs in different states take different roles in the IRP process. In some states, such as Oregon, California, Indiana, and Georgia, the review and evaluation of IRPs are conducted in a docketed forum, in which commission staff and stakeholders are able to both issue formal or informal discovery and comment on the IRP's assumptions and construction. Electricity procurement for default service customers and larger scale CPCN processes are almost always docketed, litigated proceedings, with supporting testimony and a multiple-month schedule of discovery and fact-finding, pre-filed testimony, and often oral argument. PUCs make the final determination of whether default service and/or CPCN are acceptable.

Cooperatively owned utilities and municipal electric boards may not be subject to formal state PUC oversight. In the case of cooperatively owned utilities, boards appointed by member-customers are charged with supervision; municipal governments that supply electric services regulate their own utilities. In rare cases, such as in Kentucky, the PUC reviews and regulates cooperatively owned utilities (KY PSC n.d.). The TVA has little or no state administration, although the utility delivers to 155 local distribution companies that are subject to state requirements.

Evaluation

State PUCs may review a variety of metrics in evaluating the outcome of a utility plan. "Least cost" is generally the dominant factor in consideration, although PUCs will consider reliability implications, short-term rate implications, and price stability. Least cost generally refers to the lowest long-term system cost discounted to present day dollars. As such, the definition requires the consideration of long-term costs, and may be highly dependent on forecasts for commodity prices and expected future regulations. Utilities seek to generally prepare plans that are consistent with PUC requirements and preferences.

States vary in the extent to which they review elements of the utility planning process. In some states, such as Oregon and Nevada, PUCs conduct a rigorous review of IRP assumptions and processes; in other states, such as Indiana and Kentucky, the state allows stakeholders to probe utility plans through formal or informal discovery

[78] CPCNs are typically applications put forth by utilities seeking approval of particular actions. As such, utilities have typically conducted a planning process they consider complete, opened to scrutiny under a litigated proceeding. Therefore, a utility only files an application that supports and recommends the CPCN.

and a comment process (Indiana 2014; Kentucky 1995). IRPs may be approved, approved with conditions, or sent back to utilities to revise their assumptions or processes. Some states do not require formal review of IRP processes or results.

PUCs rarely require a look-back period or post-hoc review of utility plans, recognizing that actions perceived to be least cost at one point in time may shift with changing circumstances. In rate cases (not planning dockets), utilities are required to show that investments and commitments were prudently incurred—i.e., the utility conducted reasonable planning at the time that the investment was made. To the extent that a utility action is found to be imprudent, PUCs may opt to penalize utilities for damages incurred (i.e., the cost difference between a reasonable course of action and the utility's decision) and/or issue a penalty for poor management. In 2012, the Oregon PUC found that a utility decision to install emissions controls was imprudent because reasonable utility planning should have otherwise found that the EGU was not economical to retrofit; the PUC imposed a $17 million penalty for poor management and an imprudent decision (OPUC 2012b). In an Indiana CPCN process, the PUC granted a utility permission to proceed with an emissions retrofit, but penalized the utility $10 million for having conducted a poorly executed planning process (IURC 2013).

Updates and Progress Reports

Regulators sometimes require utilities to submit electricity resource plans and progress reports at regular intervals. These plans and reports describe in detail the assumptions used, the opportunities assessed, and the decisions made when developing resource portfolios. Regulators carefully review these plans and either approve them or recommend changes needed for approval.

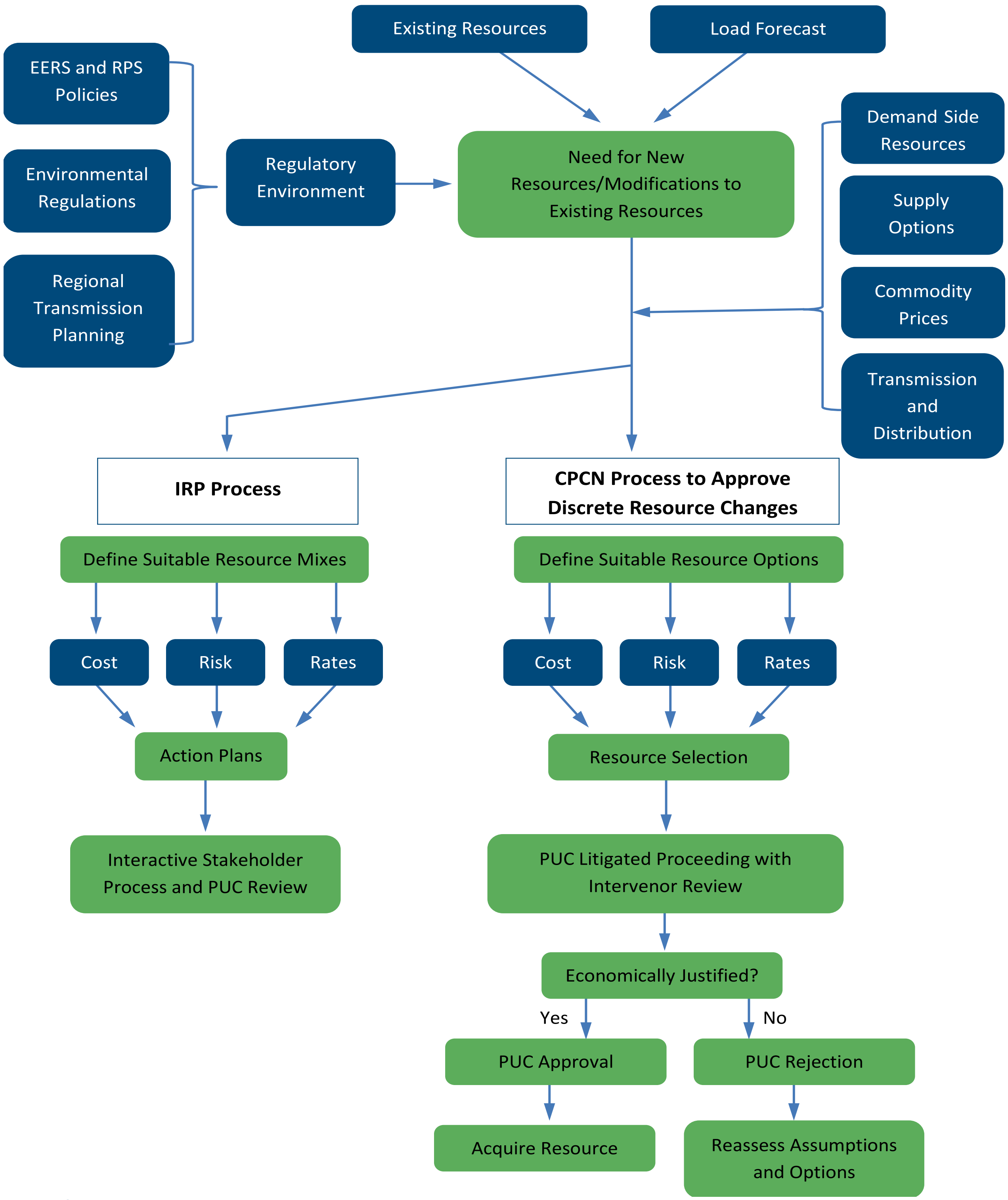
Oregon requires utilities to submit biennial IRPs and annual IRP updates (OPUC 2007). Similarly, the Iowa Utilities Board requires companies to submit annual reports on their energy efficiency and load management programs (Iowa 2014). The NWPCC's 2005 plan calls for monitoring key indicators that could affect the plan, such as loads and resources, conservation development, cost and availability of wind generation, and climate change science. This monitoring will inform IRPs developed by the utilities in the NWPCC region (NWPCC 2010b).

Applying Electricity Resource Planning Results

Integrated resource planning provides a mechanism for vetting and reviewing utility planning procedures, but it does not necessarily require specific utility actions. While some states require utility actions (such as resource acquisitions) to be consistent with IRPs, there are no states in which this requirement holds absolutely. Changing circumstances, forecast assumptions, and strategic decisions may cause a utility to deviate substantially from an IRP. Thus, IRPs are not generally considered enforceable. CPCN, including preapproval processes, carries the expectation that a specific action will be taken. However, the outcome of a CPCN process is usually permission, not a requirement, to proceed. In April 2011, for example, Louisville Gas and Electric and Kentucky Utilities filed a joint IRP which included the need for new gas-fired combined cycle generating units in 2016, 2018, and 2025 (LGE 2011a). Later that year, the Public Utilities Commission approved the companies' application for CPCN to construct one of those combined cycle units at the Cane Run generating station (LGE 2011b). The utilities began construction of the unit, and reported in their 2014 IRP that it is scheduled to come online in 2015 (LGE 2014).

In some cases, CPCN may be granted with conditions; in particular, CPCNs that are a result of settlement, rather than litigation, may carry requirements from other parties, such as a minimum purchase of renewable energy or an energy efficiency target. For example, in 2014, the Public Service Company of New Mexico offered a settlement by which the affected utility would acquire incremental renewable energy to attenuate opposition to a CPCN request (NM PRC 2010). Figure 7.1.2 provides a flow chart of IRP and CPCN long-term electricity resource planning, illustrating the differences in how the results of these processes are applied.

Figure 7.1.2: Flow Chart of Long-Term Planning Processes



Source: Synapse 2013

State Examples

Nevada IRP

Under section 704 of the Nevada Revised Statutes, Nevada requires that each electric utility submit an IRP every 3 years. The state PUC prescribes the plan's contents, which must include, but are not limited to, the methods used to forecast electric demand and determine the best combination of supply- and demand-side resources to meet consumer needs. Utility plans must include: 1) an energy efficiency program for residential customers with new solar thermal energy sources; 2) a comparison of several scenarios that look at different combinations of supply- and demand-side resources, at least one of which much be a low carbon intensity scenario; and 3) a plan for expanding transmission facilities to serve PUC-designated renewable energy zones. After a utility has submitted its plan, a hearing shall be convened to determine the plan's adequacy. The PUC determines whether the plan adequately forecasts load and energy efficiency savings, and whether it considers the benefits of improvements in efficiency, power pooling, power purchases, renewable generation including cogeneration, other types of generation facilities, and other transmission facilities. The PUC may give preference to resources that provide the greatest economic and environmental benefits to the state and provide the greatest opportunity for creating new jobs. After a utility has filed its plan, the PUC may accept the plan as filed or specify those areas of the plan that it finds to be inadequate. Utilities then have the opportunity to file an amendment to their resource plans.

Senate Bill No. 123 amended these statutes in 2013 to require that utilities also file a comprehensive emissions reduction and capacity replacement plan, reducing emissions from coal-fired electric generating plans and replacing that capacity with capacity from renewable facilities. The plan must provide for the retirement of 300 MW by the end of 2014, an additional 250 MW by the end of 2017, and an additional 250 MW by the end of 2019. Simultaneously, each utility must issue a request for proposals for 100 MW of renewable energy by 2014, an additional 100 MW by 2015, and an additional 100 MW by 2016. The utility must begin constructing an additional 50 MW of renewable energy to be owned by that utility before the end of 2017. These emissions reduction plans are subject to PUC review, and the PUC may accept the plan or recommend a modification or amendment if any portion of the plan is deemed inadequate.

Georgia Power Company IRP and CPCN

In 2011, Georgia Power submitted an application to decertify two coal units and authorize power purchase agreements, supported by an IRP. As an example of how different planning processes can work together, the Georgia PUC required the utility to update its IRP prior to allowing further expenditures at existing units. In 2013, Georgia Power submitted a revised IRP, expressly requesting further decertifications, demand-side management programs, fuel cost increases, and other approvals. The IRP became the basis for the Company's rate case filed later that year. In the rate case, many of the costs considered in the 2013 IRP were addressed through an environmental cost recovery rider, transforming the rate case into a pre-determination proceeding, similar to a CPCN.

Oregon IRP

In Oregon, investor-owned gas and electric utilities file individual least cost plans or IRPs with the PUC every 2 years. The plans, required since 1989, cover a 20-year period. The primary goal is to acquire resources at the least cost to the utility and ratepayers in a manner consistent with the public interest. These plans are expected to provide a reasonable balance between least cost and risk. By filing these plans, the utilities hope that in future proceedings the PUC will not reject, and prevent utilities from recouping, some of the costs associated with resource acquisition.

Connecticut IRP

Connecticut Public Act No. 11-80 requires the CT DEEP to develop a statewide IRP in conjunction with the Connecticut Energy Advisory Board and the state's electric distribution companies. After reviewing the state's energy and capacity needs, the CT DEEP must create a plan for procuring energy resources that seeks to minimize resource costs, maximize customer benefits, and lower the price of electricity over time. Energy resources include, but are not limited to, conventional and renewable generating facilities, energy efficiency, load management, demand response, CHP, DG, and other emerging technologies. Resource needs are to be met first with all available energy efficiency and demand reduction resources that are cost-effective, reliable, and feasible. The state IRP should include an assessment of: 1) energy and capacity requirements for the next 3, 5, and 10 years; 2) how best to eliminate demand growth; 3) how best to level the state's electric demand through reductions in peak demand and load shifting to off-peak periods; 4) the impact of current and proposed environmental standards; 5) any energy security or economic risks associated with energy resources; and 6) estimated lifetime costs and availability of energy resources.

The CT DEEP is required to hold a public hearing on the completed IRP and consider all written and oral comments on the proposed plan. The commissioner may approve or reject the plan with comments. The procurement manager of the Public Utilities Regulatory Authority will then develop and hold public hearings on a procurement plan in consultation with the electric distribution companies, ISO-NE, and the Connecticut Energy Advisory Board. Every 2 years, the CT DEEP must report to the General Assembly on progress toward plan implementation, as well as any recommendations about the process.

New Jersey Energy Master Plan

New Jersey state law requires an Energy Master Plan (EMP) to be revised and updated at least every 3 years to address the production, distribution, consumption, and conservation of energy in the state. The law requires the EMP to include both long-term objectives and interim measures consistent with and necessary for achieving the long-term objectives. The EMP considers the full scope of energy service delivery in the state, including energy sources that are regulated by the Board of Public Utilities (such as electric and natural gas IOUs) and those that are not (NJ EMP n.d.).

Like the previous EMP in 2008, the 2011 EMP recognized "what the State can do directly to affect the reliability and cost of energy; what the State is constrained to do indirectly to influence the decisions of PJM, the FERC, and power plant owners and developers; and what factors are outside the State's control" (NJ EMP 2011). While the goals, targets, and policies put forth in the plans are not, by themselves, enforceable in practice, the plans serve as guidance for narrower resource planning processes. For example, policy direction and targets from the plans are fed into the process for determining funding levels for the state's energy efficiency and renewable energy incentive programs.

Northwest Power and Conservation Council

The Sixth Northwest Conservation and Electric Power Plan was issued in February 2010, making it the most recent plan released by the NWPCC. The plan is intended to mitigate risks that stem from uncertainties such as climate change policy, fuel prices, and economic growth. The Sixth Plan includes recommendations to ensure the reliability and efficiency of the power system.

Improving energy efficiency is a top priority because it is predicted to be the least financially risky resource, has no ongoing fuel costs or dependence on foreign imports, and reduces demand on the Northwest's hydroelectricity industry while supporting reliable and affordable electricity service. If implemented, these improvements could fulfill 85 percent of the region's increased energy needs over the next 20 years, as well as defer investments from what are currently expensive low-carbon technologies or less clean energy resources (NWPCC 2010b). The NWPCC has also illustrated energy efficiency's sustainability over time by reducing electricity demand by an average of 3,900 MW between 1978 and 2008. In addition, they have identified 6,000 MW of available new efficiency, demonstrating the future viability of this resource (NWPCC 2010a).

Additional recommendations include developing cost-effective renewable energy, such as wind. The plan advises improving power system operations to incorporate new wind energy as well as enhance its efficiency and flexibility. The plan also encourages the construction of natural gas-fired plants to meet local needs, reduce dependence on coal, ensure sufficient backup power, and meet carbon-reduction targets. Lastly, the plan recommends researching the potential of new technologies, such as smart-grid technology or carbon sequestration, for future development and long-term stability of the region's power system (NWPCC 2010b).

What States Can Do

Action Steps for States

Most states already have some form of electricity resource planning processes. These states may be able to take action to ensure that energy efficiency, renewable energy, and CHP are consistently considered along with other resource options. Actions for states that already have electricity resource planning processes include:

- Remove barriers to fair consideration of available energy efficiency resources by using third-party energy efficiency potential studies and mandating all cost-effective energy efficiency in planning.
- Update key assumptions for renewable energy so that values for current and future capacity availability and costs reflect current market conditions.
- Require utilities to assume both existing and reasonably expected future EERS and RPS policies, as well as environmental regulations, in their electricity resource modeling.
- Ensure that the resource planning process is tied to investment decisions or other enforceable actions.
- Leverage existing knowledge from state utility and environmental regulators.
- Increase transparency in planning processes—for example, by presuming that all information should be public unless demonstrated to be proprietary or protected business information.
- Promote meaningful stakeholder input, including input from consumer advocates and non-governmental organizations that promote energy efficiency, renewable energy, and CHP.

For states that do not yet have long-term electricity resource planning processes in place, state legislation can be used to direct the state PUC to require planning. For examples of IRP state statutes, see the information resources listed at the end of this section. DOE also offers grant funding and technical assistance to state governments, including energy offices and PUCs, to facilitate the sharing of state best practices and to conduct stakeholder processes that help establish electricity resource planning.[79]

[79] For more information on technical assistance available through DOE, visit http://www.energy.gov/ta/state-local-and-tribal-technical-assistance-gateway. Funding opportunities available to assist states in electricity resource planning may be made available through the State Energy Program (http://energy.gov/eere/wipo/state-energy-program).

States can also work through their state legislatures and/or utility regulators to establish new electricity resource planning processes or make statutory changes that remove barriers to fair consideration of all resource options.

Increasing State Agency Coordination in Electricity Resource Planning

Energy planning can affect the work of a variety of state government agencies, and many of these agencies can provide valuable input to the planning process. Thus, many states have found benefits in fostering more interagency communication and collaboration.

A useful first step is to determine who plays a role and what mechanisms currently exist for interagency collaboration. As the *Participants* section on page 7-18 explains, state agencies may already participate in planning as regulators (e.g., PUCs in rate-based cases such as IRP, CPCN, and default service cases; air regulators in permitting) or as intervenors or stakeholders (e.g., a consumer advocate or attorney general's office representing ratepayers, or a Department of Energy representing state policy).

In one example of fostering coordination, the Commonwealth of Massachusetts brought its environmental and energy offices together under the Executive Office of Energy and Environmental Affairs in 2007. However, even without combining agencies, utility and environmental regulators can find many opportunities to coordinate. For example, PUC staff can alert environmental managers about ongoing planning processes and engage them to vet long-term environmental outcomes; environmental regulators can similarly alert PUC staff and ratepayer advocates about air and water permit applications. Such coordination can be mutually beneficial to both agencies as decisions made by one state entity can have significant implications on other regulatory bodies. In some cases, utilities pursue air or construction permits prior to pursuing a CPCN or preapproval, thus creating a situation in which long-term planning is necessarily compressed by permit deadlines, or constraining potential outcomes for utility regulators. In the inverse situation, utility regulators may not be aware of impending, or even ongoing, environmental regulatory requirements that pose financial risks or costs. Utility regulatory decisions may have substantial effects on a state's ability to pursue energy efficiency, renewable energy, and CHP alternatives.

Information Resources

Resources on Integrating Energy Efficiency, Renewable Energy, and CHP into Electricity Resource Planning

Title/Description	URL Address
Resource Planning Model: An Integrated Resource Planning and Dispatch Tool for Regional Electric Systems. This 2013 report for NREL introduces a capacity expansion model, the Resource Planning Model, with high spatial and temporal resolution that can be used for mid- and long-term scenario planning of regional power systems.	http://www.nrel.gov/docs/fy13osti/56723.pdf
Using Integrated Resource Planning to Encourage Investment in Cost-Effective Energy Efficiency Measures. This 2011 report for the State and Local Energy Efficiency Action Network summarizes the benefits of IRP processes as a mechanism to encourage cost-effective energy efficiency, and provides best practices on how to develop IRPs and other similar planning processes that promote energy efficiency.	https://www4.eere.energy.gov/seeaction/sites/default/files/pdfs/ratepayer_efficiency_irpportfoliomanagement.pdf
Energy Efficiency Participation in Electricity Capacity Markets: The US Experience. This 2014 paper summarizes the rules governing how efficiency resources participate in the ISO-NE and PJM capacity markets, the result of that participation, and lessons learned to date.	http://www.raponline.org/document/download/id/7303
Guide to Resource Planning with Energy Efficiency. This guide from the National Action Plan for Energy Efficiency, published in 2007, describes key issues, best practices, and main process steps for integrating energy efficiency into resource planning.	http://www.epa.gov/cleanenergy/documents/suca/resource_planning.pdf
Treatment of Solar Generation in Electric Utility Resource Planning. This 2013 technical report from NREL captures utility-provided information about how utilities approach long-range resource planning, methods and tools utilities use to conduct resource planning, and how solar technologies are considered in the resource planning process.	http://www.nrel.gov/docs/fy14osti/60047.pdf
Incorporating Energy Efficiency into Western Interconnection Transmission Planning. This 2014 report documents the energy efficiency-related analyses developed by Lawrence Berkeley National Laboratory for the Western Electricity Coordinating Council's Transmission Expansion Planning and Policy Committee 2011 and 2012 study cycles.	http://emp.lbl.gov/sites/all/files/lbnl-6578e.pdf
A Guidebook to Expanding the Role of Renewables in a Power Supply Portfolio. This 2004 report prepared for the American Public Power Association's Demonstration of Energy-Efficient Development Program describes a suggested process and analytic approach to aid utility managers in expanding the role of renewable resources in their energy supply portfolios.	http://apps2.eere.energy.gov/wind/windexchange/pdfs/power_supply_guidebook.pdf
Edison Electric Institute/Natural Resources Defense Council (EEI/NRDC) Joint Statement to State Utility Regulators. This February 2014 statement by the EEI and NRDC provides recommendations to utilities for innovative technologies that enhance grid performance while lowering emissions, including net metering and energy efficiency measures.	http://docs.nrdc.org/energy/files/ene_14021101a.pdf

Title/Description	URL Address
A Brief Survey of State Integrated Resource Planning Rules and Requirements. This 2011 document by Synapse Energy Economics, Inc., provides an overview of IRP rules in each state, as well as a general discussion of LTPP.	http://www.cleanskies.org/wp-content/uploads/2011/05/ACSF_IRP-Survey_Final_2011-04-28.pdf

Additional Resources Related to Electricity Resource Planning

Title/Description	URL Address
Best Practices in Electric Utility Integrated Resource Planning: Examples of State Regulations and Recent Utility Plans. This 2013 report by Synapse Energy Economics, Inc., provides utilities, commissions, and legislatures with IRP guidance by offering best practice examples.	http://www.synapse-energy.com/sites/default/files/SynapseReport.2013-06.RAP_.Best-Practices-in-IRP.13-038.pdf
Integrated, Multi-pollutant Planning for Energy and Air Quality (IMPEAQ). This 2013 paper represents the Regulatory Assistance Project's (RAP's) early-stage effort to develop a model process that states, local agencies, and EPA can use to comprehensively and simultaneously reduce all air pollutants (criteria, toxic, and greenhouse gases). IMPEAQ adheres to integrated resource planning principles by trying to identify least cost pathways to reduce emissions.	http://www.raponline.org/document/download/id/6440
Best Practices in Electric Utility Integrated Resource Planning: Examples of State Regulations and Recent Utility Plans. This 2013 report describes IRP requirements in three states that have recently updated their regulations governing the planning process, and it reviews the most recent resource plan from the largest utility in each of those states.	http://www.raponline.org/document/download/id/6608
Projecting EGU CO2 Emission Performance in State Plans This Technical Support Document to EPA's 2014 Clean Power Plan Proposal includes a discussion of modeling structures used in utility planning.	http://www2.epa.gov/sites/production/files/2014-06/documents/20140602tsd-projecting-egu-co2emission-performance.pdf
EPA Power Sector Modeling. This website provides information and documentation on EPA's application of the Integrated Planning Model (IPM) to analyze the impact of air emissions policies on the U.S. electric power sector.	http://www.epa.gov/powersectormodeling/
Assessment of Demand-Side Resources within the Eastern Interconnection. This 2013 guide, prepared for the Eastern Interconnection States' Planning Council and National Association of Regulatory Utility Commissioners, is an assessment of demand-side resources and their existing and forecasted deployments within the eastern United States. The guide was commissioned to improve understanding of how demand-side resources will affect the needs of future transmission development throughout the Eastern Interconnection.	http://communities.nrri.org/documents/68668/9f3dc4d3-485a-4d54-aad6-80964c932c5e
Utility Scenario Planning: "Always Acceptable" vs. the "Optimal" Solution. This paper describes the concept of Utility Scenario Planning, which is a tool similar to integrated resource planning in which utilities identify sharply different "scenarios" of the future and then seek to define a resource strategy that is most successful in addressing all of those potential futures.	http://www.nrri.org/documents/317330/c1f34184-faf6-4585-8d6f-04587d7da2f9
2013 Carbon Dioxide Price Forecast. This report provides a reasonable range of future price estimates for CO_2 for use in utility integrated resource planning and other electricity resource planning analyses.	http://www.synapse-energy.com/sites/default/files/SynapseReport.2013-11.0.2013-Carbon-Forecast.13-098.pdf

Title/Description	URL Address
A Brief Survey of State Integrated Resource Planning Rules and Requirements. This 2011 report, prepared for the American Clean Skies Foundation, provides an overview of state integrated resource planning rules and identifies for each state the planning horizon, frequency with which plans must be updated, and the resources required to be considered.	http://www.synapse-energy.com/sites/default/files/SynapseReport.2011-04.ACSF_.IRP-Survey.11-013.pdf
Portfolio Management: Design Principles and Strategies. This presentation, part of a 2003 portfolio management workshop hosted by RAP, provides background information and outlines design choices and strategies for effective portfolio management.	http://www.raponline.org/document/download/id/241
State Generation and Transmission Siting Directory. This EEI directory provides siting process summaries for Washington, D.C., and all 50 states.	http://www.eei.org/issuesandpolicy/transmission/Documents/State_Generation_Transmission_Siting_Directory.pdf

State IRP Statutes

State	Title/Description	URL Address
Arizona	Arizona Corporate Commission Decision No. 71722, in Docket No. RE-00000A-09-0249. June 3, 2010.	http://images.edocket.azcc.gov/docketpdf/0000112475.pdf
Arkansas	Arkansas PSC. Resource Planning Guidelines for Electric Utilities. Approved in Docket 06-028-R. January 4, 2007.	http://www.apscservices.info/pdf/06/06-028-r_57_1.pdf
Colorado	Colorado PUC. 4 CCR 723-3, Part 3: Rules Regulating Electric Utilities. Decision No. C10-1111. Docket No. 10R-214E. November 22, 2010.	https://www.dora.state.co.us/pls/efi/efi_p2_v2_demo.show_document?p_dms_document_id=81364
Delaware	Delaware Electric Utility Retail Customer Supply Act of 2006. Delaware Code, Title 26, Chapter 10 Section 1007(c)(1)	http://delcode.delaware.gov/title26/c010/index.shtml
Georgia	Georgia Public Service Commission. General Rules. 515-3-4-.06 Integrated Resource Plan Filing Requirements and Procedures. Amended.	http://rules.sos.state.ga.us/docs/515/3/4/06.pdf
Hawai'i	Public Utilities Commission, State of Hawaii, A Framework for Integrated Resource Planning. March 9, 1992. Revised: March 14, 2011.	http://www.hawaiianelectric.com/vcmcontent/IntegratedResource/IRP/PDF/IRP_Framework_March_2011.pdf
Idaho	Idaho Public Utilities Commission Order No. 22299, in Case No. U-1500-165.	http://www.puc.idaho.gov/search/cases/electriccases.html
Indiana	Indiana Administrative Code 4-7-1: Guidelines for Integrated Resource Planning by an Electric Utility. New draft rules have been proposed in docket IURC RM 11-07, but are on hold due to the rulemaking moratorium currently in effect in Indiana.	http://www.in.gov/legislative/iac/title170.html (status updates for the IRP update rule making can be found here: http://www.in.gov/iurc/2673.htm)
Kentucky	Integrated Resource Planning by Electric Utilities. Relates to KRS Chapter 278.	http://www.lrc.ky.gov/kar/807/005/058.htm
Louisiana	Louisiana Public Service Commission Corrected General Order. Docket No. R-30021. Decided at the Commission's March 21, 2012, Business and Executive Session.	http://lpscstar.louisiana.gov/star/ViewFile.aspx?Id=95a4e806-45b4-4d5d-ae07-dd088a447363

State	Title/Description	URL Address
Minnesota	Resource Planning; Renewable Energy planning requirements: MN Statute §216B.2422. Utility planning requirements: MN Administrative Rules Chapter 7843. "Utility Resource Planning Process."	Statute available at: https://www.revisor.mn.gov/statutes/?id=216B.2422 Rule available at: https://www.revisor.mn.gov/rules/?id=7843
Missouri	Rules of Dept. of Economic Development. Division 240-PSC. Chapter 22—Electric Utility Resource Planning (4 CSR 240.22).	http://www.sos.mo.gov/adrules/csr/current/4csr/4c240-22.pdf
Montana	Montana's Integrated Least-Cost Resource Planning and Acquisition Act (§§ 69-3-1201-1206, Montana Code Annotated). For traditional utilities: Administrative Rules of Montana 38.5.2001-2016, adopted by the Montana PSC. Least Cost Planning – Electric Utilities. For restructured utilities: Administrative Rules of Montana 38.5.8201-8227, adopted by the Montana PSC. Default Electric Supplier Procurement Guidelines.	Code, Title 69: http://leg.mt.gov/bills/mca_toc/69_3_12.htm Rules, Chapter 38.5: http://www.mtrules.org/gateway/ChapterHome.asp?Chapter=38.5
Nebraska	Nebraska Revised Statute 66-1060.	http://nebraskalegislature.gov/laws/statutes.php?statute=66-1060
Nevada	Nevada Revised Statutes 704.741.	http://www.leg.state.nv.us/nrs/NRS-704.html
New Hampshire	Title XXXIV Public Utilities, Chapter 378: Rates and Charges, Section 38: Least Cost Energy Planning.	http://www.gencourt.state.nh.us/rsa/html/NHTOC/NHTOC-XXXIV-378.htm
New Mexico	New Mexico Administrative Code, Title 17, Chapter 7, Part 3. "Integrated Resource Plans for Electric Utilities.	http://164.64.110.239/nmac/parts/title17/17.007.0003.htm
North Carolina	North Carolina Utilities Commission Rule R08-60: Integrated Resource Planning and Filings.	http://ncrules.state.nc.us/ncac/title%2004%20-%20commerce/chapter%2011%20-%20utilities%20commission/04%20ncac%2011%20r08-60.pdf
North Dakota	North Dakota PSC Order issued on January 27, 1987 in Case No. 10,799. Amended on March 11, 1992 in Case No. PU- 399-91-689.	URL not available.
Oklahoma	Title 165: Oklahoma Corporation Commission. Chapter 35: Electric Utility Rules, Subchapter 37: Integrated Resource Planning.	http://www.occeweb.com/rules/Ch%2035%20Electric%20Rules%20eff%209-12-2014%20Searchable.pdf
Oregon	Oregon PUC Order No. 07-002, Entered January 8, 2007.	http://apps.puc.state.or.us/orders/2007ords/07-002.pdf
South Carolina	Established in: Public Service Commission of South Carolina Order No. 91-885 in Docket No. 87-223-E. October 21, 1991. Authority: South Carolina Code of Laws, Title 58, Chapter 37, Section 58-37-40.	PSC Order: http://dms.psc.sc.gov/pdf/orders/DF4FC4A9-EB41-2CB4-D44614AD02D02B8D.pdf SC Code: http://www.scstatehouse.gov/code/t58c037.php

State	Title/Description	URL Address
South Dakota	Utility plan requirement: South Dakota Legislature 1977, Ch. 390, § 23. Chapter 49-41B-3. Facility plan requirement: Administrative Rule Chapter 20:10:21, Energy Facility Plans.	Utility plan: http://legis.sd.gov/Statutes/Codified_Laws/DisplayStatute.aspx?Type=Statute&Statute=49-41B-3&cookieCheck=true Facility plan: http://legis.sd.gov/Rules/DisplayRule.aspx?Rule=20:10:21&cookieCheck=true
Utah	Report and Order on Standards and Guidelines. Docket No. 90-2035-01. In the Matter of Analysis of an Integrated Resource Plan for PacifiCorp. Issued June 18, 1992.	http://www.airquality.utah.gov/Public-Interest/Current-Issues/Regionalhazesip/RegionalHazeTSDdocs/Utah_PSC_Integrated_Planning_Rules.pdf
Vermont	Vermont Statutes, Title 30 (30 V.S.A.), Chapter 5, Sub-chapter 1, Section 218c, Least Cost Integrated Planning.	http://legislature.vermont.gov/statutes/section/30/005/00218c
Virginia	Definitions (Code of Virginia § 56-597). Contents of Integrated Resource Plans (Code of Virginia § 56-598). Integrated Resource Plan Required (Code of Virginia § 56-599).	Section 597: http://leg1.state.va.us/cgi-bin/legp504.exe?000+cod+56-597 Section 598: http://leg1.state.va.us/cgi-bin/legp504.exe?000+cod+56-598 Section 599: http://leg1.state.va.us/cgi-bin/legp504.exe?000+cod+56-599
Washington	Washington Administrative Code 480-100-238: Integrated Resource Planning.	http://apps.leg.wa.gov/wac/default.aspx?cite=480-100-238
Wyoming	Wyoming Public Service Commission Rule 253 (submitted July 22, 2009), and associated Guidelines for Staff Review.	Rule: http://legisweb.state.wy.us/ARULES/2009/AR09-043.htm Guidelines: http://psc.state.wy.us/htdocs/electric/ElectricIRPGuidelines7-10.pdf

State CPCN Rules and Statutes

State	Title/Description	URL Address
Alabama	Certificate of Convenience and Necessity - When Required; Application; Issuance (ALA Code § 37-4-28).	http://codes.lp.findlaw.com/alcode/37/4/1/37-4-28
Arizona	Compliance by Utility; Commission Order (Arizona State Legislature Title 40-360.07).	http://www.azleg.state.az.us/FormatDocument.asp?inDoc=/ars/40/00360-07.htm&Title=40&DocType=ARS
Arkansas	City of Paragould v. Arkansas Utilities Co. (70 F.2d 530).	http://leagle.com/decision/193460070F2d530_1412.xml/CITY%20OF%20PARAGOULD%20v.%20ARKANSAS%20UTILITIES%20CO
Colorado	Colorado Public Utilities Commission: Rules Regulating Electric Utilities (4 CCR 723-3, §3102)	http://www.sos.state.co.us/CCR/GenerateRulePdf.do?ruleVersionId=5738&fileName=4%20CCR%20723-3
Connecticut	Certificate of Environmental Compatibility and Public Need. Transfer. Amendment. Excepted Matters. Waiver (CT Gen Stat § 16-50k).	http://law.justia.com/codes/connecticut/2012/title-16/chapter-277a/section-16-50k

State	Title/Description	URL Address
Florida	Environmental Cost Recovery (Florida Statute 366.8255).	http://www.leg.state.fl.us/Statutes/index.cfm?App_mode=Display_Statute&Search_String=&URL=0300-0399/0366/Sections/0366.8255.html
Georgia	Actions Prohibited Without a Certificate of Public Convenience and Necessity (O.C.G.A. 46-3A-3).	http://law.justia.com/codes/georgia/2010/title-46/chapter-3a/46-3a-3
Idaho	Certificate of Convenience and Necessity (Idaho Statute 61-526.	http://www.legislature.idaho.gov/idstat/Title61/T61CH5SECT61-526.htm
Indiana	Necessity for Certification (Ind. Code §8-1-8.5-2)	http://codes.lp.findlaw.com/incode/8/1/8.5/8-1-8.5-2
Iowa	Electric Power Generation and Transmission (Iowa Code 476A).	http://coolice.legis.iowa.gov/cool-ice/default.asp?category=billinfo&service=iowacode&ga=83&input=476A
Kansas	Electric Public Utilities; Power, Authority, and Jurisdiction of State Corporation Commission (Kansas Statute 66-101). *Applies only to nuclear generation.*	http://www.kslegislature.org/li/b2015_16/statute/066_000_0000_chapter/066_001_0000_article/066_001_0001_section/066_001_0001_k/
Kentucky	Certificate of Convenience and Necessity Required for Construction Provision of Utility Service or of Utility–Exceptions–Approval Required for Acquisition or Transfer of Ownership–Public Hearing on Proposed Transmission Line mission–Severability of Provisions (Kentucky Statute 278.020).	http://www.lrc.ky.gov/Statutes/statute.aspx?id=14042
Maryland	Article – Public Utilities (§ 7-207).	http://mgaleg.maryland.gov/webmga/frmstatutestext.aspx?pid=&tab=subject5&stab=&ys=2015rs&article=gpu&section=7-207&ext=html&session=2015rs
Minnesota	Certificate of Need for Large Energy Facility (Minnesota Statute 216B.243).	https://www.revisor.mn.gov/statutes/?id=216B.243
Mississippi	Certificate of Public Convenience and Necessity Required; Exceptions; Complaints Prompting Hearing As to Adequacy of Service (MS Code § 77-3-11).	http://law.justia.com/codes/mississippi/2013/title-77/chapter-3/article-1/section-77-3-11/
Nebraska	Electric Generation Facilities and Transmission Lines; Approval or Denial of Application; Findings Required; Regional Line or Facilities; Additional Consideration (Nebraska Revised Statute 70-1014).	http://nebraskalegislature.gov/laws/statutes.php?statute=70-1014
Nevada	Specific Requirements for Electric Companies (NAC 703.185).	http://www.leg.state.nv.us/nac/NAC-703.html
New Mexico	New Construction; Ratemaking Principles (NM Stat § 62-9-1)	http://law.justia.com/codes/new-mexico/2011/chapter62/article9/section62-9-1

State	Title/Description	URL Address
New York	Article 10: Siting of Major Electric Generating Facilities.	http://www3.dps.ny.gov/W/PSCWeb.nsf/96f0fec0b45a3c6485257688006a701a/d12e078bf7a746ff85257a70004ef402/$FILE/Article10LawText%20.pdf
North Carolina	Certificate for Construction of Generating Facility; Analysis of Long-Range Needs for Expansion of Facilities; Ongoing Review of Construction Costs; Inclusion of Approved Construction Costs in Rates (G.S. § 62-110.1).	http://www.ncga.state.nc.us/EnactedLegislation/Statutes/HTML/BySection/Chapter_62/GS_62-110.1.html
North Dakota	Chapter 49-03: Electric Utility Franchise.	http://www.legis.nd.gov/cencode/t49c03.pdf?20141029133026
Ohio	Basis for Decision Granting or Denying Certificate (Ohio Revised Code 4906.10).	http://codes.ohio.gov/orc/4906.10
South Carolina	Utility Facility Siting and Environmental Protection Act (Title 58-33).	http://www.scstatehouse.gov/code/t58c033.php
West Virginia	Requirements for Certificate of Public Convenience and Necessity (West Virginia Code § 24-2-11).	http://www.legis.state.wv.us/wvcode/ChapterEntire.cfm?chap=24&art=2&section=11
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