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REGULATORY APPROACHES FOR RENEWABLE RESOURCES

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EXECUTIVE SUMMARY

The regulatory approaches that commissions select for assessing renewable resources are determined in large part by their states' public policies regarding renewable resources and environmental protection. On the one hand, renewable resources are rightly assessed in the context of private and social costs when the state's public policy regarding the environment is protection beyond the parameters set by the state and federal governments. On the other hand, the very same resources are correctly assessed in the context of only private costs when environmental protection is within the parameters set by the state and federal governments.

In every instance, private costs are tied directly to the purchase of goods and services used to produce or consume electricity. Examples of private costs are the price of electricity and the cost of labor. Because costs of this type are easily measured and monitored, their primary economic characteristic is well known to the regulator, the utility, and the ratepayer. In particular, someone is compensated when private costs are incurred to produce or consume electricity. For example, the owners of factors of production are compensated for the use of their resources when more electricity is produced. Similarly, the producers of electricity are compensated when more electricity is consumed.

Social costs also are related to the production and consumption of electricity. However, their primary economic characteristic is markedly different from the primary economic characteristic of private costs. Whereas the realization of private costs typically means that someone is compensated for the production or consumption of electricity, the realization of social costs is not necessarily associated with any form of compensation. If tax revenues do not rise after the creation of social costs, then society is forced without compensation to bear a cost created by the production or consumption of electricity. In particular, ratepayers and utilities are not being asked to take money out of their pockets to pay for the social costs they have created. The most prominent social costs in the electricity industry are the environmental costs that can be associated with the production of electricity. If these costs are not *internalized* in the form of higher taxes or otherwise, then they are not usually reflected in the *market price* of electricity.

The most often used tool for assessing the *value* of a renewable resource is the cost-benefit test. When applied properly and consistently, a cost-benefit test establishes whether it is economically *correct* to deploy a renewable resource instead of choosing to deploy either a nonrenewable resource or demand-side management device.[1] However, economic correctness with respect to a cost-benefit test depends on the state's public policy regarding renewable resources and the protection of the environment. When the state's public policy regarding the deployment of renewable resources emphasizes the internalized costs of producing electricity, the economically correct cost-benefit test focuses only on private costs. When the state's renewable resource policy goes beyond the currently internalized costs of producing electricity, the economically correct cost-benefit test incorporates a reasonable treatment of the noninternalized social costs.

Three types of cost-benefit tests are used by the electricity industry to determine whether it is economically correct to deploy renewable resources. The first type is the Utility Impact Test (UIT). The UIT focuses on the private costs of producing electricity. The second type is the Ratepayer Impact Test (RIT). It also focuses on private costs with the additional feature that the analyst is interested in which classes of ratepayers will share what burden of the utility costs. The third type is the Total Resource Test (TRT). This test focuses attention on the private *and* social costs of producing and consuming electricity.

Often times, it is true that state and federal legislatures, in addition to establishing the public policy regarding renewable resources, also determine the type of cost-benefit test used by the public utility commissions. It is usually the case that a TRT is required when the legislature wants to promote the deployment of renewable resources. The UIT and RIT tend to be feasible alternatives only when the promotion of renewable resources is not part of legislative mandate.

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[1] Some of the more economically promising forms of the newer renewable resources such as a photovoltaic device seem most appropriate for niche applications, especially when these applications allow the utility to avoid the construction of remotely placed distribution facilities. The mining and farming states in the mountainous areas of the western United States are most likely to find these applications to be cost-effective.

There are several ways that a state legislature can effectively promote the deployment of renewable resources. There are green integrated resource planning (IRP) processes, renewable resource set-asides, dichotomized competitive-bidding processes, and monetary rewards for deploying renewable resources. Of course, each of the renewable-resource-promoting options can be independently adopted by state public utility commissions. However, this particular activity has not been pursued by many commissions.

Each of the aforementioned renewable-resource-promoting options *monetizes* the environmental and other externalities associated with producing or consuming electricity.[2] Consider that a green IRP process favorably weights the values of renewable resources in relation to other supply-side resources. A similar result occurs when there exists a renewable resource set-aside. A set-aside represents an explicit decision by the legislature that a predetermined proportion of the state's power needs have to be met by the deployment of renewable resources.[3] In effect, the values of renewable resources are lifted above the values of all other supply-side resources as far as the set-aside portion of the state's energy load is concerned.

Dichotomized competitive bidding complements the renewable resource set-aside. Whereas renewable resources are lumped together with and compete directly with nonrenewable resources in all-source competitive bidding, renewable resources are separated from the nonrenewable resources and only compete with each other in dichotomized competitive bidding. This dual purpose competitive-bidding schema ensures that some renewable resources will be included in the integrated resource plan that is developed by the

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[2] The survey data collected by The National Regulatory Research Institute (NRRI) reveal that there is not a standard procedure for the *monetization* of environmental externalities and the benefits of fuel diversity. There are reported instances where the procedures are totally subjective, totally objective, or a mixture in varying proportions of objectivity and subjectivity.

[3] A time dimension usually is associated with a renewable resource set-aside. For example, the utility may be required to deploy 100 megawatts (MWs) of renewable resources within ten years of the passage of the statute that implemented the set-aside.

utility. There really is no need to discuss the general nature of monetary rewards to induce the utility to deploy renewable resources.

The purposes of this report are to review what other states are doing in terms of promoting the deployment of renewable resources and to construct reasonable and generic methods for the regulatory assessment of renewable resources. A survey of state public utility commissions provided the data that were used to construct profiles of state-by-state renewable resource activities. Forty-seven commissions were contacted and interviewed by telephone. The Alaska and Hawaii Commissions were not contacted because the climates of their states are significantly different from the climates of the contiguous states. The commission for the District of Columbia was not contacted because its electricity needs are served by out-of-state utilities. The Florida Commission was not contacted because it and the NRRI have a contract for the production of this report. By remaining uninformed as to the Florida Commission's renewable resource practices, it was more possible to remain neutral during the assessment of the various regulatory approaches for dealing with the deployment of renewable resources.

One of four frameworks typically are used by commissions to evaluate the appropriateness of deploying renewable resources. They are the traditional, incentives, general policies, and monitoring frameworks. Each of these frameworks emphasizes a different aspect of a decision to deploy renewable resources.

The traditional framework focuses on the utilities' avoided costs as the commissions compare the revenue requirements associated with different mixes of renewable and nonrenewable resources. The guiding forces with respect to this framework are the minimization of the utilities' private costs and the levels of actual electricity rates. The organizing principle of the incentives framework is that an additional financial push is required from the commissions in order to accelerate the deployment of renewable resources. The potential to produce a broad-brush solution to the public policy problem of encouraging the deployment of renewable resources is the justification for the general policies framework. Finally, the natural tendency of policymakers to want an *ex post* measurement of the costs and benefits of their decisions to deploy renewable resources is the basis for the monitoring framework.

Within these four evaluation frameworks, there are seven parameters that are used to evaluate decisions to deploy renewable resources. They are the size of the renewable resource deployment, the social benefits that arise because of a decision to deploy renewable resources, the relative amount of the private costs that are incurred to deploy renewable resources, the willingness and ability of the ratepayers to absorb the private costs of deploying renewable resources, the consistency between a decision to deploy renewable resources and the availability of the renewable resource, the maturity of the renewable resource technology, and the sequential nature of the costs and benefits of deploying renewable resources.

A critical evaluation of the size of the renewable resource deployment is expected to place a minimum size on projects involving such resources. It is suggested that renewable resources should be deployed in blocks not smaller than 2 to 3 megawatts (MWs). The recognition of the existence of social benefits eliminates any opportunity for policymakers to rely exclusively on private costs when it comes to evaluating the merits of a decision to deploy renewable resources. The realization that the relative costs of deploying a renewable resource affects decisionmaking places upper limits on the amount of private costs that may be incurred in an effort to accelerate the deployment of these resources. The same is true of considerations as to the willingness and ability of ratepayers to finance the deployment of renewable resources. The consistency of public policy decisions in the area of renewable resources rests on the availability of a particular type of renewable resource before a decision is made to promote the deployment of this type of renewable resource. The focus on the maturity of renewable resource technologies acknowledges that it may be necessary for the utility to spend some money on the development of a renewable resource technology before the utility can actually deploy the renewable resource. Finally, the sequential nature of the effects of placing renewable resources in the generation mix recognizes that multiple public policy objectives can be met by deploying such resources.

Two generic evaluation methods are constructed that conform to the dictates of these seven parameters and fall into one of the aforementioned categories of evaluation frameworks. The first method is constructed on the basis of two assumptions. First, it is assumed that policymakers are concerned about the absolute and relative magnitudes of the private costs incurred to deploy renewable resources. Second, it is assumed that the level of pollution

implied by existing environmental laws places an upper limit on the value of avoiding an externality. Under these assumptions, it is argued that the proper evaluation method is to compare the renewable resource's private costs to the private costs of competing nonrenewable resources.[4] Because this method focuses on objectively measurable aspects of the costs of deploying renewable and nonrenewable resources, it is mostly likely to be embraced by commissions that direct a substantial portion of their efforts to keeping down the costs *and* price of electricity.[5]

The second method takes a broader look at the costs and benefits of renewable resources. The broader vista is created by giving a *credit* to the utility for producing electricity with a generation mix that emits *less than* the socially acceptable level of pollution and increases the utility's fuel diversity.[6] These credits elevate the cost-effectiveness of renewable resources as compared to other types of supply-side resources.

If thought to be reasonable by the reader, then the two methods suggest that commissions are not necessarily doing something wrong when they do not actively promote renewable resources. The deployment of renewable resources simply may be too expensive for the utilities and their ratepayers to bear presently or at any future time. Conversely, commissions are not necessarily doing something right when they actively promote renewable

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[4] A competing nonrenewable resource obviously must meet the requirements of the existing environmental laws.

[5] It would seem that commissions that adopt this method for evaluating the deployment of renewable resources are most concerned about what the utility and ratepayers immediately will have to pay for renewable resources as compared to what they would have to pay immediately for nonrenewable resources.

[6] The arguments in favor of the lowest feasible level of pollution are well known and will not be repeated. The diversification of the utility's fuel mix, in principle, causes the utility to be exposed to less risk from volatile prices for fossil fuels. However, this risk reduction is not achieved when the utility's price for the purchase of a nonutility-owned renewable resource is tied to the price of the fuel that is being displaced by the renewable resource. The relationships between electricity rates and the diversification of fuel mixes are as follows. First, actual electricity rates decrease when fossil-fuel prices increase. Second, electricity rates increase when fossil-fuel prices decrease.

resources. The deployment of renewable resources might not be consistent with the energy and economic needs of the state.

It does not make sense for anyone to ask commissions whether they can do more *in terms of cost-effectively* deploying renewable resources. Commissions historically have selected the least-cost options based on their state's current public policy regarding the promotion of renewable resources.[7] Therefore, the road to the cost-effective promotion of renewable resources is to ask the states to re-evaluate their public policy regarding the promotion of renewable resources and the beliefs about cost-effectiveness that are embedded in these public policies. Such re-evaluations may cause the commissions to include the effects of avoiding environmental externalities and promoting fuel portfolio diversity in their cost-benefit calculations.

It is undeniable that commissions do not sit by and watch the deployment of renewable resources parade by. Commissions approve rules that apply to renewable resources. Some of these rules may favor the deployment of renewable resources and other rules may make it more difficult to deploy these resources. The rules' actual contents are not important for the moment. What is important is that these rules in large measure represent the state's current beliefs as to the cost-effectiveness of renewable resources.

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[7] The majority of online renewable resources are hydroelectric and biomass facilities. The technologies associated with these generation facilities have been commercially feasible for some time. Consequently, online renewable resources tend to be cost-effective in the traditional economic sense. That is, their deployment has decreased the private costs of producing electricity and the price of electricity.

TABLE OF CONTENTS

TABLE OF CONTENTS--Continued

TABLE OF CONTENTS--Continued

LIST OF TABLES

LIST OF TABLES--Continued

FOREWORD

As stated within, the purposes of this NRRI report, prepared under a technical assistance contract with the Florida PSC, are two fold: (1) discovering what states (other than Florida) are doing regarding the promotion of renewable resources, and (2) developing objective, fair, and generalized methods for the regulatory assessment of renewable resources. A survey was employed to assist in the first of these two ends and several analytical frameworks are offered and appraised as to their appropriateness in meeting the second.

The Florida PSC has graciously allowed us to distribute our report to you and the rest of the regulatory community. We believe it has wide and timely application.

Douglas N. Jones
Director
Columbus, Ohio
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CHAPTER 1

ACCESSIBILITY OF RENEWABLE RESOURCES

1.1 Introduction

The standard classification of energy sources for the generation of electricity places renewables, such as wind, water, geothermal, and solar thermal in the group of supply-side resources. These resources have prominent characteristics that differentiate them from demand-side resources, such as insulation and energy efficient appliances. Usually, supply-side resources are developed by utilities, municipalities, and third-party independent producers of energy. Typically, these resources are interconnected to the utility's electricity system and integrated with the utility's other supply-side and demand-side resources.

However, many renewable resources do not have to be interconnected and integrated with the utility's electricity system. True cogenerators do not have to be connected to the utility's electricity system whether or not these firms are able to use all of the electricity that they generate from the waste and byproduct of their primary production process.[1] Stand-alone solar units for residential and commercial buildings do not have to be connected to the utility's system. These units are capable of providing electrical power to these buildings without any assistance from the serving utility. Similarly, stand-alone solar units are sometimes appropriate for remote locations that are far from existing transmission lines. The substitution of remotely generated power for power from the central station occurs most efficiently when the distribution costs to the remote location are greater than the cost of the stand-alone solar unit.

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[1] The Public Utility Regulatory Policies Act of 1978 (PURPA) requires the utility that serves the cogenerator to purchase the power that the cogenerator wants to sell to it. This requirement tends to bolster the economic viability of cogenerators because it is often true that these cogenerators find it cost-effective to produce their own electricity only if they can sell the excess to the utility. But, in principle, cogenerators can exist even if they do not have a ready-made market for their excess electricity.

The importance of accessibility cannot be underrated during any discussion of the capability of renewable resources to meet a state's energy needs. The fact is that renewable resources are most often developed where they are found. It is seldom cost-effective to divert a river in order to build a dam for the purpose of generating hydroelectric power for a location some distance from the normal course of the river. It is never possible to transport the wind to the load centers. Lastly, geothermal steam is trapped in underground pockets and as a result, is immobile. Consequently, the power from the development of renewable resources is most often transported via transmission lines from the development sites to the load centers. These transmission costs can be substantial. In fact, they may be so large that the renewable resource is currently inaccessible for all practical purposes. Therefore, in the final analysis, accessibility refers to the cost of bringing the power from the renewable resource to the load center. A renewable resource is not accessible if it is too costly to build the power station or to transport the power to where it is needed.

The accessibility of a renewable resource is predicted by the subgroup that the renewable resource belongs to. The first subgroup for renewable resources contains the mature renewable resources, such as high-temperature geothermal, biomass combustion, biomass gasification, small-system photovoltaics, and photovoltaics for remote locations. These renewable resources already have demonstrated their accessibility. They represent the majority of the currently installed or planned capacity. The second subgroup contains the emerging renewable resources, such as wind, moderate-temperature geothermal, and niche applications for photovoltaics that are not connected to the grid. Many of these renewable resources are currently accessible. There are wind farms in California and other parts of the United States, and niche applications for photovoltaics are starting to arise in the southwestern portion of the United States and in the Rocky Mountains. The third subgroup contains the incipient renewable resources, such as power generated from advanced wind technologies, geopressure, magma, solar-thermal devices, and large-scale photovoltaic farms that are connected to the utility's electricity system. Very few of these renewable resources are accessible to utilities, municipalities, or third-party independent power producers.

The primary purpose of this report is to construct an approach for evaluating the accessibility of renewable resources. The intent is to analyze the public policies that are

furthered by making renewable resources more accessible to ratepayers. The theme of this report is that the evaluation of the accessibility of a renewable resource is often dependent on what legislatures want to accomplish in terms of promoting renewable resources. This theme sends a two dimensional message to utilities, municipalities, and third-party independent power producers. First, regulators are not necessarily doing something *wrong* when they do not actively consider renewable resources during the planning process. Second, regulators are not necessarily doing something *right* when they do actively consider this type of supply-side resource. Right or wrong depends on the specific circumstances under consideration.

1.2 Renewable Resource Statistics

This section contains a brief summary of some renewable resources statistics as of 1992. In all, the three subgroups of renewable resources represent 12 percent of the nation's installed and planned capacity.[2] In addition, the geographic distribution of this renewable capacity across resource types is more revealing. Hydroelectric power is owned and operated throughout the nation by utilities, municipalities, and third-party producers. In fact, hydroelectric power accounts for over 80 percent of the installed and planned renewable resource facilities. The remaining renewable resource capacity, which equals approximately 15,000 megawatts (MWs), is concentrated in California and Nevada.[3]

In 1992, California deployed 1,625.9 MWs of the 1,647 MWs of wind power online.[4] Similar patterns held for geothermal, solar thermal, and photovoltaic facilities. California deployed 94 percent of the geothermal facilities and virtually 100 percent of the solar thermal

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[2] J. Hamrin and N. Rader, *Investing in the Future: A Regulator's Guide to Renewables* ORNL/95X-SH985C (Washington, D.C.: National Association of Regulatory Utility Commissioners [NARUC], 1993).

[3] Ibid.

[4] Appendix F, Table F-2, F-3.

facilities.[5] In 1992, California clearly was the leader with respect to the commercialization and deployment of renewable resources. However, the substantial deployment of wind capacity by California occurred despite the fact that California is not the state best suited to use wind to generate electricity.[6] Similarly, there are states north and east of California that have a much larger availability of geothermal resources.[7] Also, there are states to the east and south of California that have better environmental conditions for the deployment of solar thermal technologies.[8]

The geographical clustering of installed and planned renewable resources can be inferred from other statistics. Only nineteen states had 200 MWs or more of renewable resource capacity online in 1992,[9] and only ten states accounted for over 70 percent of the deployed renewable resources when utility-owned and municipality-owned sources of hydroelectric power are excluded from consideration.[10] One of the reasons for these results is the relatively high cost of renewable resources as compared to the other supply-side resources. Even though the costs of wind technologies dropped 65 percent to 80 percent over the last ten years,[11] wind resources are not expected to be truly cost-effective until 1995 or

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[5] Ibid., Table F-2, F-3.

[6] *Wind Energy Resource Atlas of the United States* (Washington, D.C.: U.S. Department of Energy, March 1987, reprinted 1991), Map 2-1, 13-14.

[7] Michael Lotker, "Status of Solar Thermal Electric and Geothermal Technologies," in *Proceeding of the National Regulatory Conference on Renewable Energy* (Washington, D.C.: NARUC, October 1993), 11.

[8] Ibid., 17.

[9] Appendix F, Table F0-2, F-3.

[10] Hamrin and Rader, *Investing in the Future,* xvii.

[11] Ibid.

thereafter.[12] The economics for solar thermal technologies are somewhat more tenuous. Although the underlying technologies are technologically proven, most of the commercialization activity is financed by the Department of Energy.[13] As a result, the near-term commercialization of solar-thermal technologies seems to be unlikely.[14] Only biomass and hydroelectric facilities are commercially viable because their production costs have held steady or modestly fallen over the last ten years.[15] However, the long-standing cost-effectiveness of these renewable resources is clouded by environmental and aesthetic considerations at the municipal and state levels of government.

These statistics indicate that the challenge is to harness renewable resources other than hydroelectric and biomass in a manner that yields economical energy. This effort is not well developed among the nineteen states with 200 or more MWs of installed or planned renewable resources. Biomass and nonutility-owned hydroelectric facilities account for more than half of the online capacity in these states.[16] The preponderance of hydroelectric and biomass facilities seems to indicate that the cost-effectiveness of a particular renewable resource is well established before the resource is widely deployed by utilities, municipalities, and third-party producers of electricity. Consider that biomass and hydroelectric technologies have been commercially feasible for some time.

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[12] R. W. Thresher, "Wind Energy Development: Technology Status and Commercialization," *Proceeding of the National Regulatory Conference on Renewable Energy* (Washington, D.C.: NARUC, October 1993), 28-29.

[13] M. Lotker, "Status of Solar Thermal Electric and Geothermal Technologies," 9.

[14] Ibid., 9.

[15] Hamrin and Rader, *Investing in the Future,* xvi-xviii.

[16] Ibid., Tables F-3, F-5.

1.3 Ways to Increase the Accessibility of Renewable Resources

There are several ways for regulators to increase the accessibility of ratepayers to all types of renewable resources when the state's public policy is to encourage the deployment of these resources. Generally, these approaches require that regulators approve rules that apply specifically to renewable resources. Specifically, these rules might be promulgated in order to encourage the use of renewable resources as a supply-side option.

The first way for regulators to increase the accessibility of renewable resources to ratepayers is to subsidize their deployment. Subsidization is not difficult for regulators as long as a state or federal legislative body identifies the source of funds for the subsidy. Recall that a federal tax rebate (which is no longer in effect) was used in the 1980s to promote the sale of residential solar devices for water and space heating. This subsidy made residential solar energy affordable for some consumers. The same result might be attainable for commercial users if the subsidy is high enough. Although nothing is free, the practical effect of a subsidy is to lower the ratepayer's cost of "buying into" a renewable resource.

The second way for regulators to make a renewable resource accessible to a ratepayer is by accelerating research and development efforts in this area along with complementary activity of sponsoring pilot experiments that demonstrate the effectiveness of the newly developed renewable resource technologies. Successful research and development provides the strong likelihood that the cost characteristics of a specific renewable resource technology have improved to the point where a unit of power that is generated from a renewable resource is affordable to the average ratepayer. Well-designed and well-run pilot experiments provide the information that is necessary to quickly commercialize the renewable resource technology.

The third way for regulators to make a renewable resource more accessible to ratepayers is by providing the utility with a monetary incentive to encourage inclusion of renewable resources in its preferred generation mix. This incentive can supplement any other incentives that are already provided directly to the utility's consumers through manufacturer rebates and similar promotional tactics.

The fourth way to for regulators increase the accessibility of renewable resources is to give preferential treatment to a renewable resource during the technology selection or competitive-bidding phases of an integrated resource planning (IRP) process. This approach is used by a few states as will be shown subsequently.

The fifth way to increase the accessibility to ratepayers of a renewable resource is for regulators to voluntarily adopt a *set-aside* for renewable resources or for a legislative body to mandate a set-aside.[17] A few states promote renewable resources in this manner.[18] It seems that the states fall back on this approach when the net benefits from the deployment of renewable resources are sketchy or the deployment of renewable resources is perceived to be too costly on purely financial grounds.[19]

1.4 Deployment of Renewable Resources

The deployment of renewable resources is discussed in this section. Deployment refers to the amount of renewable resources that are online and the commitment to renewable resources that is apparent in the legislature or regulatory arenas. The sources of this commitment may be preferences for renewable resources or mandates that require regulators to promote the deployment and use of renewable resources.

Not surprisingly, the vast majority of renewable resources are deployed in states with some type of commitment to them. As of 1992, California had 18,159.8 MWs of renewable

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[17] A set-aside is an administrative or legislature decision that requires public utility commissions to reserve a percentage of new generation for renewable resources.

[18] Appendix D.

[19] There are two main reasons why the net benefits of renewable resources may be sketchy. First, the commission may not be able to quantify the net benefits of obtaining more diversity in the utility's and state's fuel portfolio. This is the reason California has a "set-aside" for renewable resources. Second, the commission may not be prepared to assess the monetary value of reducing the risks that are associated with volatile fuel prices. Many states deal with the problem by resorting to qualitative assessments of the value of such net benefits.

resources online.[20] Approximately, one third of these renewable resources, that is, 6,047.4 MWs, are owned by nonutility generators.[21] This deployment record is supported by strong legislative and regulatory commitments to renewable resources.[22] The California Legislature required the California Commission to minimize the cost of electricity to society, to contribute toward improving the environment, and to encourage the diversity of energy sources. The Commission was expressly directed to investigate the possibility that the deployment of renewable resources might help to complete these tasks. In addition, the California Legislature required the Commission to set-aside a specific percentage of future electrical load to be met by the deployment of renewable resources. This set-aside is to continue until the time when the Commission can quantify the value of the resource diversity that is created by the deployment of a mixture of renewable and nonrenewable resources. Meanwhile, the Commission has proactively sought to quantify the value of environmental externalities and to include these values in a utility's planning process.

Oregon has deployed 8,221.1 MWs of renewable resources, and 277.7 MWs are owned by nonutility generators.[23] Its geographic neighbor, Washington, has deployed 20,077.6 MWs of renewable resources, and 275.8 of these MWs are owned by nonutility generators.[24] Like California, both of these states have strong legislative commitments to renewable resources that are supplemented by regulatory rules.

The Oregon Legislature adopted a statute that mandates the Commission to treat renewable resources favorably.[25] The Commission interpreted this statute as requiring it to get renewable resources into the resource stack for consideration during the IRP process.

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[20] Appendix F, Table F-1, F-2.

[21] Ibid., Table F-2, F-3.

[22] Appendix C, C-2.

[23] Ibid.

[24] Ibid.

[25] Appendix C, C-7.

In an effort to meet this requirement, the Oregon Commission voluntarily has adopted a set-aside of 20 MWs to 30 MWs of renewable resources and a "green" IRP process.[26] Oregon's utilities have twenty years to fulfill the set-aside obligation. As a result of these decisions, the Commission issued a statement of policy that allows a renewable resource to be included among the proposed resource mix of the "least-cost plan" even if there is a lower-cost alternative available and accessible.[27]

The Washington Commission is subject to state statutes that encourage conservation and decoupling. The Commission has interpreted these statutes as allowing it to encourage the use of renewable resources to meet the state's energy needs,[28] and therefore, it voluntarily adopted a regulatory policy that favors renewable resources over nonrenewable resources. Its basis for this effort is that the Commission views renewable resources as better for the environment relative to other forms of electricity generation.[29] The Washington Commission has implemented its regulatory policy by offering an incentive to its utilities for the purpose of promoting the deployment of renewable resources. Renewable resources receive a 10 percent cost advantage over other forms of energy generation during the competitive-bid phase of the IRP process.[30]

Among the eastern states, commitments to renewable resources are revealed by the Maine and Massachusetts Commissions. The state energy policy for Maine induced the Commission to view renewable resources favorably during the IRP process. At that time, the Maine Commission evaluates renewable resources from the perspective of their ability to

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[26] Appendix B, B-13.

[27] Availability refers to the potential that a renewable resource possesses with respect to meeting the state's energy needs. Wind is not an available renewable resource if the average wind speed is not sufficiently large.

[28] Appendix C, C-8.

[29] Appendix B, B-17.

[30] Ibid.

create a diverse and sustainable energy resource base.[31] The Massachusetts Commission promotes the deployment of renewable resources by employing an externality adder to compare the costs and benefits of renewable and nonrenewable resources.[32] In addition, the Massachusetts Commission gives renewable resources an advantage over nonrenewable resources by including in its cost-benefit analysis the net benefits of alleviating fuel-price uncertainty and increasing the utility's fuel diversity.[33]

However, Maine and Massachusetts are experiencing some economic pressures that are causing their regulators and legislatures to be more concerned about the financial costs that utilities and ratepayers incur when renewable resources are selected over nonrenewable resources. A concern of this type, if it becomes strong enough, can easily slow the deployment of renewable resources.

These legislative and regulatory directions were uncovered during the National Regulatory Research Institute's (NRRI) survey of regulatory and legislative practices affecting the deployment of renewable resources.[34] That survey established that regulators, with the encouragement of their legislatures, often give preferential treatment to renewable resources, but these preferential treatments are seldom strong enough to overcome the economic realities that attend the deployment of renewable resources. These realities may be divided into two groups. There are the continued health of the state economy and changes in fuel prices.

The survey data indicate that commissions with substantial reservoirs of nonrenewable resources tend to exhibit a skepticism toward the cost-effectiveness of renewable resources. This posture is not surprising because of the relatively low cost of the nonrenewable resource in that state and the importance of the continued production of the nonrenewable resource to the state's economy. Meanwhile, the survey data indicate that commissions without

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[31] Appendix B, B-7.

[32] Appendix B, B-8.

[33] Ibid.

[34] Appendix E contains the survey questions that were used to generate the data and information used in this report.

substantial reservoirs of nonrenewable resources seem to worry about falling prices for nonrenewable fuels and the effects that these falling prices might have on the cost-effectiveness of the deployment of renewable resources.[35]

1.5 Time Frames for Renewable Resources

The theme of this report is that the "proper" regulatory policy for renewable resources depends on what legislatures want to accomplish in the broader areas of environmental protection, economic development, and the quality of life. This theme is not as vacuous as it may first sound. By recognizing that the deployment of renewable resources is a means to reach a public policy end, it becomes clear that the time horizon for regulatory decisions will have a significant impact on the deployment of renewable resources. Three scenarios and their time frames are presented in this section to prove this point.

Sluggish state and regional economies, and relatively high electricity rates characterize the first scenario. As a result, regulators are under pressure to lower rates and give a boost to the economy. Consequently, they have reason to adopt a *near-term* perspective for policymaking that focuses on the ratepayers' wallets. This perspective pushes regulators in the direction of making decisions that lower rates in the short run. When actual rate reductions are not available to regulators, this perspective is likely to cause them to make decisions that place the least amount of immediate upward pressure on electricity rates. If the deployment of renewable resources tends to increase rates, then they will not do well in the calculus that drives decisionmaking in this scenario. As a result, regulators give renewable resources little consideration.

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[35] The cost-effectiveness of renewable resources has short-term and long-term components. Falling prices for nonrenewable fuels affect both of the components. Clearly, falling fuel prices make it more difficult to justify the deployment of renewable resources on short-term financial grounds. Similarly, they also make it more difficult to justify deployment on long-term financial grounds when reduced fuel costs are the primary benefit of the substitution of renewable for nonrenewable resources. This long-term effect of falling nonrenewable fuel prices is most troubling because the construction of renewable resources facilities tend to be more expensive per kilowatt (kW) than the construction of nonrenewable resource facilities. Therefore, saved fuel costs tend to be very important to the long-term economics of renewable resources.

The second scenario is characterized by relatively high electricity rates and booming state and regional economies. Although rates are high, it is assumed that electricity usage is growing robustly and on a sustained basis. Using this assumption as a basis, it is asserted that the utility has to add plant and equipment to its asset base. It also is asserted on the basis of the usage assumption that regulators are not under undue pressure to lower electricity rates.

Because electricity usage is growing and the utility has to invest in plant and equipment, it is reasonable to propose that the *intermediate term* represents the regulators' decisionmaking horizon. The intermediate term is selected because regulators have to consider the effects on the ratepayers' wallets that are created by the construction of facilities or the deployment of demand-side technologies. These effects are embedded in quality-of-life and economic growth issues.

Once again, the fate of renewable resources is dependent on how their deployment affects electricity rates. Renewable resources do not do well when quality-of-life issues are not particularly important in the state and the deployment of these resources causes an increase in the electricity rate. Conversely, renewable resources do well when deterioration in the quality of life affects the state's economic growth.

The third scenario is characterized by relatively low electricity rates and booming state and regional economies. It is assumed that the state's economic base does not include an indigenous nonrenewable resource industry and the vast majority of the utility's existing plant and equipment have a relatively long useful life. Consequently, regulators are not under pressure to lower electricity rates. Also, they do not have to worry about the immediate impact of their decisions on the ratepayers' wallets. Under these conditions, it is proposed that the *long term* is the appropriate time frame for regulatory decisionmaking. In the long term, quality-of-life issues can easily be more important than economic growth issues. Renewable resources will do well as a result.

1.6 Evaluation of Renewable Resources

Once it is known what is desired from the deployment of renewable resources, it is possible to construct a regulatory approach to make it happen. There are many possible

approaches to evaluating renewable resources. Two of these approaches are summarized in this section. Either approach is capable of providing information that is useful for determining how the deployment of renewable resources can further the legislature's public policy objectives. These approaches are developed more fully in Chapter 4 of this report.

Approach **A** uses cost-benefit analysis that does not vigorously recognize the social aspects of choosing renewable resources over nonrenewable resources. More specifically, the analysis does not place a value on how the deployment of renewable resources affects the utility's risks in the areas of environmental compliance and fuel portfolios. Therefore, Approach **A** is most likely to be selected by regulators who want to consider renewable resources during the planning process.

Approach **B** uses cost-benefit analysis that does recognize the social gains that can arise from the deployment of renewable resources. In particular, the analysis requires values for the avoidance of environmental externalities, the promotion of fuel diversity, and the alleviation of fuel-price uncertainty. Therefore, Approach **B** is a way to rationally promote renewable resources.

1.7 Concluding Remarks

A commission is not behaving irrationally when it chooses to consider renewable resources only on a financial level. Consider the deployment of renewables as a means to avoid pollution. Zero pollution is unachievable. Very low levels of pollution often are expensive to achieve. However, the socially acceptable level of pollution, which is determined in the legislative context, usually is within reach at a reasonable cost. Therefore, a commission is not necessarily acting irrationally when it does not place a positive value on the overcontrol of pollution. If overcontrol through the deployment of renewable resources occurs at a higher cost than what is necessary to achieve the socially acceptable level of pollution, then it is relatively certain that these renewable resources are legislatively too expensive for society.

A strictly financial evaluation of renewable resources carries forward into the IRP process. All that IRP really does is force the electric utility to consider all means for meeting

its needs in the area of supplying electricity. IRP does not guarantee that renewable resources will be included in the utility's preferred resource mix. IRP does not guarantee that renewable resources are part of the least-cost solution to the problem. These guarantees, if they do exist, arise or do not arise as a result of the way renewable resources are evaluated relative to other energy sources during the IRP process. Therefore, a strictly financial evaluation of the deployment of renewable resources is consistent with the IRP principles.

Finally, a strictly financial evaluation of renewable resources provides a way to estimate the value of avoiding a negative environmental externality. With respect to the utility's finances, the value of avoiding an environmental externality is not greater than the costs of complying with existing environmental protection laws. Of course, this upper bound for avoiding pollution makes it more difficult for anyone to justify the deployment of renewable resources.

CHAPTER 2

SURVEY OF REGULATORY POLICIES FOR RENEWABLE RESOURCES

2.1 Introduction

The NRRI surveyed state public utility commissions to obtain information on how renewable resources are evaluated during the planning process. Inquiries were made about events that have occurred in five arenas that affect the deployment of renewable resources. First, the commissions were asked about the degree and intensity of lobbying effort on behalf of renewable resources. Second, commissions were asked if legislative mandates have caused them to accelerate and enlarge the deployment of renewable resources. Third, they were asked whether renewable resources play a favored role during the IRP process. Fourth, they were questioned about monetary incentives that might induce utilities to deploy more renewable resources. Fifth, they were invited to list the types of cost-benefit tests they use to evaluate renewable and nonrenewable resources.

The data gathered from this survey make three points about the relative importance of renewable resources in a commission's overall conservation effort. In terms of commission expertise in the area of renewable resources, it often is the case that the same staff members working on conservation issues also are the most knowledgeable about renewable resources. With respect to the legislative commitment to renewable resources, the state's legislative policy on renewable resources is frequently embedded in the broader framework of its legislative policy on conservation and the preservation of the environment. As for the regulatory commitment to renewable resources, it tends to be true that the promotion of renewable resources is on a lower plane than the promotion of demand-side management (DSM). Commissions that have consistently approved monetary incentives to promote DSM have not approved incentives to induce utilities to deploy renewable resources. These points strongly suggest that the promotion of renewable resources is a subset of the commission's overall conservation effort.

2.2 Survey Instrument and Technique

The survey instrument and technique used in this study are described in this section of the report. The survey approach in this instance was to obtain data from the individuals who make policy decisions at state commissions. The first step toward implementing this approach was to design a survey instrument that extracted recent and direct information regarding a *commissioner's* views on renewable resources. The second step was to follow an interview protocol with a high probability of reaching a sitting state commissioner familiar with his or her commission's policy, if any, on renewable resources. (The authors believe that both of those objectives were met.)

The survey instrument is found in Appendix E of this report. It contains eleven questions related to commission practices and capabilities in the area of promoting conservation and the deployment of renewable resources. There are two questions that pertained to the existence of monetary or other incentives for inducing a utility to increase its conservation efforts or accelerate its deployment of renewable resources. Finally, there are two questions that provided some insight into the commissioner's perspective as to how well the utilities under his or her jurisdiction are doing in terms of deploying renewable resources.

The survey technique is unimodal. The interviewer attempted to communicate *directly* with a commissioner over the telephone.[36] No other means were used to initiate these contacts. When the interviewer did not talk to a commissioner, the interviewer questioned a staff member who was knowledgeable regarding the commission's renewable resource policy. This safety net had to be activated ten times. In two of these instances, the interviewer questioned a staff member who was on the commissioner's personal staff.

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[36] In most cases, the interviewer reached a commissioner. Of the forty-seven state commissions contacted, the interviewers were able to talk directly to thirty-seven commissioners. The Alaska and Hawaii Commissions were not contacted because the climates of those states are significantly different from the climates of the contiguous states. The District of Columbia Commission was not contacted because its electricity needs are served by out-of-state utilities. The Florida Commission was not contacted because it contracted with the NRRI for the production of this report.

The principal characteristics of this technique are simultaneity and flexibility. The interviewer personally hears and simultaneously records the responses to survey questions. This real-time coding provides the interviewer with the flexibility to clear up any ambiguities that are related to the delivery of the questions.[37] In addition, the survey technique provides the interviewer with an opportunity to clarify the answers to questions on a real-time basis. Finally, the interviewer has the opportunity to probe a little deeper after the interviewee's initial answer to the question. These characteristics help to ensure that the data are reliable, reasonably reflective of the regulator's viewpoints, and suitable for providing answers to the many public policy questions that are associated with the deployment of renewable resources.

2.3 Multiple Contacts with the Commissions

The interviewer contacted state commissions for two independent reasons during the data collection phase of this research. In both instances, the interviewer was interested in obtaining data on a variety of facts and perceptions related to the deployment of renewable resources. During the first contact, the interviewer focused on the deployment of renewable resources by a utility. During the second contact, the focus was on the deployment of solar technologies by residential and commercial customers.

The majority of the questioning during the first contact centered on the commission's policies with respect to the promotion and deployment of conservation activities and renewable resources. There were three separate sets of questions. The principal focus of the first set of questions was to obtain (1) a general assessment of the viability of DSM and renewable resources within the state, (2) a list of the types of renewable resources most commonly found in the state, (3) the reasons why the commission might look favorably or unfavorably on renewable resources, and (4) the legislative mandates that prompted commissions to promote DSM and renewable resources. The second set of questions

[37] Ambiguities related to the wording of the questions were eliminated during a pretest. Before doing the full-scale survey, the NRRI randomly contacted commission staff members and asked them the survey questions. When the answers appeared inconsistent with the intent of the question, the question was modified and reasked.

extracted data regarding (1) how renewable resource proposals are evaluated by the commission, (2) whether the commission staff is required to make an independent assessment of the availability of renewable resources to the state, and (3) what analytical format the commission staff uses to critique an assessment of the availability of renewable resources. The third set of questions explored organizational issues, such as whether the commission had a stand-alone conservation department, and whether the commission collaborated with a state energy board.

In the second contact with the commissions, all of the respondents were commission staff members,[38] and the questions focused attention on solar technologies that can be purchased and installed by ratepayers. During this much shorter interview, the respondents were asked (1) if the commission approved incentives that reward a utility for promoting and deploying residential and commercial solar technologies, and (2) if the commission approved incentives that reward a utility's customers directly when they decided to deploy solar technology at their premises.

2.4 Summary of the Survey Results

Although renewables are supply-side resources, they perform many of the functions that usually are associated with demand-side resources. Renewables and demand-side resources protect the environment, albeit in different fashions. The deployment of renewables and demand-side resources implies a reduction in the rate of growth in the use of fossil fuels to generate electricity. More specifically, the selection of renewable resources over demand-side resources implies the substitution of nonfossil fuels for fossil fuels, whereas the choice of demand-side resources over renewables implies a reduction in the use of fossil fuels without

[38] Each of these staff members was identified by commissioners as the most knowledgeable person on the commission staff with respect to the promotion and deployment of renewable resources within the state.

any corresponding increase in the use of other types of fuels used to generate electricity. These observations suggest that public utility commissions might jointly consider the availability and accessibility of renewables and demand-side resources. This hypothesis resulted in a series of questions that were designed to determine if the center of the commission's expertise in the area of renewable resources is located in the commission's conservation department.

Table 1 summarizes the results of these questions. The survey data indicate that public utility commissions often consider the availability and accessibility of renewables jointly with demand-side resources. Eight commissions have departments or sections whose personnel are charged with the analysis of conservation issues and the implementation of the commission's demand-side policies.[39] In every instance, these conservation departments or sections have subdepartments or subsections that contain staff members knowledgeable about renewable resource issues. For the remaining thirty-nine states, there is at least one staff member who has an interest in and is knowledgeable about this topic.

Table 2 provides some insights into the realities that affect regulatory policies with respect to the promotion and deployment of renewable resources. The data in this table indicate that influences, external to the commission, may have an effect on decisions that represent the regulatory policy for renewable resources. Twenty-five commissions perceive themselves as coming in contact with proactive lobbyists for renewable resources.

TABLE 1

CONSERVATION DEPARTMENTS OR SECTIONS AT THE COMMISSIONS

Commissions with Conservation Departments or Sections	Commissions without Conservation Departments or Sections
8	39

Source: Author's construct.

[39] Eight conservation departments or sections is not a particularly large number given the rising visibility of renewables and demand-side resources.

TABLE 2

POLITICAL ASPECTS OF RENEWABLE RESOURCES

Number of States with an Active Renewable Resource Lobby	Number of States with Existing Laws Mandating the Use of Renewable Resources	Number of States with Pending Laws Mandating the Use of Renewable Resources
25	7	1

Source: Author's construct.

Meanwhile, there are seven commissions subject to legislation that mandates renewable resources are to be used to meet at least a portion of the state's energy needs.[40]

Of the seven commissions with legislative mandates, California, Iowa, Minnesota, Oregon, and Wisconsin perceive themselves as facing proactive lobbyists for renewable resources.[41] The other two states--Connecticut and Maryland--do not report particularly active lobbies for renewable resources. Maryland describes its lobby as "fairly quiet" and Connecticut describes its lobby as inactive.

Finally, the data reveal that only one commission--Nevada--is awaiting the outcome of pending legislation in the area of renewable resources. However, Nevada also does not perceive a well-formed renewable resource lobby in the state. If correct, the absence of a well-formed lobby can influence the legislative debate on this issue.

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[40] These seven states are California, Connecticut, Maryland, Iowa, Minnesota, Oregon, and Wisconsin. Appendix E contains descriptions of how the state legislation mandates the use of renewable resources.

[41] Iowa reports an active renewable resource lobby only recently.

Table 3 contains the results of questions that were designed to identify the commissions with incentives to induce the utility to use renewable resources to meet the state's energy needs. The comparison group is commissions with incentives that induce the utility to deploy demand-side resources. The data indicate that five commissions provide or intend to provide their utilities with incentives to deploy renewable resources.

Mississippi rewards Mississippi Power and Light for its use of renewable resources during the utility's performance review. Montana uses a rate-of-return incentive to induce its utilities to deploy renewable resources. Iowa provides its utilities with a monetary reward when their deployment of renewable resources achieves 20 percent of the available net social benefits. Wisconsin provides its utilities with additional revenues for installing renewable resources. These utilities receive 0.75 cents per kilowatthour (kWh) for installing solar technologies and 0.25 cents per kWh for installing hydroelectric, biomass, and solid waste facilities. Vermont intends to offer long-term and levelized electricity rates to qualifying facilities that use renewable resources to generate electricity.

The data in Table 3 also indicate that twenty-nine commissions provide their utilities with an incentive to deploy demand-side resources. Our survey data reveal that every state

TABLE 3

INCENTIVES FOR RENEWABLE RESOURCES

Number of States with Incentives for Conservation	Number of States with Incentives for Renewable Resources
29	5

Source: Author's construct.

that provides or intends to provide an incentive to deploy renewable resources also provides an incentive to deploy demand-side resources. Therefore, there is almost a 6:1 ratio in favor of incentives for demand-side resources. A ratio of this size suggests that the promotion and deployment of renewable resources are not on the same plane in the United States as the promotion and deployment of demand-side resources.

Another fact emerges from the survey data that underlie Table 3. This information shows that the incentives for renewable resources are not as well defined in the minds of regulators as are the incentives for demand-side resources. Several states report monetarily based inducements for renewable resources that do not meet the usual specifications of an incentive. The survey responses of the Massachusetts and Oregon public utility commissions are taken as examples of this phenomenon. Massachusetts views the externality adder as an incentive for the deployment of renewable resources. The monetized externality adder makes renewable resources score well in the integrated resource plan relative to nonrenewable resources. Oregon views its practice of allowing renewable resources in the IRP resource stack, even if they are not the least-cost option, as an incentive for renewable resources.

Table 4 compares commissions with monetary incentives for renewable resources to commissions who, for whatever reason, have preferential treatments for renewable resources. Recall that a monetary incentive for renewable resources is a *direct and measurable* monetary reward or penalty that is associated with the promotion and deployment of renewable resources.[42] Meanwhile, preferential treatments for renewable resources are defined as *mixtures* of regulatory behaviors that are favorable toward renewable resources. A sampling of these behaviors are (1) the commission requires the utilities to consider renewable resources during the IRP process, (2) the commission monetizes environmental externalities, and (3) the commission makes a qualitative assessment of the net benefits of deploying renewable resources in terms of the avoidance of environmental externalities, an increase in fuel diversity, and a decrease in fuel-cost uncertainty.[43]

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[42] Examples are (1) Montana's rate-of-return incentive, (2) Iowa's net social benefit incentive, and (3) Wisconsin's per-kWh incentive.

[43] The commissions with some or all of these types of behaviors are Arizona, California, Colorado, Illinois, Iowa, Maine, Massachusetts, Minnesota, New Hampshire, New York, Oregon, Vermont, Washington, and Wisconsin.

TABLE 4

PREFERENCES FOR RENEWABLE RESOURCES

Number of States with Preferential Treatment for Renewable Resources	Number of States with Monetary Incentives for Renewable Resources	Number of States with Monetary Incentives and Preferential Treatments for Renewable Resources
14	5	3

Source: Author's construct.

When commissions adopt preferential treatments for renewable resources, say, because of a legislative mandate, the stage is set for the adoption of a monetary incentive to induce the deployment of renewable resources. Of course, preferential treatments, if they exist within a particular commission, do not guarantee that the commission will adopt a monetary incentive for renewable resources. Some institutional barrier, such as legislation preventing monetary incentives, may prevent a commission with preferential treatments for renewable resources from adopting incentives to induce the deployment of renewable resources.

Table 4 shows that commissions with preferential treatments for renewable resources do not always adopt incentives for renewable resources. Although fourteen commissions have reported preferential treatment for renewable resources, only three commissions--Iowa, Vermont, and Wisconsin--actually have monetary incentives for renewable resources. Conversely, it also is possible that a commission without any preferential treatments for renewable resources can have a monetary incentive for renewable resources. Recall that an external force, such as a legislative mandate or an existing regulatory policy, may require an incentive for renewable resources. The latter is the case for Mississippi.

Table 5 describes six types of preferential treatment that commissions have afforded to renewable resources. These treatments start with subjective adjustments to cost-benefit tests meant to preserve the environment and end with *set-asides* for a specific amount of deployed

TABLE 5

PREFERENTIAL TREATMENTS FOR RENEWABLE RESOURCES

Number of States with Subjective Adjustment	Number of States with Set-Asides	Number of States with Objective Adjustment	Number of States with Risk Adjustment	Number of States with Price Advantage	Number of States with Other Reasons
11	5	3	1	1	1

Source: Author's construct.

renewable resources.[44] The table reveals that the most common treatment is a subjective adjustment that favors renewables over other supply-side resources. Eleven states--California, Colorado, Connecticut, Delaware, Illinois, Maine, New Hampshire, Oregon, Vermont, Washington, and Wisconsin--fall into this category.

The next most popular treatment is the set-aside, which is a legislatively mandated or commission-initiated requirement to reserve a portion of the utility's electricity load for renewable resources. Five states--Arizona, Iowa, Michigan, Minnesota, and Oregon--use this approach for promoting the deployment of renewable resources. However, the survey data behind this entry in the table indicate that a set-aside is either mandated by legislation or is in place because acceptable methods for estimating the social benefits of renewable resources have not been devised.

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[44] A subjective adjustment to a cost-benefit test provides favorable weights to renewable resources over nonrenewable resources. This type of adjustment often is used to push a renewable resource over the top in terms of its inclusion in the "resource stack" of an IRP process.

Third place is occupied by quantitatively based adjustments to cost-benefit tests that serve to favor renewables over other supply-side resources.[45] The most common type of adjustment in this category is the externality adder. Three states--California, Massachusetts, and Vermont--use this approach to promote the deployment of renewable resources.

Each of the next three preferential treatments for renewable resources is used by one commission. The Colorado Commission uses a *risk adjustment* to encourage its utilities to deploy renewable resources. The usual procedure is to *reduce* the cost of a renewable in relation to other supply-side resources by presuming that the deployment of a renewable resource reduces the utility's financial risk. The sources of the reduced risk are an increase in the diversity of the utility's fuel portfolio and an alleviation of the uncertainty that is attributable to varying costs of nonrenewable resources. The Washington Commission provides a *price advantage* to renewable resources. This preferential treatment occurs during the resource selection phase of an IRP process. Its effect is to cause more renewable resources to be included in the resource mix forwarded to the competitive-bid stage of the Washington Commission's IRP process. The basic structure of this price advantage works as follows. The price (or alternatively the cost) of a renewable resource to the utility is allowed to be some percentage, say 10 percent, above the lowest-cost nonrenewable resource that is included in the forwarded resource mix. However, this price advantage can disappear during the competitive-bidding phase of an IRP process. Finally, the Vermont Commission prefers renewables over other supply-side resources because the deployment of a renewable resource lowers the state's dependency on foreign-produced oil.

Table 6 lists the three cost-benefit tests used by commissions to evaluate renewable resources. These tests are commonplace in regulated industries. The most often used test is the Utility Impact Test (UIT), which simply compares the discounted private costs of

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[45] Any quantitatively based adjustment is essentially the monetization of a cost to society that is realized by incurring a negative externality, or alternatively, a benefit to society that is realized by avoiding a negative externality. It seems best to estimate the value of this type of adjustment to a cost-benefit test by calculating the costs of complying with the rules of the United States Environmental Protection Agency. This approach has been adopted by the Wyoming Commission.

TABLE 6

COST-BENEFIT TESTS FOR RENEWABLE RESOURCES

Type of Cost-Benefit Test	Number of States Mandating the Test	Number of States Treating Test as Optional
Utility Impact Test	20	1
Ratepayer Impact Test	1	4
Total Resource Test	9	2

Source: Author's construct.

two competing supply-side resources. The UIT is concerned about the internalized costs of environmental standards that are established by existing federal and state legislation. This test is mandatory at the Alabama, Connecticut, Delaware, Georgia, Idaho, Illinois, Indiana, Maine, Maryland, Michigan, New Hampshire, New Mexico, Ohio, Rhode Island, South Carolina, Texas, Utah, Washington, West Virginia, and Wisconsin Commissions. It is optional at the Virginia Commission.

The total resource test (TRT) is the next most popular test. The test is essentially a comparison of the discounted sum of private and social costs for two competing supply-side resources. It is a mandatory test at the Arizona, Arkansas, California, Massachusetts, Minnesota, New York, Oregon, Vermont, and Wisconsin Commissions. This test is optional at the Illinois and Virginia Commissions.

The ratepayer impact test (RIT) identifies the winning and losing classes of ratepayers. It is mandated by the Wyoming Commission. However, this test is optional at the Delaware, Maryland, Virginia, and Wisconsin Commissions.

Tables 1 through 6 provide a sense of commission activities, but they do not provide any notion of how these states are grouped geographically. The geography of a renewable is

important because this type of supply-side resource cannot be transported cost-effectively to the site of a central station generating unit. Instead, the generation facility must be brought to the site of the renewable resource. Examples of this phenomenon are windmill farms and hydroelectric plants. Windmill farms are erected where the wind blows on a sustained basis and at acceptable speeds. Hydroelectric plants are located where the water is.

Table 7 contains a regional grouping of commissions based on the predominant geographic characteristic of the state in which the particular commission is located. This configuration of commissions was selected because the availability and accessibility of a renewable resource are heavily influenced by geographic and climatic variations. The six regions shown in Table 7 are eastern coastal, low mountainous, low plains, high mountainous, desert, and western coastal.

Table 8 shows the results of an assessment of regional efforts to promote and deploy renewable resources. This necessarily subjective assessment is based on the state-by-state descriptions of the regulatory efforts to promote and the utilities' efforts to deploy renewable resources. These descriptions are displayed in Appendix A.

The entries in Table 8 suggest that the level of effort to promote utility deployment of renewable resources is relatively uniform across the United States. On the one hand, four of the six regions appear to expend an average level of effort to promote and deploy renewable resources. On the other hand, the two remaining regions seem to expend either very little or a great deal of effort in this area.

However, a utility is not the only entity that can deploy a renewable resource. Furthermore, a commission is not restricted to promoting utility deployment of renewables. A commission can promote the deployment of renewable resources by *end users*, such as residential and commercial ratepayers. For example, a commission could offer incentives to ratepayers to promote the use of solar technologies. Several solar technologies are applicable for off-grid applications, such as providing electrical power to remote locations not easily reached from existing transmission lines. This particular application is cost-effective for everyone involved when the cost of installing and operating the solar technology is less than the cost of building transmission and distribution lines to the remote

TABLE 7

REGIONAL GROUPING OF STATES BY PREDOMINANT GEOGRAPHIC CHARACTERISTIC

Title of Regional Grouping	States Within Regional Grouping
Eastern Coastal Region	Connecticut, Delaware, Florida, Georgia, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, North Carolina, Rhode Island, South Carolina, Vermont, and Virginia.
Low Mountainous Region	Alabama, Arkansas, Kentucky, Louisiana, Mississippi, New York, Pennsylvania, Tennessee, West Virginia
Low Plains Region	Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, Oklahoma, South Dakota, and Wisconsin
High Mountainous Region	Colorado, Idaho, Montana, New Mexico, Utah, and Wyoming
Desert Region	Arizona, Nevada, and Texas
Western Coastal Region	California, Oregon, and Washington

Source: Author's construct.

TABLE 8

REGIONAL EFFORTS TO PROMOTE AND DEPLOY RENEWABLE RESOURCES

Region	Level of Effort
Eastern Coastal	Medium
Low Mountainous	Low
Low Plains	Medium
High Mountainous	Medium
Desert	Medium
Western Coastal	High

Source: Author's construct.

location. Another end-user application is the use of solar technology to heat a home or a place of business. The selected technology can be either active or passive, but the end result is that the utility is no longer the *primary* source of electricity for the purpose of space heating. These and other potential applications of solar technology at the end-user level raise the question: Do commissions systematically promote the deployment of solar technologies by end users? To answer this question, we surveyed commission staff members who are knowledgeable about the renewable resource policy at their particular commissions.[46] Table 9 displays the results of this survey.

[46] The survey questions are continued in Appendix E.

TABLE 9

PROMOTION OF SOLAR TECHNOLOGIES AT THE END-USER LEVEL

Number of States with Rules or Laws Encouraging Solar Devices at the End-User Level	Number of States Reviewing IRP Documents that Encourage Solar Devices at the End-User Level	Number of States Mandating the State Commission to Promote Solar Devices at the End-User Level	Number of States Using Incentives to Promote Solar Devices at the End-User Level
6	9	0	1

Source: Author's construct.

Six commissions are subject to laws or have adopted rules that encourage the use of solar technologies at the end-user's location. They are the Arizona, Massachusetts, New Hampshire, North Carolina, Oregon, and Texas Commissions. It is interesting that three of these commissions are located in the northern or central portions of the eastern coastal region. These are areas where solar technologies would be used primarily for space-heating purposes. Two of the remaining three commissions are located in the desert region, which is an area that tends to be very hot during the day but cools down rapidly during the night. Meanwhile, the remaining commission is in the northern portion of the western coastal region, which tends to be relatively cloudy during the heating season. Therefore, it may be that the expected use of solar technologies in these states is to bring power to remote locations with specialized needs.

The survey data also indicated that nine commissions reviewed integrated resource plans that mention the option of deploying solar technologies at end-user locations. They are the California, Indiana, Massachusetts, Nevada, New York, North Carolina, Vermont, Wisconsin, and Wyoming Commissions. It is interesting that only the Massachusetts and the North Carolina Commissions are members of both sets. It also is interesting that only the

Arizona Commission--of all the commissions subject to laws or rules encouraging the use of solar technologies at the end-user level--reported that it has adopted an incentive to promote the deployment of solar technology at an end-user location. Therefore, it appears that laws or rules pertaining to the voluntary deployment of solar technology at the end-user location are relatively ineffective. This observation suggests that the deployment of a solar technology by an end user is a voluntary decision based on the end user's assessment of market conditions.

2.5 Concluding Remarks

This chapter contained a summary and analysis of the survey data that was collected by the NRRI interviewer on two separate occasions. More detailed survey results can be found in Appendices A through D that are attached to this report. The actual survey instruments are reproduced in Appendix E. Finally, detailed data describing the deployment of renewable resources at the state level are found in Appendix F.

There are results in this chapter worth repeating. Nine commissions use the TRT to make decisions on the deployment of renewable resources. This test opens the door for subjective evaluations of the costs and benefits of avoiding negative externalities. It appears that several commissions have walked through this door. Eleven commissions make nonquantifiable adjustments to the UIT that favor renewables over other supply-side resources. This regulatory practice is consistent with another of the results, which is that fourteen commissions have a stated preference for renewable resources.

CHAPTER 3

POLICY ANALYSIS OF SURVEY DATA

3.1 Introduction

The survey data presented in Chapter 2 indicate that fourteen commissions appear to apply preferential treatments to deploy renewable resources if it is at all possible to do so. Recall from the discussion of Table 4 that these commissions may require their utilities to (1) consider renewable resources during the IRP process, (2) monetize environmental externalities, or (3) make qualitative assessments of the net benefits to society caused by an increase in the diversity of a utility's fuel portfolio. Each of these practices enhances the cost-effectiveness of renewables in relation to other supply-side resources.

It also was established in the preceding chapter that other approaches are used to induce the utility to deploy renewable resources. As shown in Table 5, five commissions use set-asides to guarantee the deployment of some predetermined amount of renewable resources. Usually, these set-asides are mandated by the state legislation that promotes the deployment of this type of resource. It also was shown in this table that one commission uses a risk adjustment to promote renewable resources and another commission uses a pricing mechanism for the same purpose. Finally, this table revealed that one commission promotes the deployment of renewable resources in order to lessen the state's dependence on foreign-produced oil.

These six regulatory or legislative initiatives represent an array of preferential treatments for renewable resources. The purpose of this chapter is to look deeply into these preferential treatments. Our intent is to discover how these commission activities affect the promotion, deployment, and evaluation of renewable resources. The various justifications for the preferential treatment of renewable resources are considered in the next section.

3.2 Justifications for the Deployment of Renewable Resources

Many reasons are used to justify the preferential treatments for renewable resources by commissions. The most-common justification is that environmental benefits are achieved by deploying renewable resources. The nature of these benefits has been widely discussed in the trade journals and will not be repeated here.

The next-most-common justification is the financial benefits that *may* accrue to the utility after it deploys renewable resources. The essence of this justification is well known to most analysts, but it is repeated here because of its technical nature. The usual argument is that the *present value* of the construction and operating cost *savings* that are created by *not* deploying nonrenewable resources are *larger* than the construction and operating cost *expenditures* that are attributable to the deployment of renewable resources. Typically, the measure of cost savings includes a *value* for the *avoidance* of a negative externality. The *magnitude* of this value is established either *objectively* or *subjectively*. There may also be positive *values* in this measure of cost savings for the increase in the utility's fuel diversity and the decrease in the utility's fuel-cost uncertainty that are caused by the deployment of renewable resources.

The least-common justification is that the deployment of renewable resources reduces the utility's risk. The central theme of the reasoning underlying this justification is that the deployment of renewable resources is equivalent to a *multidimensional* reduction in the utility's risk profile. Table 10 lists four ways that the deployment of renewable resources can alter the utility's risk profile. Three ways reduce the utility's risk by "diversifying it away." Specifically, the deployment of renewable resources is thought to diversify the utility's fuel mix, the adverse environmental effects of meeting the expected electrical load, and the adverse financial effects of project failures. Each of the diversified risks is associated with the utility's costs. The diversification of the fuel mix makes it less likely that the utility's costs will be greatly affected by a rapid increase in fuel prices. The utility's cost consequences of adverse environmental effects are diversified because the adverse environmental effects that are associated with the deployment of renewables are different from

TABLE 10

RISK REDUCTIONS DUE TO THE DEPLOYMENT OF RENEWABLE RESOURCES

Risk Reduction Approach	Risk Reduction Effect
Diversified Fuel Mix	A diversified fuel mix is thought to involve less exposure to the risks of varying costs of nonrenewable fuels.
Diversified Environmental Effects	The deployment of renewable resources is thought to create different types of environmental effects compared to the environmental effects that are incurred as a result of the deployment of nonrenewable resources. Therefore, overall risk should be lowered for the utility if its environmental risk portfolio is not dominated by one adverse environmental effect.
Diversified Project Risk	The deployment of renewable resources is thought to reduce project risk because the failure of any one project can be absorbed by the success of another project.
Resource Modularity	Resource modularity is thought to the lower the utility's exposure to the risks of constructing large generation facilities. Renewable resources can be added in small increments of MWs. Therefore, forecasting risk is thought to be reduced as a result of deploying renewable resources.

Source: Author's construct.

the adverse environmental effects that are associated with the deployment on nonrenewable resources. Because the existing environmental laws do not provide much protection against the adverse environmental effects of renewable resources, the deployment of renewable resources diversifies the risk of a more restrictive interpretation of existing environmental protection laws. Finally, the deployment of renewables instead of other supply-side resources has the result of allowing renewable resource projects to fail. If project failure rates are different across renewables and other supply-side resources, then the deployment of renewable resources diversifies the risk of project failure.

The fourth way reduces the utility's risk by increasing resource modularity. Resource modularity has to do with the size of the MW additions to the utility's asset base. The idea is that smaller increments of MWs are added when renewable resources are chosen over nonrenewable resources. Consequently, the utility's exposure to the adverse cost effects of inaccurate forecasts of demand and energy usage is reduced.

Unfortunately, the standard risk assessment procedures make it difficult to quantify most, if not all, of these risk reductions. Moreover, these risk reduction techniques may be viewed as the utility taking out insurance contracts against adverse financial effects, which means that ratepayers may have to pay the utility's *insurance premiums*. If these insurance premiums do indeed materialize, then the result is that the utility's ratepayers will face an increase in the short-term price of electricity.

3.3 Promotion of Renewable Resources

Promotion is the principal reason for the six preferential treatments afforded to renewable resources. This promotional effort is not ill advised for those commissions that are legislatively induced to deploy renewables rather than the other supply-side resources. It is apparent from the preceding discussion that the justification for deploying renewable resources is that *society* will eventually benefit from this activity. Not one of the justifications implies that the *particular* utility and *its* ratepayers will necessarily benefit from the deployment of these resources. In fact, these justifications suggest that the utility's costs and the ratepayer's expenditures on electricity will increase in the short run as a result of a decision to deploy

renewable resources. In effect, the basis of each justification is that it is correct to pay now for a potential future benefit.

Given that most of the benefits to be achieved by deploying renewable resources now are to realized in the future, it is surprising that the distinguishing characteristic of the six preferential treatments for promoting renewable resources is their inflexibility. Consider risk diversification and price advantages. The ratepayer is asked to pay more for electricity in both instances. With respect to risk diversification, the mechanism that enforces this outcome often is an inflexible long-term price contract between the utility and a nonutility generator that uses renewable resources to produce electrical power. The mechanism is inflexible because the contractually set price for the purchased power is not usually tied to the market prices of oil or natural gas.[47] With respect to the price advantage, the enforcement mechanism is a two-part, competitive-bidding process that has producers who use nonrenewable resources bidding only against each other, and producers who use renewable resources only bidding against each other.[48] In this way, it is assured that the amount of renewable resources, forwarded as part of the commission's preferred resource stack, will have a strong chance of being deployed by the utility.

Next consider the form of inflexibility that characterizes set-asides, subjective adjustments to cost-benefit tests, objective adjustments to cost-benefit tests, and the elimination of a dependency on foreign-produced fuel. The measure of success or failure in each of these instances is how many units of power produced from renewable resources are cost-effectively included in the generation mix. However, cost-effectiveness is usually defined in the social context. When such a definition is used, it is easy to ensure that the entire amount of the set-aside or the renewable resource *target* will eventually find its way into the utility's asset base. Moreover, it is possible that the decisions supporting either outcome will

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[47] Oil and natural gas are the nonrenewable fuels most often displaced by renewable resources.

[48] A slightly different enforcement mechanism, also associated with IRP, is a competitive-bidding procedure that does *not* permit the producers who use nonrenewable resources to bid away the commission-imposed price advantage that was afforded to renewable resources during the resource-selection phase of an IRP process.

only be marginally related to the *private costs* of deploying renewable resources.[49] Consequently, the size of the set-aside or target becomes a *goal* that is set in concrete.

In principle, both types of inflexibility make it easier to determine whether a particular preferential treatment for renewable resources was successful. In both cases, the test of success or failure is performed in four steps. The first step is complete when the commission establishes the amount of renewable resources that it wants to deploy over and above what it expects would be deployed without any promotional efforts on the part of the commission. The estimation of the expected deployment of renewable resources without any preferential treatment marks the completion of the second step. The third step is completed after the commission estimates the amount of renewable resources that are expected to be deployed when the commission promotes the resources. The fourth step is completed by calculating the difference between these estimates. This difference represents the expected amount of deployed renewable resources that is induced by the preferential treatment.

However, the idealized world of principles is different from the practical world of reality. It is not as simple as it may first seem to estimate the expected deployment of renewable resources without preferential treatment. A utility is not subject to stable relationships that tie together the growth rates of electricity usage and ratepayers. Consequently, a utility cannot obtain the baseline estimate of renewable resource deployment without preferential treatment by simply projecting current trends into the future in the same way that estimates of worldwide population change are determined. Because a utility faces an economic environment that is fluid, with pockets of turbulence scattered here and there, the estimate of expected deployed renewable resources has to reflect the expected changes in the trends of fuel prices, expected accelerations or decelerations of the movement through the business cycle, and other complicating changes in trends. Moreover, the practical difficulties do not stop here.

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[49] A private cost is the cost that the utility incurs to produce to electricity. This cost is realized as a flow of funds from the utility to one or more of the utility's suppliers of factors of production. A common example of a private cost to the utility is the money that it pays to coal companies for coal, or oil companies for oil, or natural gas companies for natural gas.

Although it is tempting to attribute all of a utility's successes or failures with respect to hitting its renewable resource target to preferential treatments, this action represents a naive valuative approach in a fluid economic environment. It is likely that unanticipated changes in economic trends that are unrelated to preferential treatment have helped or hindered the utility's progress toward meeting its renewable resources target. These unanticipated changes have to be identified and understood, and then their influence on the deployment of renewable resources has to be factored out to obtain a more-ordered picture of how well the preferential treatment promoted the deployment of renewable sources. Unfortunately, the factoring out of complicating influences is easier said than done. Data and methodological limitations often reduce this exercise to a poorly informed guess.

3.4 Deployment of Renewable Resources

The manner in which a commission assists in the deployment of renewable resources is a decision variable. The commission can make a conservative selection with respect to the cost-benefit test that it intends to use to evaluate renewable resources. For instance, the commission may choose a UIT (utility impact test) with a *specific* monetization of environmental externalities. In that case, the commission might require the utility to treat the cost of complying with *existing* environmental laws as the measure of the cost of avoiding the adverse environmental externalities that are incurred when nonrenewable resources are deployed to meet the utility's generation needs. Alternatively, the commission can accelerate the deployment of renewable resources. In this instance, the commission seeks out ways to get renewable resources into the utility's asset base. One of these ways could be the selection of a cost-benefit test that relies on a *nonspecific* monetization of environmental externalities and other factors that influence the value of a renewable resource to society. These competing approaches are neither correct nor incorrect. However, the very fact that they exist establishes that the commission has some latitude in choosing how it will participate in the deployment of renewable resources.

Notwithstanding the type of participation that is chosen by the commission, it is easy to use the survey data to show that a commission's decision to assist in the deployment of

renewable resources almost always occurs in the context of the IRP process. First, recall from Table 4 that fourteen commissions seem to be leveling the playing field for renewable resources when they are compared to supply-side resources.[50] They are the Arizona, California, Colorado, Iowa, Maine, Massachusetts, Minnesota, New Hampshire, New York, Oregon, Vermont, Washington, and Wisconsin Commissions. Second, recall from Table 3 that five commissions adopted or intend to adopt incentives that reward their utilities for deploying renewable resources.[51] They are the Iowa, Mississippi, Montana, Vermont, and Wisconsin Commissions. The intersection of these two sets of commissions reveals that the Iowa, Vermont, and Wisconsin Commissions have preferential treatments for renewable resources and an incentive to reward their utilities for deploying this type of resource. From the data contained in Appendix A, it can be deduced that thirty-seven commissions have IRP processes in place. These same data also establish that every commission with preferential treatments for renewable resources also has an IRP process that repeats itself on a regular cycle. Consequently, the Iowa, Vermont, and Wisconsin Commissions have preferential treatments for renewable resources, incentives to reward their utilities for the deployment of renewable resources, and an IRP process on a multiyear cycle to evaluate renewable resources. Meanwhile, the other eleven states with a preferential treatments for renewable resources also have a cyclic IRP process to assist them in making decisions to deploy renewable resources. These relationships are summarized in Table 11.

It appears to be very difficult for regulators to assert they are seriously considering renewable resources without some form of a cyclical IRP in place. This, of course, is not to say that a fair consideration of renewable resources cannot occur without a repeated IRP process. There is absolutely no support for such a conclusion. The point is that a commission that is supportive of renewable resources always has a cyclic IRP process in place.

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[50] A commission may be thought of as revealing a preference for renewable resources through a mixture of specific and well-defined regulatory behaviors that promote renewable resources.

[51] Remember that an incentive for a renewable resource is a specific and well-identified commission action that provides monetary compensation to the utility for the deployment of renewable resources.

TABLE 11

EVALUATION CHARACTERISTICS FOR RENEWABLE RESOURCES

Number of States with Integrated Resource Planning	Number of States with with Preferences for Renewable Resources	Number of States with Incentives
37	14	5

Source: Author's construct.

It needs to be noted that nothing in the structure of an IRP process requires the commission to use a cost-benefit test that favors renewable resources. In fact, there is not even a requirement that the cost-benefit test in use during the IRP process has to monetize the value of an externality adder, or the value of fuel diversity, or the value of lessening a state's economic dependence on foreign sources of fuel.[52] In principle, there is nothing wrong with an IRP process that uses the *standard* UIT as the cost-benefit test. What would be wrong is an IRP process that is not based on *consistent* decisionmaking. Every decision has to be based on the same cost-benefit technique.[53]

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[52] The general feeling extracted from the survey data is that renewable resources tend to receive most of their support from commissions at the qualitative (subjective) level.

[53] It is impossible to overestimate how important it is for a commission to select a cost-benefit test that reflects its public policy objectives. The UIT (utility impact test) is appropriate when the commission worries primarily about the short- and long-term effects on the actual prices that ratepayers pay for electricity. The RIT (ratepayer impact test) is best suited for those situations where the commission is most concerned about the shifting of the responsibility for the recovery of the utility costs. Finally, the TRT (total resource test) is best when the commission wants to alter the utility's risk profile or protect the environment.

3.5 Four Evaluation Frameworks for Renewable Resources

Although it is essential that the commission use the same cost-benefit test throughout the IRP process, there are other important actions that the commission must take as it evaluates renewable resources. It has to decide whether it wants the utility's finances to determine how fast renewable resources are deployed. It may want to accelerate or decelerate the current rate at which renewable resources are deployed. Or, it may prefer to adopt general policies that advance or retard the deployment of renewable resources. Finally, the commission may simply want to monitor the developments pertaining to the deployment of renewable resources.

Whatever decisions are made and whatever actions are taken, they will feed back into and perhaps alter the framework that the commission currently uses to evaluate renewable resources. Usually, a commission chooses from among four general frameworks when it evaluates renewable resources. The general evaluation frameworks are: (1) traditional, (2) incentive, (3) general policies, and (4) monitoring.

If the commission allows the utility's finances to dictate the deployment of renewable resources, then it is apt to adopt a *traditional framework* for evaluating supply-side investment options. If the commission is intent on accelerating the deployment of renewable resources, then an *incentives framework* seems best suited for this purpose. If the commission wishes to focus on institutional arrangements that affect the deployment of renewable resources, then a *general policies framework* seems to be the best choice. If the commission wants to track the progress that is being made in the deployment of renewable resources, then the *monitoring framework* is the first choice.

3.5.1 Traditional Framework

The *traditional framework* uses the utility's avoided costs to evaluate the accessibility of renewable resources. Generally, the actual evaluation is a comparison of the effects on

revenue requirements of different mixes of renewable and nonrenewable resources. The distinguishing characteristic of this framework is that it does not recognize any economic or environmental effects that are *not* internalized by the utility. Essentially then, an evaluation within the traditional framework is done in terms of the ability of the renewable resource to minimize the utility's *private* costs and the *actual* electricity rates that ratepayers must pay.

3.5.2 Incentives Framework

The *incentives framework* is a straightforward extension of the traditional framework. The organizing principle is that an additional financial push is required *from* the commission in order to accelerate the deployment of renewable resources. Perhaps this push is needed because there are regulatory or other barriers that hinder the utility's ability to deploy renewable resources. Maybe the UIT indicates that the deployment of a renewable resource is not cost-beneficial because the private cost of a deployed renewable resources is higher than the private cost of a deployed nonrenewable resource. Or, the incentive framework may be needed in order to reap the long-term net benefits of a deployed renewable resource sooner than is otherwise expected.

3.5.3 General Policies Framework

The *general policies framework* is separate and distinct from the traditional framework and the latter framework's variants. The general policies framework may be thought of as a broad-brush solution to a public policy problem. Imagine that the commission wants to accelerate the deployment of renewable resources. The application of the general policies framework would result in many solutions to this problem. One potential solution is to include the value of the net benefits of increasing fuel diversity in the cost-benefit analysis. A flexible procurement mechanism is another solution to this problem. If adopted, a procurement mechanism of this type would allow the utility to consider and value nonprice factors, such as the alleviation of fuel-cost uncertainty. A third possible solution under the

general policies framework is the adoption of a *green pricing* policy. Green pricing uses price subsidies to encourage the deployment of renewable resources. A fourth solution to the problem of accelerating the deployment of renewable resources is the use of front-end-loaded purchased power contracts. These contracts make it easier and less risky for a nonutility generator to achieve the early recovery of its fixed cost of producing electricity from renewable resources. The adoption of a *safe harbor* policy for renewable resources is still another potential solution to the problem. A safe harbor generally guarantees the return of investment expenditures to the utility. Finally, there is the *set-aside* for renewable resources. This policy was discussed earlier in this report.

3.5.4 Monitoring Framework

Periodic reports to the commission describe the *monitoring framework.* These reports may contain measures of the amount of deployed renewable resources and the utility's research and development, and commercialization efforts. These reports also may include information updates on the technical performance and private and social costs of renewable resources. Additionally, they may incorporate discussions of the cost-effective advances in the deployment of renewable resources that look promising to the utility. Finally, these reports may be designed to build a data base that allows the commission to independently assess the potential of renewable resources to meet the state's energy needs.[54]

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[54] The survey data indicate that a commission does not usually participate in any manner in the estimation of renewable resource potential within the state. The most often stated reason is that this responsibility was given to some other state agency, such as an energy office. However, there may be another reason why a commission does not produce its own estimates of renewable resource potential. The reliable estimation of this statistic requires expertise and analytical tools that are not usually present at a commission. Whatever the reason, the standard procedure is for the commission to review and critique someone else's estimates. This procedure unnecessarily reduces the role that the commission could play in the estimation of the potential for renewable resources to meet the state's energy needs.

3.6 Seven Parameters for the Evaluation of Renewable Resources

After the commission has chosen its evaluation framework, it has to set the parameters that define the boundaries of the framework. There are seven *parameters* that may serve to guide regulators as they assist in the deployment of renewable resources.

3.6.1 Minimum Size for a Renewable Resource Project

The first parameter is that a deployed renewable resource should generate at least 2 MWs to 3 MWs of power. Intuitively, it does not appear to make sense economically for the utility to connect kilowatts of renewable resource power to its system. The expectation is that the plant construction and transmission costs would outweigh any fuel cost savings and environmental benefits that can be attributed to the deployment of the renewable resource. This parameter suggests that the commission may want to encourage small renewable resource projects only in the context of the utility's research and development efforts.

3.6.2 Private Costs and the Deployment of Renewable Resources

The second parameter is that the private cost that the utility incurs to deploy a renewable resource does not have to be less than or equal to the private cost that it incurs to deploy a nonrenewable resource. Absent this parameter, it is always true that a private cost of 3 cents per kWh is preferred to a private cost of 5 cents per kWh. However, this preference ignores the value that accrues to society through the deployment of renewable resources. In order to capture this value, a commission may have to accept the deployment of a renewable resource with a higher private cost per kWh, compared to the private cost per kWh of a nonrenewable resource. Of course, this parameter does not have to be binding. A commission can choose to ignore societal benefits when it estimates the cost-effectiveness of a renewable resource.

3.6.3 Willingness and Ability to Pay for Renewable Resources

The third parameter is closely related to the second parameter. When there is an increase in the utility's private costs because a renewable resource instead of a nonrenewable resource was deployed, the ratepayers are asked to pay for these additional costs. The ratepayers have to be *willing and able* to pay these additional costs. If they are neither willing nor able to do this, then a commission's decision to support the deployment of the renewable resource may be termed deficient.

Therefore, the third parameter requires that ratepayers have to be willing to pay the additional private cost of a renewable resource as compared to the private cost of a nonrenewable resource.

3.6.4 Consistent Regulator Behavior

The fourth parameter requires that the commission act consistently with regard to the availability of renewable resources within its state. Specifically, a renewable resource has to be available within the state. It does not make much sense for a commission to examine the "pros and cons" of a renewable resource when the state does not have the proper deployment characteristics. For example, wind farms should be immediately eliminated from consideration when the state does not have sustained winds at the necessary speeds. Similarly, solar power should not be considered for space-heating purposes when there is too much cloud cover during the heating season.

3.6.5 Maturity of the Renewable Resource Technology

The fifth parameter is that technological maturity has to be considered before the commission conducts a cost-benefit analysis.[55] This parameter helps to determine the

[55] The technological maturity of a renewable resource is comprised of two factors: (1) how much power and energy can be produced by using the technology and (2) how available and reliable are the technologies.

amount of money that the utility will spend on the development of renewable resources and the amount of money that it will spend on the deployment of renewable resources. Suppose that a particular renewable resource technology is found to be immature but promising. A commission may want to encourage the utility to spend some money on the research, development, and commercialization of this technology. Next, suppose that the commission finds another technology to be mature. Then the commission may want to deploy it, if the technology passes the cost-benefit test.

3.6.6 Staged Procedure for Cost-Benefit Tests

The sixth parameter is that the commission should use a *staged* cost-benefit test for evaluating renewable resources. The first stage is a cost-effectiveness analysis designed to consider only the actual dollars that will be spent by the utility to deploy the renewable resource and thereby avoid environmental pollution at least equal to that avoided by the competing supply-side resource.[56] If the renewable resource is found to be cost-competitive with alternative supply-side resources, then no further analysis is required of the commission to justify the deployment of the renewable resource. If, however, the renewable resource is not found to be cost-competitive at the end of the first stage of the analysis, then the commission has to examine multiple public policy questions, in addition to the avoidance of pollution, in an effort to determine whether the deployment of this renewable resource is the best option available to the commission. These questions may include: (1) how the deployment of a renewable resource affects the economic development of the state; (2) how the deployment of a renewable resource affects the retention and creation of jobs within the state; (3) how the state's tourist industry is affected by the deployment of a renewable resource; (4) how the state's tax revenues are affected by the deployment of a renewable resource; (5) how the regional and global environments are affected by the deployment of a renewable resource; and (6) how the portfolio of fuels used to produce the state's power and energy is altered by the deployment of a renewable resource. These questions are not easy to

[56] Of course, these actual dollars could be the cost of the utility's purchase of electricity from third-party providers who use renewable resources to generate this electricity.

answer; however, a commission should have good reasons for allowing the utility to incur the higher private cost of deploying a renewable resource.

If the regulators find that the promotion of the renewable resource represents the optimal public policy under the circumstances, then the third stage of the cost-benefit test consists of an analysis of the private costs that have to be incurred to realize the expanded environmental and other benefits that are associated with the deployment of the renewable resource. If this analysis yields that the actual private costs to the utility of deploying the renewable resource are higher than the private costs of the alternative supply-side resources, *but not that much higher*, then the commission may want to approve its deployment. Recall that during the second stage the commission already established that the deployment of this renewable resource is the best public policy option under the circumstances.

3.6.7 Maximum Amount of Private Costs

The seventh parameter is that the private cost to the utility of a renewable resource cannot be *too high* when compared to the private costs of the alternative supply-side resources. Because this is the loosest of the seven parameters, it can cause a great deal of confusion when it becomes a *binding parameter*. To get a flavor of what happens when this parameter is binding, suppose that a renewable resource is selected over the alternative supply-side resources because the renewable resource is environmentally more benign. Now, suppose that the utility spends more money on a daily, monthly, or annual basis in order to achieve this societal benefit; that is, the deployment of the renewable resource has resulted in an increase in the utility's private costs. Meanwhile, the value of the societal benefit must be measured in terms of the money that is not spent by the utility because it has deployed a renewable resource rather than an alternative supply-side resource.

The money not spent falls into two categories. The first category is the costs the utility does not incur because the utility has not built and does not operate the alternative supply-side resource. This *cost savings* is measured in terms of money that is *not* transferred from the utility's bank account to, say, the bank account of the firm that would have supplied the materials for building the alternative supply-side resource. The second category is the costs that society does not incur because the utility has deployed the renewable resource. This

cost savings is *not* measured in terms of money that the utility pays to one of its suppliers. Instead, this cost savings is measured in terms of the *monetized value* of the societal benefit that is achieved by not polluting the air. This monetized value is essentially a bundle of *phantom dollars*. A phantom dollar is a unit of money that never changes hands, and never increases or decreases the bank accounts of any individual person or firm. When the private cost of a renewable resource is high in relation to the private cost of the alternative supply-side resource and the renewable resource is still deployed, the ratepayers are asked to pay for a cost savings that is measured in phantom dollars with actual dollars that could be used to purchase other goods and services. That is, ratepayers are asked to forego consumption opportunities in order to achieve a societal benefit. The seventh parameter implies that the ratepayers should not be asked to forego many consumption opportunities.

3.7 Concluding Remarks

The policy analysis of the survey data indicates that some commissions do monetize the value of the societal benefits that are usually associated with the deployment of a renewable resource. Consequently, there is room for all of the four evaluation frameworks that are discussed in this chapter. Those commissions that place a monetized value on a renewable resource may adopt the incentives or general policies framework. The remaining commissions may adopt either the traditional or monitoring framework.

When the incentives or general policies frameworks are adopted, it seems reasonable to restrict the commission to deploy only those renewable resources whose private costs are not too high. Obviously, this restriction is not a hard-and-fast guideline. The concept of "too high" is open to conflicting interpretations. Still, the quantification of too high is necessary because the monetization of the societal benefits of deploying a renewable resource is equally soft.

The survey data also indicate that commissions spend more time assessing the accessibility of a particular renewable resource than assessing the availability of renewable resources within the state. A large majority of the surveyed commissions reported that they rely on external estimates of their states' potentials to use renewable resources to meet their states' energy needs. Most of the other commissions have an advisory role in this area.

CHAPTER 4

EVALUATION METHODS FOR RENEWABLE RESOURCES

4.1 Introduction

The selection of an evaluation method for renewable resources depends on the choice of the framework for assessing their accessibility and availability. It was suggested in the concluding remarks of the immediately preceding chapter that the incentives and general policies frameworks require evaluation methods that include cost-benefit tests that monetize societal benefits, and the traditional and monitoring frameworks do not require cost-benefit tests with this characteristic.

It is now time to examine possible evaluation methods more deeply. The general observations thus far suggest two generic evaluation methods for renewable resources. Method **A** is most appropriate for those commissions that do not explicitly promote renewable resources. Method **B** is most suitable for commissions that do explicitly promote the deployment of renewable resources.

4.2 Discussion of Evaluation Method A

A commission that does not explicitly promote the deployment of renewable resources may be most comfortable with an evaluation method that does not dichotomize the competitive-bidding phase of the IRP process, does not monetize societal benefits, and does not make qualitative adjustments to the utility's private costs to account for societal benefits. Because the competitive-bidding stage of the standard two-stage IRP process is not dichotomized, those power producers using nonrenewable resources will bid against those producers that use renewable resources to produce power. Because societal benefits are not monetized in the social sense, phantom dollar values are not placed on increased fuel diversity, alleviated fuel-cost uncertainty, and reduced pollution. Because there are no qualitative adjustments to the cost-benefit test, only the utility's private costs of complying with existing environmental rules and regulations are included in the cost-benefit analysis.

Let Method A meet the preceding requirements. The first implication then is that the monetization of avoiding an environmental externality is carried out in the private sense. That is, the value of avoiding an environmental externality is the private cost to the utility of complying with existing environmental rules and regulation. The second implication is that the utility is not asked to incur any additional costs to achieve cleaner air, more fuel diversity, or less fuel-cost uncertainty. The third implication is that the utility's ratepayers are not asked to pay any insurance premiums to ensure clean air and fuel diversity.

4.2.1 All-Source Competitive Bidding

If competitive-bidding is not dichotomized, then it must be all source. All-source competitive bidding places renewable and nonrenewable resources on the same financial plane. That is, a nonrenewable resource with lower private costs is always preferred over a renewable resource with higher private costs, and vice versa.

It is extremely important that the commission be aware that all-source bidding makes it very difficult for renewable resources to win the competitive-bidding process. Table 12 summarizes previously compiled data that indicate how well the bids based on renewable resources do in an all-source competitive bidding process. The data show that many more competitive bids, involving renewable resources, are made than are won. During the period 1984 through 1992, the most competitive bids involving renewable resources were made in California. Energy suppliers bid for 8099.7 MWs; however, they won only 12.8 percent of these bids. This 8:1 loss-win ratio is significant in terms of public policy because the California Commission is subject to a legislatively mandated set-aside for renewable resources until such time as the California Commission is able to monetize the value to society of more fuel diversity and less fuel-cost uncertainty.

The more detailed data, supporting Table 12, do not indicate any national trend in the type of the renewable resource that is competitively bid. Only six of the states listed in Table 12 exhibit similarities with respect to the types of competitive bids that were made involving renewable resources. Georgia had two competitive bids for 97 MWs of hydroelectric power. Montana had six competitive bids for 144.9 MWs of hydroelectric

TABLE 12

COMPETITIVE BIDS OF RENEWABLE RESOURCES FROM 1984 THROUGH 1992

Rank	State	Bids Made in MWs	Bids Won in MWs
1	California	8,099.7	207.0
2	Maine	5,351.0	507.9
3	Nevada	2,832.6	95.4
4	Massachusetts	1,434.5	205.0
5	Washington	922.8	193.3
6	Virginia	906.8	136.8
7	New York	705.4	17.7
8	Montana	595.5	0.0
9	Vermont	389.1	0.9
10	New Jersey	271.8	146.3
11	Delaware	242.0	33.0
12	Connecticut	186.6	194.0
13	Georgia	97.0	0.0
14	New Hampshire	89.8	0.0
15	Florida	79.8	79.0
16	Texas	77.0	0.0
17	Oregon	27.9	27.8
18	Alabama	5.0	0.0

Source: Adapted from *Investing in the Future: A Regulator's Guide to Renewables* (Washington, D.C.: NARUC, 1993), Appendix C, C-11 through C-18.

power.[57] New Hampshire had one competitive bid for 2 MWs of hydroelectric power, and it had three competitive bids for 52.8 MWs of municipal solid waste.[58] Texas had two competitive bids for 51 MWs of hydroelectric power, and it had one competitive bid for 1 MW of municipal solid waste. Additionally, Texas had one competitive bid for 25 MWs of landfill gas. None of these bids were won in these states. However, competitive bids involving hydroelectric resources, municipal solid waste, and landfill gas did well in other states. A competitive bid of 43 MWs of municipal solid waste was won in Florida.[59] Five competitive bids for 101.9 MWs of municipal solid waste and ten competitive bids for 19.7 MWs of hydroelectric power were won in Connecticut.[60] Six competitive bids for 24.2 MWs of hydroelectric power and one competitive bid of 1.8 MWs of landfill gas were won in Oregon.[61] Therefore, the type of renewable resource does not seem to be a significant factor in the separation of competitive bids into the won and lost categories.

It seems that institutional arrangements are more important in terms of the ability of a renewable resource to win in all-source bidding. Two competitive bids involving renewable resources were made in Florida, and both of them were won. Nineteen competitive bids involving renewable resources were made in Connecticut, and all of them were won. Eight of nine competitive bids were won in Oregon. Both Connecticut and Florida have standard contracts for 5 more MWs of competitively bid power.[62] Meanwhile, standard contracts are

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[57] Montana also had three competitive bids for 43 MWs of geothermal resources, and it had ten competitive bids for 407.6 MWs of wind power.

[58] New Hampshire also had one competitive bid for 35 MWs of wood-fired power.

[59] One competitive bid for 36 MWs of agricultural waste also was won in Florida.

[60] Four competitive bids for 72.4 MWs of wood-fired power also were won in Connecticut.

[61] One of two competitive bids for 1.8 MWs of agricultural waste also was won in Oregon.

[62] Hamrin and Rader, *Investing in the Future*, 48.

not part of the regulatory environment in Georgia and New Hampshire, where none of the competitive bids were won that involved renewable resources.[63]

4.2.2 Expected Outcomes Associated with Evaluation Method A

Because of the relatively unimpressive relationship between competitive bids of renewable resources and all-source bidding without standard contracts, Method **A** requires reductions in private costs from the deployment of renewable resources. Recall that Method **A** does not monetize societal benefits and does not make qualitative adjustments to the utility's private costs to account for societal benefits. Consequently, a renewable resources cannot do well in an all-source competitive bidding process by appealing to the societal benefits that are associated with the deployment of these resources.

Method **A** may be thought of as favoring nonrenewable resources, especially those that create social costs. However, this interpretation is not totally appropriate. Method **A** does account for social costs in the sense that every group of deployed nonrenewable resources must conform to the existing environmental rules and regulations, and these rules and regulations imply a socially acceptable level of pollution. Meeting the socially acceptable level of pollution, requires the utility to incur the costs that are necessary to prevent the excessive emission of pollutants. Therefore, Method **A** favors nonrenewable resources only to the extent that nonrenewable resources are a *less expensive* way to meet the socially acceptable level of pollution.

4.3 Discussion of Evaluation Method B

A commission that wants to do more than simply consider renewable resources in the context of a socially acceptable level of pollution can promote the deployment of renewable resources through a variety of methods. For example, a commission may adopt a *green* IRP process. This regulatory action guarantees that renewable resources will be considered during

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[63] Ibid.

the IRP process; however, it does not guarantee that renewable resources will be part of the utility's generation expansion plan. Consequently, a green IRP process represents only a mild deviation from the standard least-cost IRP process.[64] When subject to a green IRP process, the utility makes a point of investigating the cost of deploying renewable resources and the potential for renewable resources to meet its power and energy needs. As a result, the utility has to expend actual dollars to assess renewable resource technologies. This action serves to increase the utility's total costs, and this cost increase is passed through to ratepayers. Furthermore, a green IRP process weakly encourages the utility to do work in the commercialization of renewable resources. Even though this developmental activity is very useful for assessing the cost and potential of renewable resources, it also drives up the total cost of power production.

Because the promotion of renewable renewables is likely to result in short-term increases in the cost of producing power, Method **B**, being a promotional activity, represents an *ex ante* commitment to the deployment of renewable resources. Therefore, Method **B** in some senses will favor renewable resources over nonrenewable resources.

Method **B** is comprised of four regulatory practices in addition to the adoption of a green IRP process. The first of these four additional regulatory practices is the qualitative assessment of the social benefits of more fuel diversity and less fuel-cost uncertainty. In general, the qualitative assessment envisioned for Method **B** requires the commission to subjectively determine the value of *avoiding* the costs of less fuel diversity and more fuel-cost uncertainty. Neither is a straightforward analytical exercise.

The second regulatory practice is a different monetization of environmental externalities. Whereas the cost of an environmental externality per Method **A** is never greater than the cost of bringing pollution down to the socially acceptable level, the cost of an

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[64] The standard least-cost IRP process does not *per se* monetize environmental externalities. Instead, the standard approach does not permit the utility to deploy a resource mix that exceeds the socially acceptable level of pollution, which is determined independently by the federal and state environmental protection agencies. As a result, the cost of environmental protection is objectively determined as part of the cost of deploying a resource mix that emits no more than the socially acceptable level of pollutants.

environmental externality per Method **B** may be greater than the cost of limiting pollution to the socially acceptable level. This somewhat counter-intuitive result is achieved by putting a positive value on the *overcontrol* of pollutants. That is, a resource mix with a pollution level that is less than the socially acceptable level of pollution is more valuable to society than a resource mix that emits the socially acceptable level of pollution.

The third new regulatory practice is the dichotomization of the competitive-bidding phase of the green IRP process. Dichotomizing competitive bidding guarantees that the level of cost-effective renewable resources implied by the monetization of environmental externalities and the qualitative assessment of other social benefits will become part of the utility's asset base.

The fourth regulatory practice is a set-aside for renewable resources that may be activated when the preceding three regulatory practices do not result in the level of deployed renewable resources that is necessary to meet public policy objectives. Recall that a set-aside is a strong regulatory commitment toward the promotion of renewable resources. However, Table 13 shows that even a set-aside may not be enough to ensure the actual deployment of renewable resources. The data in this table indicate that California and Oregon have not been overly successful in getting their renewable resources online after they have won a competitive bid. This result has occurred despite the fact that both of these states have set-asides for renewable resources.

There are several ways that the commission can assist the utility as it strives to bring competitively bid renewable resources online more quickly. They are (1) standardizing the contracts for third-party sales of capacity and energy to the utility; (2) establishing commission-approved guidelines for the terms and conditions that apply to third-party sales of capacity, and energy to the utility; (3) paying third parties for avoided capacity as well as energy received; (4) fixing and making predictable the payment streams to third parties; (5) requiring the utility to use levelized or front-loaded payments to pay third parties; (6) eliminating dispatchability or minimum capacity factors for third-party capacity and

TABLE 13

COMPETITIVE BIDS WON AND ONLINE IN MWs VERSUS COMPETITIVE BIDS WON AND NOT ONLINE IN MWs FROM 1984 THROUGH 1992

State	Bids Won and Online as of August 1992	Bids Won and Not On-Line as of August 1992
Maine	303.3	133.1
Connecticut	114.9	72.2
Virginia	65.5	131.0
Florida	43.0	36.0
Nevada	13.0	82.4
Vermont	0.7	0.5
California	0.0	220.0
Massachusetts	0.0	124.3
New Jersey	0.0	124.3
Washington	0.0	88.8
Oregon	0.0	54.6
New York	0.0	17.7
Utah	0.0	16.0

Source: Adapted from *Investing in the Future*, Appendix C, C-11 through C-18.

energy sales to the utility; and (7) approving special rates for third parties who sell electricity to the utility that is generated from renewable resources.[65]

4.3.1 Expected Outcomes Associated with Evaluation Method B

There are several cost effects that are associated with Method **B**. The qualitative assessment of social benefits other than avoiding pollution and the monetization of environmental externalities represent actual cost increases that the utility has to incur to support cleaner air, a more diverse fuel portfolio, and lower fuel-cost uncertainty. The green IRP process requires the utility to investigate the cost and potential for renewable resources to meet its power and energy needs. At a minimum, the utility has to expend resources for the evaluation of renewable resource technologies. Moreover, a green IRP process may also be tied to a program to do more research in the area of renewable resources. Therefore, a green IRP process, which only guarantees that renewable resources will be considered in the IRP process, drives up the utility's cost of producing energy.

The dichotomized competitive bidding process reduces the competitive pressures that characterize the bids involving renewable resources without significantly affecting the competitive pressures that characterize the bids involving nonrenewable resources. Additionally, dichotomized bidding affects the utility's operations. The utility has to expend resources to connect the renewable resources to its system. These connection costs may be more than the transportation costs that are incurred to bring nonrenewable resources to the central power station. Either of these possible outcomes has the potential to increase the utility's cost.

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[65] For a discussion of these ways to bring renewable resources online more quickly, see Hamrin and Rader, *Investing in the Future*, Chapter 4.

4.4 The Issue of Underused Renewable Resources

Neither Method **A** nor Method **B** adequately addresses the issues that are associated with *underused* renewable resources.[66] That is, neither method acceptably deals with research and development, or commercialization issues as they pertain to renewable resources. The following discussion attempts to fill this void.

Confidence in Method **A** or Method **B** would be enhanced if the commission made or received reliable estimates of the costs of researching, developing, and commercializing a renewable resource. In fact, the validity of a green IRP process is vitally dependent on the availability of these estimates. Fortunately, many of these costs can be estimated within reasonable levels of accuracy. Among them, there are the costs that are incurred confirming the availability and quality of the renewable resources; testing the technology that will be used to bring the renewable resource online; designing the renewable resource project; and integrating the renewable resource into the utility's system. More difficult to estimate are the costs in time and money of initially developing the renewable resource in a geographic area. There is seldom a set of fully standardized procedures for this purpose. Table 14 categorizes the costs that are incurred to develop a renewable resource project by ease of estimation.

4.4.1 Importance of the Location of the Renewable Resource

Not surprisingly, the costs listed in Table 14 are estimated on a case-by-case basis because a renewable resource project has to permitted and sited where the renewable resource is located. In fact, location is a major factor with respect to estimating seven of the eight types of costs that are associated with the research and development, and commercialization of a renewable resource.

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[66] Underused has a technical meaning in this report. When referring to a renewable resource, underused means that not enough expenditures are being made in either research and development or commercialization of the renewable resource. Of course, "not enough" is a judgment call that is to be made by the commission.

TABLE 14

TYPES OF COSTS INCURRED IN RESEARCHING, DEVELOPING, AND COMMERCIALIZING A RENEWABLE RESOURCE

Easily Estimated Costs	Not Easily Estimated Costs
Resource Availability	Permitting Issues
Resource Quality	Siting Issues
Resource Integration	Project Development
Resource Testing	Resource Familiarity

Source: Author's construct.

The costs of developing a renewable resource project are closely tied to the location of the renewable resource. It is one thing to transport equipment and materials for constructing a power plant across the Central Plains, and it is another thing to transport the same equipment and materials up to remote mountainous areas.

The ease of estimating the cost to achieve resource familiarity is also a function of location. Although some commissions may be very familiar with a renewable resource, such as geothermal power, other commissions may have no familiarity with it, even though their states have reservoirs of this renewable resource.

Necessarily, location is an important factor to consider when estimating the cost of integrating a renewable resource into the utility's system. The classic example is the deployment of large-scale photovoltaic resources. Although photovoltaic technology is a cost-effective substitute for extending transmission and distribution lines to hard-to-reach locations, it is still unresolved whether more conveniently located and larger photovoltaic applications can be cost-effectively integrated into a utility's system.

It is almost unnecessary to discuss how location affects the estimates of the cost of ensuring the renewable resource's availability and quality. Geothermal temperatures vary from well to well. Wind speeds and wind sustainability are different within a state and across states. The frequency and density of cloud cover vary considerably across the United States. The same is true of the number of heating and cooling days.

4.4.2. Importance of the Maturity of the Renewable Resource Technology

Perhaps, the most difficult cost estimation problem that is associated with an underused renewable resource is the one that arises because of the maturity of the renewable resource technology. The cost of an immature technology is less reliably estimated than the cost of a mature technology. The immature technology simply does not have enough quantitative history for the usual statistical methods.

Table 15 describes the maturity of the technologies associated with renewable resources. Each technology falls into either the mature, emergent, or incipient category. A mature technology is fully commercialized, which means that it is available off the shelf. As a result, there is ample evidence of its cost characteristics. An emergent technology is currently in the process of being commercialized. Therefore, the primary sources of information with respect to its cost characteristics are demonstration and pilot projects. An incipient technology is still in the research and development stage. For these technologies, the sources of cost information are limited. In fact, it is still questionable whether they will ever be technically or economically viable.

When the data in Appendix F are compared to the information shown in Table 15, it is clear that virtually all of the online renewable resources are associated with mature technologies. In particular, this online capacity is mainly comprised of hydroelectric and biomass facilities. Geothermal applications are found primarily in California and Nevada.

TABLE 15

COMMERCIAL STATUS OF RENEWABLE RESOURCES

Mature Technology	Emergent Technology	Incipient Technology
Hydroelectric	Wind	Advanced Wind
Geothermal High Temperature	Geothermal Moderate Temperature	Geothermal Hot Dry Rock Magma Geopressure
Photovoltaics Small systems Remote locations	Photovoltaics Niche Applications (not grid-connected)	Photovoltaics Connected to Grid
Biomass Combustion Gasification		Solar Thermal Gas Hybrid

Source: Adapted from *The Potential of Renewable Energy: An Intralaboratory White Paper*, (Washington, D.C.: U.S. DOE, 1990), and *Investing in the Future*.

4.5 Concluding Remarks

The differences between the two evaluation methods discussed in this chapter hinge on the treatment of environmental externalities, fuel diversity, and fuel-cost uncertainty. Particular monetizations of environmental externalities and specific qualitative assessments of the value of more fuel diversity and less fuel-cost uncertainty can clearly favor renewable resources over most nonrenewable resources, or vice versa. Based on the survey results, it appears that a commission's decision with respect to which evaluation method to use for assessing the cost-effectiveness of a renewable resource is largely determined by the state's

public policy objectives in the areas of environmental protection and risk alleviation. Tables F-7 through F-9, in Appendix F, show that twelve of the fourteen states with preferential treatments for renewable resources also have reported legislative encouragements to deploy renewable resources.

CHAPTER 5

CONCLUDING OBSERVATIONS

The survey data indicate that significantly different regulatory and legislative environments are associated with the consideration versus the promotion of a renewable resource. The survey data also indicate that a common set of general background criteria exists for the promotion of a renewable resource. Quite often, a legislative mandate requires favorable treatment for a renewable resource relative to other sources of energy. The preferential treatment is sometimes as explicit as a set-aside and sometimes as implicit as giving a differentially heavier weight to the benefits of a deploying renewable resource relative to the benefits of deploying a nonrenewable resource. When a legislative mandate is not present, the promotion of a renewable resource is typically supported by environmental and risk reduction considerations. This influence is readily apparent when a commission decides to monetize environmental externalities.

Several factors affect how a commission thinks about the economic viability of a renewable resource within its state. There are the ever present concerns about resource quality and availability. Often, the proximity of the renewable resource to existing transmission lines is an important factor in regulatory decisionmaking. Less often, a commission is concerned about the proximity of the renewable resource to the load center. In this instance, a commission may not want the renewable resource facility to be too close to the load center for aesthetic reasons. Permitting and siting are problems for a commission. A commission does not control these agency functions. Even though a commission may want to deploy a renewable resource, this fact alone does not guarantee that a site can be found to build the required facilities. Then there is contracting. Contracting costs vary with the potential for future renewable resource projects, the size of the renewable resource facility, and the manufacturing capability of the renewable resource vendor.

Once a commission has decided in principle to deploy renewable resources, there are several factors that affect its selection of a particular renewable resources. The selection of a renewable resource during the IRP process is influenced by strict versus lenient financial cost-

effectiveness tests. A renewable resource is selected less frequently by a commission that is risk averse toward a loss of load and brown outs. Such a commission is worried about the fact that a greater percentage of nonutility-owned renewable resources implies a larger loss of utility control over electricity supply. However, a renewable resource is selected more frequently by a commission that is risk averse with respect to volatile changes of environmental regulations and fuel costs.

It is more difficult for a commission to select a renewable resource when the electricity prices are high and rising. In order to induce the use of a renewable resource, a commission might find it necessary to approve research and development adders, fuel diversity adders, and environmental externality adders. Each of these adders serves to increase the actual costs that the utility incurs to produce electricity. Furthermore, a commission may have to approve the payment of avoided capacity costs to third-party developers of a renewable resource. Consequently, the deployment of a renewable resource may not significantly lower the utility's total costs of producing electricity. It also is more difficult for a commission to select a renewable resource when it employs an IRP process that includes all-source competitive bidding. This particular bidding routine seems to select nonrenewable resources more often than it selects renewable resources.

The social benefits of deploying a renewable resource are an improved environment, more modular technologies, more diversity in the technology and fuel areas, and less exposure to the risks of the fuel market. The recognition of these benefits makes it easier for a commission to select a renewable resource over a nonrenewable resource. In fact, the value of the benefit package may be sufficient to overcome any skepticism with respect to the capability of a renewable resource to reliably produce the required amounts of electricity. But, there is a limit to this regulatory optimism. Economic reality can intrude. When the actual private cost that is incurred by the utility to deploy renewable resources is viewed as onerous, a commission has to act more like an economic regulator and less like an environmental regulator.

APPENDIX A

STATE-BY-STATE DESCRIPTION OF REGULATORY EFFORTS TO PROMOTE RENEWABLE RESOURCES

This appendix contains a description of the efforts of state public utility commissions to promote renewable resources. They outline the absence or presence of ten regulatory practices. The practices are (1) the encouragement of IRP, (2) the explicit consideration of renewable resources during the IRP process, (3) commission staff working in the area of renewable resources, (4) reliance on another state agency's assessment of the potential of renewable resources, (5) commission-conducted assessment of the potential of renewable resources, (6) qualitative assessment of net benefits of environment externalities, the alleviation of fuel-cost uncertainty, and an increase in fuel diversity, (7) monetization of environmental externalities or preferential treatment of renewable resources during the IRP process, (8) implementation of a legislatively mandated set-aside for renewable resources, (9) commission's adoption of a set-aside for renewable resources, and (10) commission-initiated incentives to promote renewable resources.

Florida, Alaska, Hawaii, and Washington, D.C. are not included in this analysis for reasons that are stated in the text.

ALABAMA

The Alabama Commission does not have commission-paid personnel who work primarily in the area of renewable resources. It does not offer incentives to promote renewable resources, and renewable resources play a small and nonfavored role in its decisionmaking. It does not encourage IRP for electric utilities, and it does not assess the potential for using renewable resources to meet Alabama's energy needs. It does not qualitatively or quantitatively estimate values for externalities of any type.

ARIZONA

The Arizona Commission has commission-paid personnel who work primarily in the area of renewable resources. It does not offer incentives to promote renewable resources, but it does encourage the deployment of renewable resources by setting a deployment target. It does consider renewable resources during the IRP process, and it makes an independent assessment of the potential for renewable resources to meet the state's energy needs. It does monetize environmental and other externalities.

ARKANSAS

The Arkansas Commission does not have commission-paid personnel who work primarily in the area of renewable resources. It does not offer incentives to promote renewable resources. It mildly encourages IRP for electric utilities, but it does not assess the potential for using renewable resources to meet Alabama's energy needs. It does not qualitatively or quantitatively estimate values for externalities of any type.

CALIFORNIA

The California Commission has commission-paid personnel who work primarily in the area of renewable resources. It does not offer incentives to promote renewable resources, but it is subject to a legislatively imposed set-aside that requires the California commission to earmark a percentage of new generation needs to be met by renewable resources. It does consider renewable resources during the IRP process, and the California Energy Commission's assessment of the potential for renewable resources to meet the state's energy needs is available to it. It does monetize environmental externalities.

COLORADO

The Colorado Commission does not have commission-paid personnel who work primarily in the area of renewable resources. It does not offer incentives to promote renewable resources, but the commission does require the utilities to provide a qualitative assessment of the effects on the environment of different generation technologies. It does encourage IRP for electric utilities, and it does independently assess the potential for using renewable resources to meet state's energy needs. Furthermore, there is an on-going investigation of renewable resources. Four times each year, the commission receives information about the development of and advances in renewable resource technology. Additionally, it has an opportunity to question experts in the area of renewable resources.

CONNECTICUT

The Connecticut Commission does have commission-paid personnel who work primarily in the area of renewable resources. It does not offer incentives to promote renewable resources, but renewable resources do receive preferred treatment during the IRP process. It does encourage IRP for electric utilities, and but it does not independently assess the potential for using renewable resources to meet the state's energy needs. It does monetized environmental externalities, and it qualitatively estimates a value for other externalities.

DELAWARE

The Delaware Commission does not have commission-paid personnel who work primarily in the area of renewable resources. It does not offer incentives to promote renewable resources, and it does not do an independent assessment of the potential for using renewable resources to meet state's energy needs. It encourages IRP for electric utilities, but it does not qualitatively or quantitatively estimate values for externalities of any type.

GEORGIA

The Georgia Commission does have commission-paid personnel who work primarily in the area of renewable resources. It does not offer incentives to promote renewable resources, and it does not do an independent assessment of the potential for using renewable resources to meet state's energy needs. It encourages IRP for electric utilities, but it does not qualitatively or quantitatively estimate values for externalities of any type.

IDAHO

The Idaho Commission does not have commission-paid personnel who work primarily in the area of renewable resources. It does not offer incentives to promote renewable resources, and it does not do an independent assessment of the potential for using renewable resources to meet state's energy needs. It encourages IRP for electric utilities, but it does not qualitatively or quantitatively estimate values for externalities of any type.

ILLINOIS

The Illinois Commission does have commission-paid personnel who work primarily in the area of renewable resources. It does not offer incentives to promote renewable resources, and it does not do an independent assessment of the potential for using renewable resources to meet state's energy needs. Instead, it relies on the Department of Energy and Natural Resources for this information. It encourages IRP for electric utilities, and it places qualitative values on externalities of different types.

INDIANA

The Indiana Commission does not have commission-paid personnel who work primarily in the area of renewable resources. It does not offer incentives to promote renewable resources, and it does not do an independent assessment of the potential for using renewable resources to meet state's energy needs. It encourages IRP for electric utilities, but it does not qualitatively or quantitatively estimate values for externalities of any type.

IOWA

The Iowa Commission does not have commission-paid personnel who work primarily in the area of renewable resources. These responsibilities lie with the Department of Natural Resources. It does offer incentives to promote renewable resources, and it is subject to a legislative mandate that requires the utilities to use renewable resources to meet the state's energy needs. It does not do an independent assessment of the potential for using renewable resources to meet state's energy needs. Instead, it relies on the Iowa Energy Center for this information. It encourages IRP for electric utilities, but it does not qualitatively or quantitatively estimate values for externalities of any type.

KANSAS

The Kansas Commission does have commission-paid personnel who work primarily in the area of renewable resources. It does not offer incentives to promote renewable resources. It does not do an independent assessment of the potential for using renewable resources to meet state's energy needs. It encourages IRP for electric utilities, but it does not qualitatively or quantitatively estimate values for externalities of any type.

KENTUCKY

The Kentucky Commission does not have commission-paid personnel who work primarily in the area of renewable resources. These responsibilities lie with the Department of Natural Resources. It does not offer incentives to promote renewable resources. It does not do an independent assessment of the potential for using renewable resources to meet state's energy needs, but it working with utilities to explore the potential for renewable resources. It encourages IRP for electric utilities.

LOUISIANA

The Louisiana Commission does not have commission-paid personnel who work primarily in the area of renewable resources. It does not offer incentives to promote renewable resources. It does not do an independent assessment of the potential for using renewable resources to meet state's energy needs. It encourages IRP for electric utilities, but it does not qualitatively or quantitatively estimate values for externalities of any type.

MAINE

The Maine Commission does have commission-paid personnel who work primarily in the area of renewable resources. It does not offer incentives to promote renewable resources, but it does evaluate renewable resources from the perspective of their ability to create a diverse and sustainable energy mix. It does not do an independent assessment of the potential for using renewable resources to meet state's energy needs. It encourages IRP for electric utilities. It qualitatively estimates values for environmental externalities.

MARYLAND

The Maryland Commission does have commission-paid personnel who work primarily in the area of renewable resources. It does not offer incentives to promote renewable resources, but it is prepared to treat the costs of the research and development of renewable resources as a legitimate expense for regulatory purposes. It does not do an independent assessment of the potential for using renewable resources to meet state's energy needs. This assessment is done by Maryland's Energy Administration. It encourages IRP for electric utilities, and it qualitatively estimates values for externalities of different types.

MASSACHUSETTS

The Massachusetts Commission does have commission-paid personnel who work primarily in the area of renewable resources. It does not offer incentives to promote renewable resources. It does not do an independent assessment of the potential for using renewable resources to meet state's energy needs. It encourages IRP for electric utilities. It monetizes environmental externalities, and it qualitatively estimates values for fuel diversity and the alleviation of fuel-cost uncertainty.

MICHIGAN

The Michigan Commission does not have commission-paid personnel who work primarily in the area of renewable resources. These responsibilities lie with the State Energy Office. It does not offer incentives to promote renewable resources, but it is subject to a legislative mandate that requires the utilities to generate 120 MWs from municipal waste. It does not do an independent assessment of the potential for using renewable resources to meet state's energy needs. It encourages IRP for electric utilities. It does not qualitatively or quantitatively estimate values for externalities of any type.

MINNESOTA

The Minnesota Commission does have commission-paid personnel who work primarily in the area of renewable resources. It does not offer incentives to promote renewable resources, but there is an indication that incentives with exist in the future. Additionally, it is subject to a legislative mandate to reserve a percentage of the utility's resource mix for renewable resources. It does an independent assessment of the potential for using renewable resources to meet state's energy needs. It encourages IRP for electric utilities. It does monetize environmental externalities, and it does qualitatively estimate values for fuel diversity and the alleviation of fuel-cost uncertainty.

MISSISSIPPI

The Mississippi Commission does not have commission-paid personnel who work primarily in the area of renewable resources. These responsibilities lie with another state agency. It does not offer incentives to promote renewable resources, but it does do a performance evaluation for each utility that it regulates. It does not do an independent assessment of the potential for using renewable resources to meet state's energy needs. It encourages IRP for electric utilities. It does not qualitatively or quantitatively estimate values for externalities of any type.

MISSOURI

The Missouri Commission does not have commission-paid personnel who work primarily in the area of renewable resources. These responsibilities lie within the Department of Natural Resources. It does not offer incentives to promote renewable resources, but there is some indication that incentives may be approved in the future. It does not do an independent assessment of the potential for using renewable resources to meet state's energy needs. It encourages IRP for electric utilities. It does not qualitatively or quantitatively estimate values for externalities of any type.

MONTANA

The Montana Commission does not have commission-paid personnel who work primarily in the area of renewable resources. It does offer a rate-of-return incentive to promote renewable resources. It does do an independent assessment of the potential for using renewable resources to meet state's energy needs. It does encourage IRP for electric utilities, and renewable resources are considered during the IRP process. It has not adopted a cost-benefit approach for evaluating renewable resources.

NEBRASKA

The Nebraska Commission does not have commission-paid personnel who work primarily in the area of renewable resources. It does not offer incentives to promote renewable resources. It does not do an independent assessment of the potential for using renewable resources to meet state's energy needs. It does not encourage IRP for electric utilities. It does not qualitatively or quantitatively estimate values for externalities of any type.

NEVADA

The Nevada Commission does not have commission-paid personnel who work primarily in the area of renewable resources. It does not offer incentives to promote renewable resources, but it is subject to legislation that encourages the use of renewable resources. It does not do an independent assessment of the potential for using renewable resources to meet state's energy needs. It does encourages IRP for electric utilities, and it explicitly considers renewable resources during the IRP process. It does not qualitatively or quantitatively estimate values for externalities of any type.

NEW HAMPSHIRE

The New Hampshire Commission does have commission-paid personnel who work primarily in the area of renewable resources. It does not offer incentives to promote renewable resources, but it is aware that the New Hampshire Legislature wants renewable resources to be part of the resource mix. It does not do an independent assessment of the potential for using renewable resources to meet state's energy needs. It does encourages IRP for electric utilities, and it does place renewable resources in a favored role during the IRP process. It does not monetize environmental externalities, but its does qualitatively estimate values for these externalities.

NEW MEXICO

The New Mexico Commission does not have commission-paid personnel who work primarily in the area of renewable resources. It does not offer incentives to promote renewable resources. It does not do an independent assessment of the potential for using renewable resources to meet state's energy needs. It does encourages IRP for electric utilities, but it does not give any differential weight to renewable resources during the IRP process. It does not qualitatively or quantitatively estimate values for externalities of any type.

NEW JERSEY

The New Jersey Commission does have commission-paid personnel who work primarily in the area of renewable resources. It does not offer incentives to promote renewable resources. It does not do an independent assessment of the potential for using renewable resources to meet state's energy needs. It does encourages IRP for electric utilities, but it does not give any differential weight to renewable resources during the IRP process. It does not qualitatively or quantitatively estimate values for externalities of any type.

NEW YORK

The New York Commission does have commission-paid personnel who work primarily in the area of renewable resources. It does not offer incentives to promote renewable resources, but it is considering a 300 + MW set-aside for renewable resources. It does not do an independent assessment of the potential for using renewable resources to meet state's energy needs. Instead, it relies on the New York Energy Office for this information. It does encourages IRP for electric utilities, and it has agreed to use the recommendations of the Energy Office during the IRP process. It does monetize environmental externalities, and it does qualitatively estimate values of other externalities.

NORTH CAROLINA

The North Carolina Commission does not have commission-paid personnel who work primarily in the area of renewable resources. It does not offer incentives to promote renewable resources. It does not do an independent assessment of the potential for using renewable resources to meet state's energy needs. Instead, it relies on the Department of Health, Energy, and Natural Resources for this information. It does encourages IRP for electric utilities. It does not monetize environmental externalities.

NORTH DAKOTA

The North Dakota Commission does not have commission-paid personnel who work primarily in the area of renewable resources. It does not offer incentives to promote renewable resources. It does not do an independent assessment of the potential for using renewable resources to meet state's energy needs. It does not encourage IRP for electric utilities. It does not monetize environmental externalities.

OHIO

The Ohio Commission does not have commission-paid personnel who work primarily in the area of renewable resources. It does not offer incentives to promote renewable resources. It does not do an independent assessment of the potential for using renewable resources to meet state's energy needs. It does not encourage IRP for electric utilities. It does not monetize environmental externalities, but it does include environmental compliance costs in its cost-benefit analysis.

OKLAHOMA

The Oklahoma Commission does not have commission-paid personnel who work primarily in the area of renewable resources. It does not offer incentives to promote renewable resources. It does not do an independent assessment of the potential for using renewable resources to meet the state's energy needs. It does not encourage IRP for electric utilities. It does not monetize environmental externalities.

OREGON

The Oregon Commission does have commission-paid personnel who work primarily in the area of renewable resources. It does offer incentives to promote renewable resources. It is subject to legislation that requires it favorably treat renewable in the IRP prices, and it has adopted a set-aside of 20 MWs to 30 MWs of renewable resources over the next twenty years. It does do an independent assessment of the potential for using renewable resources to meet state's energy needs. It does not encourage IRP for electric utilities. It does monetize environmental externalities, and it qualitatively estimates values for fuel diversity and the alleviation of fuel-cost uncertainty.

PENNSYLVANIA

The Pennsylvania Commission does have commission-paid personnel who work primarily an area related to renewable resources. It does not offer incentives to promote renewable resources. It does not do an independent assessment of the potential for using renewable resources to meet state's energy needs. It does encourage IRP for electric utilities. It does not qualitatively or quantitatively estimate values for externalities of any type.

RHODE ISLAND

The Rhode Island Commission does not have commission-paid personnel who work primarily an area related to renewable resources. It does not offer incentives to promote renewable resources. It does not do an independent assessment of the potential for using renewable resources to meet state's energy needs. It does encourage IRP for electric utilities. It does not qualitatively or quantitatively estimate values for externalities of any type.

SOUTH CAROLINA

The South Carolina Commission does not have commission-paid personnel who work primarily an area related to renewable resources. It does not offer incentives to promote renewable resources. It does not do an independent assessment of the potential for using renewable resources to meet state's energy needs. It does encourage IRP for electric utilities. It does not qualitatively or quantitatively estimate values for externalities of any type.

SOUTH DAKOTA

The South Dakota Commission does have commission-paid personnel who work primarily an area related to renewable resources. It does not offer incentives to promote renewable resources, but it does encourage its utilities to explore the potential for using renewable resources to meet the state's energy needs. Additionally, it is monitoring the renewable resource programs of adjacent states. It does not do an independent assessment of the potential for using renewable resources to meet state's energy needs. It does not encourage IRP for electric utilities. It does not qualitatively or quantitatively estimate values for externalities of any type.

TENNESSEE

The Tennessee Commission does not have commission-paid personnel who work primarily in an area related to renewable resources. It does not offer incentives to promote renewable resources. It does not do an independent assessment of the potential for using renewable resources to meet the state's energy needs. It does not encourage IRP for electric utilities. It does not qualitatively or quantitatively estimate values for externalities of any type.

TEXAS

The Texas Commission does not have commission-paid personnel who work primarily an area related to renewable resources. It does not offer incentives to promote renewable resources. It does not do an independent assessment of the potential for using renewable resources to meet state's energy needs. It does encourage IRP for electric utilities. It does not qualitatively or quantitatively estimate values for externalities of any type.

VIRGINIA

The Virginia Commission does not have commission-paid personnel who work primarily an area related to renewable resources. It does not offer incentives to promote renewable resources. It does not do an independent assessment of the potential for using renewable resources to meet state's energy needs. It does encourage IRP for electric utilities. It does qualitatively or quantitatively estimate values for externalities of any type.

UTAH

The Utah Commission does have commission-paid personnel who work primarily an area related to renewable resources. It does not offer incentives to promote renewable resources. It does not do an independent assessment of the potential for using renewable resources to meet state's energy needs. It does encourage IRP for electric utilities. It does not qualitatively or quantitatively estimate values for externalities of any type.

VERMONT

The Vermont Commission does have commission-paid personnel who work primarily an area related to renewable resources. It does offer incentives to promote renewable resources. It does not do an independent assessment of the potential for using renewable resources to meet state's energy needs. Instead, it relies on both the Department of Public Service and the Vermont Energy Office for this information. Both agencies have been active in the area of renewable resources. It does encourage IRP for electric utilities, and renewable resources play a substantial role during the IRP process. It does monetize environmental externalities, and it does qualitatively estimate values for other externalities.

WASHINGTON

The Washington Commission does not have commission-paid personnel who work primarily an area related to renewable resources. It does not offer incentives to promote renewable resources. It may do an independent assessment of the potential for using renewable resources to meet state's energy needs. Usually, it relies on the Northwest Power Planning Council and the State of Washington's Energy Office for this information. It does encourage IRP for electric utilities, and renewable resources do receive preferential treatment in the competitive-bidding process. Renewable resources receive a 10 percent price advantage over other forms of generation during the competitive-bidding process. It does not monetize environmental externalities, but it qualitatively estimate values for this and other externalities.

WEST VIRGINIA

The West Virginia Commission does not have commission-paid personnel who work primarily an area related to renewable resources. It does not offer incentives to promote renewable resources. It does not do an independent assessment of the potential for using renewable resources to meet state's energy needs. It does encourage IRP for electric utilities. It does not qualitatively or quantitatively estimate values for externalities of any type.

WISCONSIN

The Wisconsin Commission does have commission-paid personnel who work primarily an area related to renewable resources. It does offer incentives to promote renewable resources. A utility receives 0.75 cents per kWh for installing solar power, and 0.25 cents per kWh for installing hydroelectric, biomass, and waste power. It does not do an independent assessment of the potential for using renewable resources to meet state's energy needs. It does encourage IRP for electric utilities, and renewable resources receive a high priority in the integrated resource plan. It does qualitatively estimate values for different types of externalities.

WYOMING

The Wyoming Commission does have commission-paid personnel who work in the area of renewable resources on an ad hoc basis. It does not offer incentives to promote renewable resources. However, it is proposing incentives to the Wyoming Legislature under the title of innovative ratemaking and incentive ratemaking. It does do an informal assessment of the potential for using renewable resources to meet state's energy needs. It does encourage IRP for electric utilities, and renewable resources receive a high priority in the integrated resource plan. It monetizes environmental externalities, but it does not qualitatively estimate values for other types of externalities.

APPENDIX B

REGULATORY ENVIRONMENTS FOR RENEWABLE RESOURCES: STATES WITH 200 OR MORE MWS OF ONLINE RENEWABLE RESOURCE CAPACITY

This appendix describes the regulatory environment in states with 200 MWs or more of online renewable resource capacity that are not owned by utilities.[1] There are six prominent features in this appendix.

First, Oregon and Washington are the only states that offer incentives to utilities to promote renewable resources. Oregon offers a commission-initiated set-aside for renewable resources, and Washington gives a 10 percent price advantage over other forms of generation during the competitive-bidding phase of the IRP process.

Second, not one state does an independent assessment of the potential to use renewable resources to meet the state's energy needs.

Third, eight out of seventeen states consider renewable resources during the IRP process. They are: (1) California, (2) Maine, (3) Massachusetts, (4) Michigan, (5) New Hampshire, (6) New York, (7) Oregon, and (8) Washington.

Fourth, five out of the eight states that consider renewable resources during the IRP process also evaluate renewable resources in the context of clean air, fuel diversity or the alleviation of fuel price uncertainty. They are (1) California, (2) Maine, (3) Massachusetts, (4) New York, and (5) Oregon.

Fifth, three out of the eight states that consider renewable resources during the IRP process also give commission-initiated preferred treatment to renewable resources. They are (1) Maine, (2) Oregon, and (3) Washington. However, only Connecticut is prepared to fund a demonstration project for renewable resources.

Sixth, twelve out of the seventeen states encourage IRP. They are (1) California, (2) Georgia, (3) Louisiana, (4) Maine, (5) Massachusetts, (6) Michigan, (7) New Hampshire, (8) New York, (9) North Carolina, (10) Oregon, (11) South Carolina, and (12) Washington.

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[1] Florida was not surveyed for reasons that are stated in the text.

ALABAMA

The Alabama Commission has not established a DSM group, and it does not provide any incentives to a utility to encourage it to promote conservation. Neither does the Commission provide any incentives to a utility to encourage it to promote renewable resources, nor does the Commission make or require a formal assessment of the potential to use renewable resources to generate electricity. Finally, the Commission does not use IRP during the planning cycle of its utilities. Obviously, Alabama ranks number six with respect to online renewable capacity, for reasons other than regulatory policy. Alabama is among the top wood-producing states in the country. As a result, Alabama's forest products industry produces a great deal of wood waste that can be disposed of through the onsite generation of power. Not surprisingly then, 99.9 percent of Alabama's online renewable capacity falls into the biomass category.

CALIFORNIA

The California Commission has a conservation department that is spread over the California Advocacy and Advisory staffs. Furthermore, the Commission provides incentives to a utility to encourage it to promote DSM. They are decoupling and an opportunity to earn a rate of return on DSM investments. However, the Commission does not offer any incentives to encourage a utility to promote renewable resources. Still, it does evaluate renewable resources during its two-year IRP process. In addition, the California Legislature required the Commission to set-aside a percentage of new generation for renewable resources. The set-aside will continue until the Commission can agree on a measure for the value of fuel diversity. The size of the set-aside is determined jointly by the Commission and the utilities that it regulates. The Commission evaluates renewable resources in the context of a quantified clean air externality, but it does not place different risks on renewable resources relative to other generation options. Finally the Commission does not directly assess the potential for using renewable resources to meet state-wide energy needs. Clearly, California's regulatory policies promote the use of renewable resources to generate electricity.

CONNECTICUT

The Connecticut Commission devotes a substantial amount of time to DSM. Furthermore, the Commission provides incentives to promote DSM. They are (1) DSM investments allowed in rate base, (2) DSM expenses flowed through the fuel adjustment clause, and (3) a 1 percent to 3 percent rate-of-return bonus on the DSM investment in rate base if the utility meets or exceeds its quantified DSM goals. However, the Commission does not provide monetary incentives to promote the use of renewable resources. Instead, the Commission is prepared to give preferred treatment to hydroelectric power and other renewable resources that preserve air quality. Presently, it is thought that the *year of need* is 2007 for any renewable resource. In the interim, the Commission might be prepared to fund a demonstration project using photovoltaic resources. Also, the Commission has elected to consider externalities on a qualitative basis. Consequently, the Commission is prepared to give favorable treatment to a renewable resource that improves fuel diversity or improves air quality, even if that resource costs more to deploy. The Commission does not directly assess the potential of renewable resources to meet Connecticut's energy needs. The Commission asks the utilities for these assessments, and the Commission does review and critique them. Clearly, the Connecticut Commission's regulatory policies are supportive and moderately promotional with respect to renewable resources.

GEORGIA

The Georgia Commission has a group that focuses primarily on DSM, and it allows a utility to recover its DSM costs via a DSM rider. However, renewable resources account for less than 1 percent of any utility's generation expansion plan. Several regulatory policies contribute to this result. The avoided cost rate does not always cover a nonutility generator's (NUG's) operating costs. There has not been a formal assessment of the potential to use renewable resources to generate electricity. Finally, the Commission does not offer any monetary incentives to a utility to encourage it to promote renewable resources. Obviously, Georgia ranks number four with respect to online renewable capacity for reasons other than regulatory policy. Georgia is one of the top wood-producing states in the country. As a result, Georgia's forest products industry produces a great deal of wood waste that can be disposed of through the onsite generation of power. Not surprisingly then, 96.8 percent of Georgia's online renewable capacity falls into the biomass category.

LOUISIANA

The Louisiana Commission does not have a DSM department or section. However, the State of Louisiana has a conservation office. The Commission does not provide a utility with incentives to promote DSM, and it does not provide incentives to a utility to use renewable resources to meet the energy needs of Louisiana. The Commission does not do a quantitative assessment of the potential of renewable resources to meet Louisiana's energy needs, and renewable resources are rarely discussed as a preferred option during the IRP process. The Commission believes that renewable resources should be subject to the same economic tests as other forms of generation. Obviously, Louisiana has 205 MWs of online renewable resource capacity for reasons other than regulatory policy. Not surprisingly then, 100.0 percent of Louisiana's renewable resources fall into the hydro and biomass categories.

MAINE

The Maine Commission dedicated personnel to DSM and IRP analyses, but the Commission does not currently provide a utility with any incentives to encourage it to promote DSM. The Commission had a decoupling mechanism in place for three years. The Commission does not offer any incentives to encourage a utility to promote renewable resources, but it does evaluate renewable resources during the IRP process. Maine's energy policy causes the Commission to favorably view renewable resources. In particular, the Commission evaluates renewable resources from the perspective of their ability to create a diverse and sustainable energy resource base. Finally, the evaluation of renewable resources is carried out in the context of a qualitative assessment of the costs of environmental externalities. Consequently, Maine's regulatory policies promote the use of renewable resources to generate electricity. However, the high electricity prices in Maine are causing the Commission and the Maine Legislature to reassess their renewable resource policies. A state statute was passed recently that allows a utility to buy its way out of a renewable resource contract that was signed before April of the year that the statute was passed. This statute was passed because of the high cost of energy under the existing renewable resource contracts.

MASSACHUSETTS

The Massachusetts Commission has analysts that work primarily on DSM. The Commission provides incentives to promote DSM. They are performance-based rewards, the pass through of all DSM costs, and a lost revenue recovery mechanism. However, the Commission does not offer incentives to promote renewable resources When examining renewable resources during an IRP exercise, an externality adder makes renewable resources score well relative to nonrenewable energy resources. In addition, the Commission's informal consideration of fuel-price uncertainty and fuel diversity has the effect of lifting renewable resources relative to nonrenewable resources. The Commission evaluates the potential of renewable resources to meet Massachusetts' energy needs on a two-year cycle that corresponds with the IRP cycle. However, the Commission does not directly assess the potential of renewable resources to meet the state's energy needs. Instead, the Commission reviews and critiques the data that are provided by the utilities and other parties. Clearly, Massachusetts' regulatory policies promote the use of renewable resources to generate electricity.

MICHIGAN

The Michigan Commission contains the State Energy Office, and the State Energy Office is responsible for Michigan's DSM policies. The Commission provides an incentive to encourage the utility to promote DSM. It is a bonus rate of return that is tied to the size of the cost savings that are due to DSM. However, the Commission does not offer any incentives to encourage a utility to promote renewable resources. Moreover, the Commission is subject to a legislative mandate that requires it to reserve 120 MWs of power to be provided by cogenerators using municipal-solid-waste facilities. The Commission evaluates renewable resources in the context of an IRP process that does not recognize an externality adder. The Michigan Commission is supportive of using renewable resources to generate electricity, but it cannot be called a promotional commission. As a result, most of Michigan's renewable resources were initially justified on economic grounds. A significant amount of these resources (approximately 300 MWs) exists as a result of long-term contracts that were signed during a period of high avoided fuel costs and inflated capacity costs.

NEW HAMPSHIRE

The New Hampshire Commission has two analysts that specialize in DSM and load management, and the Commission does offer an incentive to a utility to encourage DSM. It is a lost-revenue-recovery mechanism. The Commission does not provide a utility with incentives to encourage the use of renewable resources, and the Commission has rejected monetized externalities. The Commission does not directly assess the potential of renewable resources to meet New Hampshire's energy needs. Instead, the Commission reviews and critiques the data that are provided by the utilities and other parties. Obviously, the Commission's formal regulatory policies do not support or promote the use of renewable resources. However, the Commission is aware that the New Hampshire Legislature wants renewable resources to be part of the state's energy resource mix. Therefore, the Commission encourages the utility's to include renewable resources in their integrated resource plans.

NEW YORK

The New York Commission has a conservation department that addresses DSM and IRP issues, and the Commission provides incentives to a utility to encourage it to promote DSM. They are DSM-program cost recovery, lost revenue recovery, and the sharing of cost savings due to DSM among ratepayers and the utility. The Commission does not offer any incentives to encourage a utility to promote renewable resources, but it is considering a 300+ MW set-aside. The Commission is concerned that renewable resources did not play a significant role in the integrated resource plans that were submitted by the utilities. Additionally, the apparent lack of interest in renewable resources prompted the Commission to open a renewable resource proceeding for the purpose of allowing the utilities to gain experience with renewable resources as recommended in the New York Energy Plan. The Commission evaluates renewable resources in the context of a competitive-bidding process that uses the analog of the quantified externality adder that is an important part the Commission's DSM evaluation process. However, the Commission does not directly assess the potential for using renewable resources to meet state-wide energy needs. This parameter is determined by the State of New York Energy Office, which is the lead drafter of the State of New York Energy Plan. Clearly, New York's regulatory policies promote the use of renewable resources to generate electricity.

NORTH CAROLINA

The North Carolina Commission does not have a DSM department or section. The DSM responsibilities were given to the Department of Health, Energy, and Natural Resources. The Commission is required to implement its DSM mandate. The Commission does not provide incentives to promote renewable resources. The Commission does not directly assess the potential for renewable resources to meet North Carolina's energy needs, but the utilities are required to assess the potential of renewable resources on a two-year cycle. North Carolina's regulatory policies are supportive of renewable resources, but they cannot be called promotional. Instead, these renewable resources were deployed in the context of a liberal qualifying-facility policy and long-term contracts. The qualifying-facility policy and long-term contracts work in favor of NUGs using renewable resources.

OREGON

The Oregon Commission has a group of analysts that specialize in DSM, and the Commission offers incentives to a utility to encourage DSM. They are a lost-revenue-recovery mechanism, rebates, energy service charges to finance DSM appliances through utility loans to its customers, and the distribution of low-cost DSM devices free of charge to customers. The Commission also provides a utility with an incentive to encourage the use of renewable resources. There is a renewable resource set-aside of 20 MWs to 30 MWs of renewable energy. The utilities have twenty years to fulfill this obligation. The set-aside was adopted because the Commission has not adopted a method for monetizing the value of improving fuel diversity and alleviating fuel-price uncertainty. Furthermore, the Oregon Commission describes its two-year IRP cycle as "green." In particular, the Commission issued a statement of policy that allows renewable resources to be evaluated on a competitive bid basis and other criteria. An example of the other criteria is that a renewable resource does not have to be a least-cost option to be part of the proposed resource mix that is contained in a utility's integrated resource plan even though the Commission has adopted a method for monetizing environmental externalities. The Commission does not directly assess the potential of renewable resources to meet Oregon's energy needs. Clearly, the Oregon Commission's regulatory policies promote renewable resources.

PENNSYLVANIA

The Pennsylvania Commission has a bureau of DSM, and the Commission provides a utility with an incentive to promote DSM. It is straightforward recover of DSM program costs. The Commission does not provide a utility with incentives to use renewable resources to meet the energy needs of Pennsylvania. The Commission does not do a quantitative assessment of the potential of renewable resources to meet the state's energy needs. Moreover, the Commission does not require the utilities to do an assessment of the potential for renewable resources during their planning processes. Obviously, Pennsylvania has 200.8 MWs of online renewable resource capacity for reasons other than regulatory policy. Not surprisingly then, 99.7 percent of Pennsylvania's renewable resources fall into the biomass and hydro categories.

SOUTH CAROLINA

The South Carolina Commission does not have a DSM department or a section. The South Carolina Energy Management Office has the DSM responsibility for the state. The Commission provides the following incentive to a utility to promote DSM: a utility receives 15 cents for every dollar of proven cost savings that are due to DSM. The Commission does not provide a utility with any incentive to promote the use of renewable resources, and the Commission does not monetize or qualitatively consider externalities during its three-year IRP process. The Commission has not opened a docket to address renewable resources, and the South Carolina utilities have not explored renewable resources in any detail. The Commission has never assessed the potential of renewable resources to meet South Carolina's energy needs. Obviously, the South Carolina Commission's regulatory policies are not supportive or promotional with respect to renewable resources. Therefore, it is not surprisingly that biomass facilities comprise 88.6 percent of South Carolina's renewable resource base. Biomass facilities can compete economically with fossil-fuel generation, but often the utility is required to connect them to its system because of PURPA.

TENNESSEE

Only one electric utility is under the jurisdiction of the Tennessee Commission. The Commission uses federal guidelines to regulate this utility, but it does not encourage this utility to use IRP. Because the Commission is not actively involved in the regulation of electric utilities, it does not offer incentives that promote the use of DSM or renewable resource technologies. Furthermore, there is not a need for the Commission to assess the potential of renewable resources to meet Tennessee's energy needs. In summary, Tennessee does not have a renewable resource regulatory policy.

VIRGINIA

The Virginia Commission does not have a DSM department or a DSM section, and the Commission does not provide any incentives to a utility to encourage it to promote DSM or renewable resources. The Commission does not directly assess the potential for renewable resources to meet Virginia's energy needs, but the utilities are required to assess the potential of renewable resources on an annual basis. Because there is not a formal review of a utility's generation expansion plan, renewable resources are evaluated on an *ad hoc* basis. Virginia's regulatory policies cannot be characterized as either supportive or promotional with respect to renewable resources. Renewable resources have been deployed in Virginia when they can successfully compete in an "all source" competitive-bidding process.

WASHINGTON

The Washington Commission does not have a DSM department or section. The Commission provides incentives to a utility to promote DSM. They are a rate-of-return bonus of 2 percent for successful DSM and decoupling. The Commission also offers an incentive to a utility to promote the use of renewable resources. The incentive works through the Commission's two-year IRP process. Specifically, renewable resources receive a 10 percent price advantage over other forms of generation during the competitive bid phase of the IRP process. However, this advantage can quickly disappear because a utility negotiates the prices that it pays for electricity during the competitive bid phase. The Commission does not do a quantitative assessment of the potential of renewable resources to meet Washington's energy needs. The Commission relies on the utilities, the Northwest Power Planning Council, the State of Washington Energy Office, and the wind producers for these data. Clearly, the Washington Commission's regulatory policies are supportive and mildly promotional with respect to using renewable resources to meet the state's energy needs. In addition, it is noted that the Commission views renewable resources as being better for the environment relative to other forms of electricity generation.

APPENDIX C

LEGISLATIVE ENVIRONMENTS FOR RENEWABLE RESOURCES: STATES WITH 200 OR MORE MWS OF ONLINE RENEWABLE RESOURCE CAPACITY

This appendix describes the legislative environment for those states with 200 MWs or more of online renewable resource capacity that are not owned by utilities.[1] The most prominent feature of this appendix is the significant variation in these environments.

The legislative environment in California is the most demanding. The California Commission must evaluate renewable resources in terms of their ability to minimize the costs of electricity to society.

The legislative environment in Wisconsin is the next most demanding. The Wisconsin Commission must give top priority to renewable resources during the IRP process. Meanwhile, the legislative environments in Oregon and Connecticut are almost as demanding as the environment in Wisconsin. The Oregon Commission must give favorable treatment to renewable resources during the IRP process, and the Connecticut Commission must promote renewable resources to the most practical extent possible.

The legislative environments in Maine, New Hampshire, North Carolina, Virginia, and Washington are not particularly demanding. The North Carolina Commission must explore the potential to use renewable resources to generate electricity. The other commissions must encourage the use of renewable resources.

The legislative environments in Alabama, Georgia, Louisiana, Michigan, Massachusetts, New York, Pennsylvania, Tennessee, and South Carolina do not place any demands on their commissions with respect to the promotion and deployment of renewable resources.

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[1] Florida was not surveyed for reasons that are stated in the text.

ALABAMA

The Alabama Legislature has not adopted a statute that requires the Alabama Commission to encourage conservation or the use of renewable resources to meet the state's energy needs.

CALIFORNIA

The California Legislature has charged the California Commission with the tasks of minimizing the cost of electricity to society, improving the environment, and encouraging the diversity of energy sources through improvements in energy efficiency and development of renewable energy resources such as wind, solar, biomass, and geothermal energy. The Legislature requires the Commission to calculate values for the environmental costs and benefits of energy resources. These environmental values must be used to calculate the cost-effectiveness of energy resources. The Legislature requires the Commission to determine a value that recognizes the resource diversity that is provided by renewable resources. Finally, the Legislature requires the Commission to set-aside a specific portion of future electrical generation capacity for renewable resources until the Commission can determine values for the costs and benefits of resource diversity.

CONNECTICUT

The Connecticut Legislature adopted a statute that requires the Connecticut Commission to promote renewable resources to the most practical extent. The Commission has interpreted this statute as compelling it to favorably weight renewable resources whenever the need for new generation capacity arises.

GEORGIA

The Georgia Legislature has not charged the Georgia Commission with any specific tasks concerning the promotion or deployment of renewable resources. However, a statute was passed in 1991 that encourages the Commission to pursue conservation and renewable resource opportunities.

LOUISIANA

The Louisiana Legislature has not adopted a statute that requires the Louisiana Commission to encourage conservation or the use of renewable resources to meet the state's energy needs.

MAINE

The Maine Legislature has not charged the Maine Commission with any specific tasks concerning the promotion or deployment of renewable resources. However, the Legislature requires the Commission to encourage conservation whenever and wherever possible. Specifically, the Commission is required to treat conservation as a preferred option during the IRP process. The Commission has interpreted the legislative requirements that apply to conservation as also applying to renewable resources.

MASSACHUSETTS

The Massachusetts Legislature has not adopted a statute that requires the Massachusetts Commission to set conservation goals or to promote conservation. However, there was *proposed* legislation that addressed the use of specific renewable resources and conservation appliances and devices. The *proposed* legislation required the Commission to favor a particular renewable resource or conservation activity during the IRP process.

MICHIGAN

The Michigan Legislature has not adopted a statute that requires the Michigan Commission to encourage conservation or the use of renewable resources to meet the state's energy needs.

NEW HAMPSHIRE

The New Hampshire Legislature adopted a statute that requires the New Hampshire Commission to establish conservation and load management programs every two years. The Legislature also adopted a statute that encourages the Commission to use cogenerators and qualifying facilities as energy resources, especially if these NUGs produce electricity by using renewable resources. The Commission interpreted these statutes as allowing it to encourage the use of renewable resources to meet the state's energy needs.

NEW YORK

The New York Legislature has not adopted a statute that requires the New York Commission to encourage conservation or the use of renewable resource to meet the state's energy needs. However, there does exist an **Energy Plan** for the State of New York. The conservation goals for the state are set in this plan. The Commission has agreed that it will adopt the recommendations that are made in the **Energy Plan**. The plan may contain recommendations for the use of renewable resources to meet the state's energy needs.

NORTH CAROLINA

The North Carolina Legislature charged the North Carolina Commission with the task of exploring conservation goals for the state. The statute does not require the Commission to set conservation goals or to encourage conservation.

OREGON

The Oregon Legislature adopted a statute that requires the Oregon Commission to favorably treat renewable resources. The Commission interpreted this statute as requiring it to take steps to get renewable resources into the resource stack during the IRP process.

PENNSYLVANIA

The Pennsylvania Legislature has not adopted a statute that requires the Pennsylvania Commission to encourage conservation or the use of renewable resources to meet the state's energy needs.

SOUTH CAROLINA

The South Carolina Legislature has not adopted a statute that requires the South Carolina Commission to encourage conservation or the use of renewable resources to meet the state's energy needs.

TENNESSEE

The Tennessee Legislature has not adopted a statute that requires the Tennessee Commission to set conservation goals, promote conservation, or use renewable resources to meet the state's energy needs. However, it should be noted that the Commission regulates only one modestly sized electric utility.

VIRGINIA

The Virginia Legislature charged the Virginia Commission with the task of determining the best use of natural resources. The Commission interpreted this statute as allowing it to encourage conservation and the use of renewable resources to meet the state's energy needs.

WASHINGTON

The Washington Legislature adopted statutes that encourage conservation and decoupling. The Washington Commission interpreted these statutes as allowing it to encourage the use of renewable resources to meet the state's energy needs.

APPENDIX D

STATE PUBLIC UTILITY COMMISSIONS WITH LEGISLATIVE MANDATES TO PROMOTE RENEWABLE RESOURCES

This appendix describes the mandates that state legislatures have put on state public utility commissions in order to encourage them to promote renewable resources.[1] Each of these mandates requires specific action on the part of the respective commission. The California Commission must set-aside a portion of new generation for renewable resources until the Commission can estimate the net benefits to society of fuel diversity and the alleviation of fuel-cost uncertainty. The Connecticut, Maryland, Oregon, and Wisconsin Commissions are required to favorably weight renewable resources during their IRP processes. The Minnesota and Iowa Commissions are required to quantify the environmental costs and benefits of renewable resources.

[1] Florida was not surveyed for reasons that are stated in the text.

CALIFORNIA

Statute 1951, chapter 764 requires the California Commission to promote renewable resources. The Commission must decide on a renewable resources set-aside until the Commission is able to measure the costs and benefits of fuel diversity. The conditions for the renewable resource set-aside are spelled out by Rule 701.3 of the Public Utilities Code, entitled *Regulations of the Public Utilities*. The set-aside became law on January 1, 1993.

CONNECTICUT

The Energy Utilization and Conservation Act, which is codified as Chapter 298, Sections 16A-35K of the General Statutes of Connecticut, compels the Connecticut Commission to favorably weight renewable resources in its decisionmaking. The statutory language, leading to this regulatory interpretation, stated that the Commission is concerned with the "promotion of renewables (renewable resources) to the most practical extent." This statutory language has been in effect for at least ten year.

MARYLAND

The Public Service Commission Law of Maryland (Article 78, section 54B(b)(1)) requires the Maryland Commission to annually submit a ten-year plan to the Maryland Secretary of Natural Resources that describes the Commission's efforts to promote alternative energy resources, including cogeneration. Section 54B(b)(2) requires the Commission to evaluate the cost-effectiveness of renewable resources, and section 54B(b)(2)(ii) requires that this cost-effectiveness calculation must include an assessment of the utilization of renewable resources to help meet the state's electricity needs.

IOWA

Chapter 476.41 of the Iowa Code, entitled *Alternate Energy Production Facilities*, mentions that values for economic and environmental externalities are to be established by the Iowa Commission. These requirements took effect in 1990 and 1992, respectively.

MINNESOTA

Chapter 356 of Minnesota Statute 216.B.2422, subdivision 4 of the Minnesota Law, compels the Minnesota Commission to promote renewable resources. This statute became law in 1993. The Commission is required to quantify the environmental costs and benefits of renewable resources. Most recently, Chapter 641 of Minnesota Senate File 1706, known as the "Prairie Island Bill," contains a provision that utilities should be required to produce 225 MWs of wind power and 50 MWs of biomass power by 1998, with an additional 175 MWs of wind power and 75 MWs of biomass power by 2002.

NEVADA

There is pending legislation that requires the Nevada Commission to set aside 10 percent of future generation for renewable resources and calls for the Commission to quantify economic and environmental externalities.

OREGON

Oregon Revised Statutes 469.010, adopted in 1975 and amended in 1979, mandates that the Oregon Commission favorably treat renewable resources.

WISCONSIN

Section 1.12(3) of the Wisconsin Statutes, adopted in 1977 and amended 1994, compels the Wisconsin Commission to promote renewable resources by favorably weighting renewable resources relative to nonrenewable resources.

APPENDIX E

THE NATIONAL REGULATORY RESEARCH INSTITUTE'S SURVEY OF LEGISLATIVE AND REGULATORY PRACTICES AFFECTING THE PROMOTION AND EVALUATION OF RENEWABLE RESOURCES BY STATE COMMISSIONS

This appendix contains the survey questions that were administered to individuals at forty-seven state public utility commissions, who are knowledgeable about the public policy surrounding renewable resources in their respective states. Florida and the District of Columbia were not surveyed. Florida was not surveyed because it commissioned this report. The District of Columbia was not surveyed because of its small size, unique location, and unique energy requirements.

The survey was conducted over the telephone lines. Whenever possible, commissioners were questioned directly. There are various "timing" reasons that explain when commission staff are substituted for commissioners.

Three interviewers conducted the survey for the National Regulatory Research Institute (NRRI). Each of the interviewers are employed by the NRRI.

Name of State:

Date of Interview:

Interviewee:

Interviewer:

SURVEY OF LEGISLATIVE AND REGULATORY PRACTICES AFFECTING THE PROMOTION AND EVALUATION OF RENEWABLE RESOURCES

1. Does your commission have a stand alone conservation department, or does your commission have a conservation section that is part of a larger department?

2. Does your commission face an active conservationist lobby during rate cases or other regulatory proceedings, such as a rule making for the electricity and gas industries within your state?

3. Is your commission subject to state legislation that requires your commission to set conservation goals or to encourage conservation in any form?

4. Is there currently any legislation pending or proposed that would require your commission to set conservation goals or to encourage conservation in any form?

5. Does your commission offer any incentives to utilities to encourage them to promote conservation?

6. Does your commission encourage the electric and gas utilities under your jurisdiction to use the principles of integrated resources planning?

7. What role do renewable energy sources such as wind, geothermal, waste disposal, or photovoltaics play in the development of a utility's generation expansion plan?

8. How does your commission assess the potential for using renewable resources to meet the energy needs of your state?

9. How often is your staff or the utilities under your jurisdiction required to assess the potential for using renewable resources to generate electricity?

10. Does your commission offer any incentives to the utilities under your jurisdiction to promote the use of renewable resources?

11. Does the commission treat renewable resources, conservation, and conventional generation the same during the review of the utility's generation expansion plan?

12. How does your commission evaluate renewable resources vis-a-vis the other forms of energy generation?

13. Does your commission use a specific type of cost-benefit or cost-effectiveness test to determine whether renewable resources or other forms of energy generation should be deployed by the utilities under your jurisdiction?

14. Do you have any opinions about how the utilities under your jurisdiction are assessing the value of renewable resources versus other forms of generation?

15. Can you give the name of staff member that is knowledgeable about your state's use of renewable resources to produce energy?

16. Are you aware of any specific environmental effects, good or bad, that are associated with your state's use of renewable resources to produce energy?

Name of State:

Date of Interview:

Interviewee:

Interviewer:

SURVEY OF REGULATORY PRACTICES AFFECTING THE PROMOTION AND EVALUATION OF RESIDENTIAL SOLAR RESOURCES

1. Is the Commission subject to legislation that mandates the Commission to promote the use of solar devices for residential water or space heating purposes?

2. Does the Commission offer incentives to utilities to promote the use of solar devices for residential water or space heating purposes?

3. Is there an existing rule or statute that encourages the use of solar devices for residential water or space heating purposes?

4. Has the Commission reviewed integrated resource planning documents that mention solar devices as the preferred way to heat water and space at residences?

APPENDIX F

RANK ORDER BY STATE OF ONLINE RENEWABLE RESOURCE CAPACITY

This appendix contains nine tables that refer to the renewable resource capacity that is online in a particular surveyed state.[1] Table F-1 provides a state-by-state ranking of online renewable resource capacity that is owned by utilities, municipalities, and NUGs. Washington ranks first by this criterion. Table F-2 provides a state-by-state ranking when the renewable resources owned by utilities and municipalities are removed from consideration. California ranks first by this criterion. Table F-3 shows the primary and secondary renewable resources on a state-by-state basis. This table shows among other things that hydroelectric and biomass are the predominant renewable resources. Table F-4 shows the procedures that state commissions' use to evaluate renewable resources. The most common procedure is the utility impact test. Tables F-5 to F-9 represent a summary of the characteristics of the top twenty *surveyed* states in terms of online renewable resource capacity that is not owned by utilities or municipalities.

[1] Florida is not ranked for reasons that are stated in the text.

TABLE F-1
Page 1 of 2
RANK ORDER OF ONLINE RENEWABLE CAPACITY BY FUEL TYPE:
INCLUDES HYDROELECTRIC POWER THAT IS OWNED BY
CITIES, COUNTIES, UTILITIES, AND NONUTILITY GENERATORS
(Contiguous Surveyed States in MWs as of August 1992)

Rank	State	Hydro	Biomass	Geothermal	Photovoltaic	Solar Thermal	Wind	OnLine Capacity
1	Washington	19,858.9	218.7	0.0	0.0	0.0	0.0	20,077.6
2	California	12,279.0	1,215.8	2,660.2	9.9	369.0	1,625.9	18,159.8
3	Oregon	7,964.5	253.3	2.0	0.0	0.0	1.3	8,221.1
4	New York	5,307.1	292.2	0.0	0.0	0.0	1.4	5,600.7
5	Tennessee	3,783.6	127.4	0.0	0.0	0.0	0.0	3,911.0
6	South Carolina	3,461.3	215.3	0.0	0.0	0.0	0.0	3,676.6
7	Arizona	3,642.1	0.4	0.0	0.4	0.0	0.1	3,643.0
8	Alabama	2,860.0	524.0	0.0	0.1	0.0	0.0	3,384.1
9	Georgia	2,529.1	586.7	0.0	0.0	0.4	0.0	3,116.2
10	Michigan	2,405.1	363.6	0.0	0.0	0.0	0.1	2,768.8
11	Virginia	2,243.2	329.3	0.0	0.1	0.0	0.0	2,572.6
12	Idaho	2,234.8	25.5	0.0	0.0	0.0	0.1	2,260.4
13	Montana	2,223.5	12.7	0.0	0.0	0.0	1.0	2,237.2
14	North Carolina	1,940.5	127.7	0.0	0.0	0.0	0.0	2,068.2
15	Massachusetts	1,736.6	254.1	0.0	0.2	0.0	1.1	1,992.0
16	Nevada	1,672.0	10.0	132.5	0.0	0.0	0.0	1,814.5
17	Pennsylvania	1,561.4	175.6	0.0	0.0	0.0	0.7	1,737.7
18	South Dakota	1,593.0	0.0	0.0	0.0	0.0	0.0	1,593.0
19	Texas	1,343.0	68.9	1.0	0.7	0.0	1.0	1,414.6
20	Maine	708.5	520.0	0.0	0.0	0.0	0.1	1,228.6
21	Arkansas	1,163.3	1.8	0.0	0.0	0.0	0.1	1,165.2
22	Oklahoma	1,016.8	45.5	0.0	0.1	0.0	0.2	1,062.6
23	Missouri	1,062.2	0.0	0.0	0.0	0.0	0.0	1,062.2
24	Colorado	1,030.4	9.5	0.0	0.0	0.0	0.1	1,040.0
25	Florida	39.0	821.8	0.0	0.1	0.0	0.0	860.9
26	Kentucky	747.1	0.0	0.0	0.0	0.0	0.0	747.1
27	New Hampshire	532.3	156.5	0.0	0.0	0.0	1.4	690.2

TABLE F-1
Page 2 of 2
RANK ORDER OF ONLINE RENEWABLE CAPACITY BY FUEL TYPE:
INCLUDES HYDROELECTRIC POWER THAT IS OWNED BY
CITIES, COUNTIES, UTILITIES, AND NONUTILITY GENERATORS
(Contiguous Surveyed States in MWs as of August 1992)

Rank	State	Hydro	Biomass	Geothermal	Photovoltaic	Solar Thermal	Wind	OnLine Capacity
28	Wisconsin	519.8	147.9	0.0	0.0	0.0	0.2	667.9
29	Maryland	494.6	105.9	0.0	0.0	0.0	0.0	600.5
30	North Dakota	517.8	9.0	0.0	0.0	0.0	0.4	527.2
31	Minnesota	232.9	123.6	0.0	0.0	0.0	1.8	358.3
32	Vermont	247.3	91.5	0.0	0.0	0.0	0.3	339.1
33	Connecticut	157.7	180.9	0.0	0.0	0.0	0.1	338.7
34	Utah	237.0	4.0	39.0	0.0	0.0	0.0	280.0
35	Ohio	128.9	144.3	0.0	0.0	0.0	0.0	273.2
36	New Jersey	211.0	49.9	0.0	0.0	0.0	0.0	260.9
37	Wyoming	244.3	6.5	0.0	0.0	0.0	8.0	258.8
38	West Virginia	242.0	0.0	0.0	0.0	0.0	0.0	242.0
39	Louisiana	192.0	13.0	0.0	0.0	0.0	0.0	205.0
40	Nebraska	168.9	0.0	0.0	0.0	0.0	0.0	168.9
41	Iowa	130.3	22.0	0.0	0.0	0.0	0.2	152.5
42	Mississippi	0.0	121.6	0.0	0.0	0.0	0.0	121.6
43	Indiana	110.2	0.0	0.0	0.0	0.0	0.1	110.3
44	New Mexico	90.2	0.2	0.0	0.1	0.0	0.1	90.6
45	Illinois	32.7	22.2	0.0	0.0	0.0	0.0	54.9
46	Delaware	0.5	13.3	0.0	0.0	0.0	0.0	13.8
47	Rhode Island	8.7	0.0	0.0	0.0	0.0	0.0	8.7
48	Kansas	3.9	0.0	0.0	0.0	0.0	1.2	5.1

Source: Adapted from *Investing in the Future*. These data include hydroelectric power that is owned by cities, counties, utilities, and nonutility generators.

TABLE F-2
Page 1 of 2
RANK ORDER OF ONLINE RENEWABLE CAPACITY BY FUEL TYPE:
INCLUDES HYDROELECTRIC POWER THAT IS OWNED BY NONUTILITY GENERATORS
(Contiguous Surveyed States in MWs as of August 1992)

Rank	State	Hydro	Biomass	Geothermal	Photovoltaic	Solar Thermal	Wind	OnLine Capacity
1	California	166.6	1,215.8	2,660.2	9.9	369.0	1,625.9	6,047.4
2	Maine	335.5	520.0	0.0	0.0	0.0	0.1	855.6
3	Florida	0.0	821.8	0.0	0.1	0.0	0.0	821.9
4	Georgia	18.9	586.7	0.0	0.0	0.4	0.0	606.0
5	New York	304.1	292.2	0.0	0.0	0.0	1.4	597.7
6	Alabama	0.0	524.0	0.0	0.1	0.0	0.0	524.1
7	Michigan	57.8	363.6	0.0	0.0	0.0	0.1	421.5
8	North Carolina	285.7	127.7	0.0	0.0	0.0	0.0	413.4
9	Virginia	18.9	329.3	0.0	0.1	0.0	0.0	348.3
10	Massachusetts	73.9	254.1	0.0	0.2	0.0	1.1	329.3
11	Tennessee	171.7	127.4	0.0	0.0	0.0	0.0	299.1
12	Oregon	21.1	253.3	2.0	0.0	0.0	1.3	277.7
13	New Hampshire	117.9	156.5	0.0	0.0	0.0	1.4	275.8
14	Washington	57.1	218.7	0.0	0.0	0.0	0.0	275.8
15	South Carolina	27.8	215.3	0.0	0.0	0.0	0.0	243.1
16	Connecticut	26.4	180.9	0.0	0.0	0.0	0.1	207.4
17	Wisconsin	58.0	147.9	0.0	0.0	0.0	0.2	206.1
18	Louisiana	192.0	13.0	0.0	0.0	0.0	0.0	205.0
19	Pennsylvania	24.5	175.6	0.0	0.0	0.0	0.7	200.8
20	Minnesota	64.7	123.6	0.0	0.0	0.0	1.8	190.1
21	Idaho	144.9	25.5	0.0	0.0	0.0	0.1	170.5
22	Vermont	60.3	91.5	0.0	0.0	0.0	0.3	152.1
23	Nevada	5.5	10.0	132.5	0.0	0.0	0.0	148.0
24	Ohio	1.3	144.3	0.0	0.0	0.0	0.0	145.6
25	West Virginia	141.5	0.0	0.0	0.0	0.0	0.0	141.5
26	Mississippi	0.0	121.6	0.0	0.0	0.0	0.0	121.6
27	Maryland	0.9	105.9	0.0	0.0	0.0	0.0	106.6
28	Texas	6.0	68.9	1.0	0.7	0.0	1.0	77.6

TABLE F-2
Page 2 of 2
RANK ORDER OF ONLINE RENEWABLE CAPACITY BY FUEL TYPE:
INCLUDES HYDROELECTRIC POWER THAT IS OWNED BY NONUTILITY GENERATORS
(Contiguous Surveyed States in MWs as of August 1992)

Rank	State	Hydro	Biomass	Geothermal	Photovoltaic	Solar Thermal	Wind	OnLine Capacity
29	New Jersey	14.6	49.9	0.0	0.0	0.0	0.0	64.5
30	Utah	5.6	4.0	39.0	0.0	0.0	0.0	48.6
31	Oklahoma	0.0	45.5	0.0	0.1	0.0	0.2	45.8
32	Illinois	4.3	22.2	0.0	0.0	0.0	0.0	26.5
33	Iowa	0.0	22.0	0.0	0.0	0.0	0.2	22.2
34	Colorado	10.5	9.5	0.0	0.0	0.0	0.1	20.1
35	Montana	4.8	12.7	0.0	0.0	0.0	1.0	18.5
36	Wyoming	0.0	6.5	0.0	0.0	0.0	8.0	14.5
37	Delaware	0.5	13.3	0.0	0.0	0.0	0.0	13.8
38	North Dakota	0.0	9.0	0.0	0.0	0.0	0.4	9.4
39	South Dakota	8.4	0.0	0.0	0.0	0.0	0.0	8.4
40	Rhode Island	4.4	0.0	0.0	0.0	0.0	0.0	4.4
41	Arizona	2.4	0.4	0.0	0.4	0.0	0.1	3.3
42	Kansas	1.9	0.0	0.0	0.0	0.0	1.2	3.1
43	Arkansas	0.0	1.8	0.0	0.0	0.0	0.1	1.9
44	New Mexico	0.0	0.2	0.0	0.1	0.0	0.1	0.4
45	Indiana	0.2	0.0	0.0	0.0	0.0	0.1	0.3
46	Kentucky	0.0	0.0	0.0	0.0	0.0	0.0	0.0
47	Missouri	0.0	0.0	0.0	0.0	0.0	0.0	0.0
48	Nebraska	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Source: Adapted from *Investing in the Future*. These data only include hydroelectric power that is owned by nonutility generators.

TABLE F-3
Page 1 of 2
PRIMARY AND SECONDARY RENEWABLE RESOURCE FOR RANK ORDER OF ONLINE RENEWABLE CAPACITY
(Contiguous Surveyed States in MWs)

Rank	State	Primary Resource	Percent of OnLine Capacity	Secondary Resource	Percent of OnLine Capacity	OnLine Capacity
1	California	Geothermal	44.0	Wind	26.9	6,047.4
2	Maine	Biomass	60.8	Hydro	39.2	855.6
3	Florida	Biomass	99.9	Photovoltaics	0.1	821.9
4	Georgia	Biomass	96.8	Hydro	3.1	606.0
5	New York	Hydro	50.9	Biomass	48.9	597.7
6	Alabama	Biomass	99.9	Photovoltaics	0.1	524.1
7	Michigan	Biomass	86.3	Hydro	13.7	421.5
8	North Carolina	Hydro	69.1	Biomass	30.9	413.4
9	Virginia	Biomass	94.5	Hydro	5.4	348.3
10	Massachusetts	Biomass	77.2	Hydro	22.4	329.3
11	Tennessee	Hydro	57.4	Biomass	42.6	299.1
12	Oregon	Biomass	91.2	Hydro	7.6	277.7
13	New Hampshire	Biomass	56.7	Hydro	42.7	275.8
14	Washington	Biomass	79.3	Hydro	20.7	275.8
15	South Carolina	Biomass	88.6	Hydro	11.4	243.1
16	Connecticut	Biomass	87.2	Hydro	12.7	207.4
17	Wisconsin	Biomass	71.8	Hydro	28.1	206.1
18	Louisiana	Hydro	93.7	Biomass	6.3	205.0
19	Pennsylvania	Biomass	87.5	Hydro	12.2	200.8
20	Minnesota	Biomass	65.0	Hydro	34.0	190.1
21	Idaho	Hydro	85.0	Biomass	14.9	170.5
22	Vermont	Biomass	60.2	Hydro	39.6	152.1
23	Nevada	Geothermal	89.5	Biomass	6.8	148.0
24	Ohio	Biomass	99.1	Hydro	0.9	145.6
25	West Virginia	Hydro	100.0	None	0.0	141.5
26	Mississippi	Biomass	100.0	None	0.0	121.6
27	Maryland	Biomass	99.2	Hydro	0.8	106.6

TABLE F-3
Page 2 of 2
PRIMARY AND SECONDARY RENEWABLE RESOURCE FOR RANK ORDER OF ONLINE RENEWABLE CAPACITY
(Contiguous Surveyed States in MWs)

Rank	State	Primary Resource	Percent of OnLine Capacity	Secondary Resource	Percent of OnLine Capacity	OnLine Capacity
28	Texas	Biomass	88.8	Hydro	7.7	77.6
29	New Jersey	Biomass	77.4	Hydro	22.6	64.5
30	Utah	Geothermal	80.2	Hydro	11.5	48.6
31	Oklahoma	Biomass	99.3	Wind	0.4	45.8
32	Illinois	Biomass	83.8	Hydro	16.2	26.5
33	Iowa	Biomass	99.1	Wind	0.9	22.2
34	Colorado	Hydro	52.2	Biomass	47.3	20.1
35	Montana	Biomass	68.6	Hydro	25.9	18.5
36	Wyoming	Wind	55.2	Biomass	44.8	14.5
37	Delaware	Biomass	96.4	Hydro	3.6	13.8
38	North Dakota	Biomass	95.7	Wind	4.3	9.4
39	South Dakota	Hydro	100.0	None	0.0	8.4
40	Rhode Island	Hydro	100.0	None	0.0	4.4
41	Arizona	Hydro	72.8	Biomass and Photovoltaics	12.1 12.1	3.3
42	Kansas	Hydro	61.3	Wind	38.7	3.1
43	Arkansas	Biomass	94.7	Wind	5.3	1.9
44	New Mexico	Biomass	50.0	Wind and Photovoltaics	25.0 25.0	0.4
45	Indiana	Hydro	66.7	Wind	33.3	0.3
46	Kentucky	N/A	--	N/A	--	0.0
47	Missouri	N/A	--	N/A	--	0.0
48	Nebraska	N/A	--	N/A	--	0.0

Source: Adapted from *Investing in the Future: A Regulator's Guide to Renewable* (Washington, D.C.: NARUC, 1993). These data only include hydroelectric power that is owned by nonutility generators.

TABLE F-4
Page 1 of 2
RANK ORDER OF ONLINE RENEWABLE CAPACITY:
PROCEDURE FOR EVALUATING THE COST-EFFECTIVENESS OF RENEWABLE RESOURCES
(Contiguous Surveyed States in MWs as of August 1992)

Rank	State	Total Resource Test		Utility Impact Test		Ratepayer Impact Test	
		Required	Optional	Required	Optional	Required	Optional
1	California	Yes		No	No	No	No
2	Maine	No	No	Yes		No	No
3	Florida	--	--	--	--	--	--
4	Georgia	No	No	Yes		No	No
5	New York	Yes		No	No	No	No
6	Alabama	No	No	Yes		No	No
7	Michigan	No	No	Yes		No	No
8	North Carolina	N/R	N/R	N/R	N/R	N/R	N/R
9	Virginia		Yes		Yes		Yes
10	Massachusetts	Yes		No	No	No	No
11	Tennessee	N/A	N/A	N/A	N/A	N/A	N/A
12	Oregon	Yes		No	No	No	No
13	New Hampshire	No	No	Yes		No	No
14	Washington	No	No	Yes		No	No
15	South Carolina	No	No	Yes		No	No
16	Connecticut	No	No	Yes		No	No
17	Wisconsin	Yes		Yes			Yes
18	Louisiana	N/R	N/R	N/R	N/R	N/R	N/R
19	Pennsylvania						
20	Minnesota	Yes		No	No	No	No
21	Idaho	No	No	Yes		No	No
22	Vermont	Yes		No	No	No	No
23	Nevada	N/R	N/R	N/R	N/R	N/R	N/R
24	Ohio	No	No	Yes		No	No
25	West Virginia	No	No	Yes		No	No
26	Mississippi						
27	Maryland	No	No	Yes			Yes

TABLE F-4
Page 2 of 2
RANK ORDER OF ONLINE RENEWABLE CAPACITY:
PROCEDURE FOR EVALUATING THE COST-EFFECTIVENESS OF RENEWABLE RESOURCES
(Contiguous Surveyed States in MWs as of August 1992)

Rank	State	Total Resource Test		Utility Impact Test		Ratepayer Impact Test	
		Required	Optional	Required	Optional	Required	Optional
28	Texas	No	No	Yes		No	No
29	New Jersey						
30	Utah	No	No	Yes		No	No
31	Oklahoma	N/R	N/R	N/R	N/R	N/R	N/R
32	Illinois		Yes	Yes		No	No
33	Iowa	N/R	N/R	N/R	N/R	N/R	N/R
34	Colorado	N/R	N/R	N/R	N/R	N/R	N/R
35	Montana	N/R	N/R	N/R	N/R	N/R	N/R
36	Wyoming	No	No	No	No	Yes	
37	Delaware	No	No	Yes			Yes
38	North Dakota	N/R	N/R	N/R	N/R	N/R	N/R
39	South Dakota	N/R	N/R	N/R	N/R	N/R	N/R
40	Rhode Island	No	No	Yes		No	No
41	Arizona	Yes		No	No	No	
42	Kansas	N/R	N/R	N/R	N/R	N/R	N/R
43	Arkansas	Yes		No	No	No	No
44	New Mexico	No	No	Yes		No	No
45	Indiana	No	No	Yes		No	No
46	Kentucky	N/R	N/R	N/R	N/R	N/R	N/R
47	Missouri	N/A	N/A	N/A	N/A	N/A	N/A
48	Nebraska	N/A	N/A	N/A	N/A	N/A	N/A

Source: The ranking of states is derived from online data in *Investing in the Future*. These data only include hydroelectric power that is owned by nonutility generators. The National Regulatory Research Institute collected the remaining data through interviews with commissioners or commission staff.

TABLE F-5

RESOURCE CHARACTERISTICS OF THE TOP TWENTY STATES IN TERMS OF ONLINE RENEWABLE CAPACITY
(Contiguous Surveyed States in MWs as of August 1992)

Rank	State	Primary Resource	Percent of OnLine Capacity	Secondary Resource	Percent of OnLine Capacity	OnLine Capacity
1	California	Geothermal	44.0	Wind	26.9	6,047.4
2	Maine	Biomass	60.8	Hydro	39.2	855.6
4	Georgia	Biomass	96.8	Hydro	3.1	606.0
5	New York	Hydro	50.9	Biomass	48.9	597.7
6	Alabama	Biomass	99.9	Photovoltaics	0.1	524.1
7	Michigan	Biomass	86.3	Hydro	13.7	421.5
8	North Carolina	Hydro	69.1	Biomass	30.9	413.4
9	Virginia	Biomass	94.5	Hydro	5.4	348.3
10	Massachusetts	Biomass	77.2	Hydro	22.4	329.3
11	Tennessee	Hydro	57.4	Biomass	42.6	299.1
12	Oregon	Biomass	91.2	Hydro	7.6	277.7
13	New Hampshire	Biomass	56.7	Hydro	42.7	275.8
14	Washington	Biomass	79.3	Hydro	20.7	275.8
15	South Carolina	Biomass	88.6	Hydro	11.4	243.1
16	Connecticut	Biomass	87.2	Hydro	12.7	207.4
17	Wisconsin	Biomass	71.8	Hydro	28.1	206.1
18	Louisiana	Hydro	93.7	Biomass	6.3	205.0
19	Pennsylvania	Biomass	87.5	Hydro	12.2	200.8
20	Minnesota	Biomass	65.0	Hydro	34.0	190.1
21	Idaho	Hydro	85.0	Biomass	14.9	170.5

Source: The ranking of states is derived from online data in *Investing in the Future*. These data only include hydroelectric power that is owned by nonutility generators. The National Regulatory Research Institute collected the remaining data through interviews with commissioners or commission staff.

TABLE F-6

SUMMARY OF RESOURCES OF THE TOP TWENTY STATES IN TERMS OF ONLINE RENEWABLE CAPACITY
(Contiguous Surveyed States in MWs as of August 1992)

Rank	State	Hydro	Biomass	Geothermal	Photo-voltaics	Solar Thermal	Wind	Online Capacity
1	California	166.6	1,215.8	2,660.2	9.9	369.0	1,625.9	6,047.4
2	Maine	335.5	520.0	0.0	0.0	0.0	0.1	855.6
4	Georgia	18.9	586.7	0.0	0.0	0.4	0.0	606.0
5	New York	304.1	292.2	0.0	0.0	0.0	1.4	597.7
6	Alabama	0.0	524.0	0.0	0.1	0.0	0.0	524.1
7	Michigan	57.8	363.6	0.0	0.0	0.0	0.1	421.5
8	North Carolina	285.7	127.7	0.0	0.0	0.0	0.0	413.4
9	Virginia	18.9	329.3	0.0	0.1	0.0	0.0	348.3
10	Massachusetts	73.9	254.1	0.0	0.2	0.0	1.1	329.3
11	Tennessee	171.7	127.4	0.0	0.0	0.0	0.0	299.1
12	Oregon	21.1	253.3	2.0	0.0	0.0	1.3	277.7
13	New Hampshire	117.9	156.5	0.0	0.0	0.0	1.4	275.8
14	Washington	57.1	218.7	0.0	0.0	0.0	0.0	275.8
15	South Carolina	27.8	215.3	0.0	0.0	0.0	0.0	243.1
16	Connecticut	26.4	180.9	0.0	0.0	0.0	0.1	207.4
17	Wisconsin	58.0	147.9	0.0	0.0	0.0	0.2	206.1
18	Louisiana	192.0	13.0	0.0	0.0	0.0	0.0	205.0
19	Pennsylvania	24.5	175.6	0.0	0.0	0.0	0.7	200.8
20	Minnesota	64.7	123.6	0.0	0.0	0.0	1.8	190.1
21	Idaho	144.9	25.5	0.0	0.0	0.0	0.1	170.5

Source: The ranking of states is derived from online data in *Investing in the Future*. These data only include hydroelectric power that is owned by nonutility generators. The National Regulatory Research Institute collected the remaining data through interviews with commissioners or commission staff.

TABLE F-7

RENEWABLE RESOURCE POLICIES OF THE TOP TWENTY STATES IN TERMS OF ONLINE RENEWABLE CAPACITY
(Contiguous Surveyed States in MWs as of August 1992)

Rank	State	Legislation Encouraging Renewables	Regulatory Preferences for Renewables	Preferential Treatment for Renewables	Environmental Externality Considered
1	California	Yes	Yes	Yes	Yes
2	Maine	Yes	Yes	Yes	Yes
4	Georgia	Yes	No	No	No
5	New York	No	Yes	No	No
6	Alabama	No	No	No	No
7	Michigan	No	Yes	Yes	No
8	North Carolina	Yes	No	No	No
9	Virginia	Yes	No	No	No
10	Massachusetts	No	Yes	Yes	Yes
11	Tennessee	N/A	No	No	No
12	Oregon	Yes	Yes	Yes	Yes
13	New Hampshire	Yes	Yes	Yes	Yes
14	Washington	Yes	Yes	Yes	Yes
15	South Carolina	No	No	No	No
16	Connecticut	Yes	No	Yes	Yes
17	Wisconsin	Yes	Yes	Yes	Yes
18	Louisiana	No	No	No	No
19	Pennsylvania				
20	Minnesota	Yes	Yes	Yes	No
21	Idaho	No	No	No	No

Source: The ranking of states is derived from online data in *Investing in the Future*. These data only include hydroelectric power that is owned by nonutility generators. The National Regulatory Research Institute collected the remaining data through interviews with commissioners or commission staff.

TABLE F-8

INCENTIVE POLICIES OF THE TOP TWENTY STATES IN TERMS OF ONLINE RENEWABLE CAPACITY
(Contiguous Surveyed States in MWs as of August 1992)

Rank	State	Active Conservation Lobby	Conservation Section at Commission	Incentives to Promote Conservation	Incentives to Promote Renewables
1	California	Yes	Yes	Yes	Yes
2	Maine	Yes	No	No	No
4	Georgia	Yes	No	No	No
5	New York	Yes	Yes	Yes	Yes
6	Alabama	No	No	No	No
7	Michigan	No	Yes	Yes	No
8	North Carolina	Yes	No	Yes	No
9	Virginia	Yes	No	No	N/R
10	Massachusetts	Yes	No	Yes	Yes
11	Tennessee	No	No	No	No
12	Oregon	Yes	No	Yes	Yes
13	New Hampshire	Yes	Yes	Yes	No
14	Washington	Yes	No	Yes	No
15	South Carolina	No	No	Yes	No
16	Connecticut	No	No	Yes	Yes
17	Wisconsin	Yes	No	Yes	Yes
18	Louisiana	No	No	No	No
19	Pennsylvania				
20	Minnesota	Yes	No	Yes	No
21	Idaho	No	No	Yes	No

Source: The ranking of states is derived from online data in *Investing in the Future*. These data only include hydroelectric power that is owned by nonutility generators. The National Regulatory Research Institute collected the remaining data through interviews with commissioners or commission staff.

TABLE F-9

PROMOTIONAL POLICIES OF THE TOP TWENTY STATES IN TERMS OF ONLINE RENEWABLE CAPACITY
(Contiguous Surveyed States in MWs as of August 1992)

Rank	State	Renewables Set Aside	Price Advantage in Cost-Benefit Analysis	Renewables Risk Adjustment	Nonquantified Assessment of Externalities	Quantified Assessment of Externalities	Avoidance of Oil Dependency
1	California				Yes	Yes	
2	Maine				Yes		
4	Georgia						
5	New York						
6	Alabama						
7	Michigan	Yes					
8	North Carolina						
9	Virginia						
10	Massachusetts					Yes	
11	Tennessee						
12	Oregon	Yes			Yes	Yes	
13	New Hampshire				Yes		
14	Washington		Yes		Yes		
15	South Carolina						
16	Connecticut				Yes		
17	Wisconsin				Yes		
18	Louisiana						
19	Pennsylvania						
20	Minnesota	Yes					
21	Idaho						

Source: The ranking of states is derived from online data in *Investing in the Future.* These data only include hydroelectric power that is owned by nonutility generators. The National Regulatory Research Institute collected the remaining data through interviews with commissioners or commission staff.