



**Evaluating State Renewables
Portfolio Standards**
A focus on geothermal energy

Evaluating State Renewables Portfolio Standards:

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ABOUT THE NATIONAL GEOTHERMAL COLLABORATIVE

A U.S. consensus-based collaborative, the National Geothermal Collaborative (NGC), was formed in 2002 to identify issues that impede the use of geothermal power, establish dialogue among key stakeholders, and catalyze appropriate activities to overcome obstacles to appropriate development. Our vision is that geothermal power is environmentally, economically and politically sustainable and fully integrated into mainstream energy markets.

The NGC is led by a steering committee whose membership to date includes representation from both investor owned and public utilities, academia, state energy offices, White House Task Force on Energy Project Streamlining, Center for Energy Efficiency and Renewable Technologies, Council of Energy Resource Tribes, Geothermal Resource Council and Geothermal Energy Association, Departments of Interior, Agriculture and Energy, and the National Conference of State Legislatures.

RESOLVE, a non-profit environmental dispute resolution organization, provides a full range of facilitation services to create opportunities for NGC members and other geothermal stakeholders to build long-term relationships, and to develop a number of land mark products resulting from significant negotiation and reflecting consensus of the Committee.

NGC members represent these sectors:

- Electric Utilities (both investor owned and public)
- Geothermal Industry
- Environmental/Renewable Energy
- National Conference of State Legislatures
- Academia
- Tribes
- State Energy Offices
- Public land managers

NGC members include representatives from:

Bureau of Land Management
Center for Energy Efficiency and Renewable Technologies
Council of Energy Resource Tribes
Geothermal Energy Association
Geothermal Resources Council
National Conference of State Legislatures
Seattle City Lights
Southern California Edison

State of Nevada, Commission on Mineral Resources
U.S. Department of Agriculture (Forest Service)
U.S. Department of Energy, EERE, GPW
Washington State University
White House Task Force on Energy Project Streamlining

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PREFACE

The National Geothermal Collaborative (NGC) is pleased to present this examination of state-level Renewables Portfolio Standards (RPS) and their impact on the development of geothermal energy in the United States. The RPS ensures that a minimum amount of renewable energy is included in the portfolio of electricity resources.¹ The purpose of this report is to evaluate early experience with, and specifically highlight the role of, geothermal energy in state RPS policies. As this report illustrates, creating an effective and well-functioning RPS is a complex endeavor with no uniform approach. The report begins with a discussion of the advantages and disadvantages of using a portfolio standard to develop geothermal markets, and concludes by highlighting principles and best practices that may be effective in guiding future RPS design efforts. It is the consensus of the NGC that this analysis is a valuable tool in determining whether or not, and how, to construct an effective RPS.

The NGC is a national, consensus-based stakeholder group established in 2002. Individual members of the NGC represent federal and state government, trade and educational associations, public and investor-owned utilities, tribal organizations, energy, and environmental interest groups. The purpose of the NGC is to advance the development and use of geothermal heat and power in the U.S., identifying issues that impede the use of geothermal power, establishing dialogue with key stakeholders, and catalyzing activities to overcome obstacles to appropriate development. One critical action identified in the group's first meeting was to develop solutions to mitigate market barriers and remove obstacles to the sustained, orderly development and accelerated procurement of geothermal power. This report was commissioned to move the Collaborative down that road.

To examine the impacts of current and potential RPS policies on geothermal development, the Collaborative formed a Renewables Portfolio Standard Work Group in accordance with NGC protocol and with guidance from the NGC Steering Committee. A Request For Proposals was drafted and competitively bid. The authors' study was presented to the RPS Work Group for review and comment, followed by a recommendation to the entire NGC to review and adopt the document. The NGC recognizes that the ultimate success of any RPS will depend on a variety of other factors including transmission infrastructure, strength of the renewable resource, and other state policies that may already be in place.

Heat from the Earth

Geothermal energy, heat from the Earth's interior, is one of the world's cleanest, most reliable and abundant sources of energy. This heat is brought to the surface as steam or hot water—created when water flows through heated, permeable rock—and converted to electricity or used directly for space heating/cooling in homes and buildings. Higher temperature

¹ The RPS typically applies to investor-owned electric utilities and competitive energy service providers, but this is not uniformly the case. With few exceptions, publicly-owned utilities have been exempted from the RPS requirements. One such exception is Wisconsin, where most municipalities and coops must meet the RPS along with investor-owned utilities.

geothermal resources supply 6 percent of the electricity in California, 10 percent in Northern Nevada, and 20 percent on the Big Island of Hawaii. Additionally, low-temperature, direct-use projects that provide energy for commercial, industrial and residential uses are found in 23 states, mostly in the West.

Benefits of Geothermal

A significant advantage of geothermal energy is its comparatively clean generation of electricity. Generating power with fossil fuels results in major releases of regulated emissions of sulfur dioxide, nitrogen oxides, and gases such as carbon dioxide. Nuclear power plants yield radioactive waste as by-products of the power generation process. The net environmental impact of these by-products contribute to widely acknowledged environmental problems, including acid precipitation, formation of ground-level ozone and the well-publicized greenhouse effect, and longstanding concern surrounding the proper disposal of radioactive waste. Geothermal plants emit relatively minor amounts of gases to the air and produce no radioactive waste. In addition, geothermal power production facilities require a fraction of the land necessary for traditionally-fueled power plants.

The economic benefits of geothermal energy are also important, particularly to states and local communities. Using geothermal energy can contribute to a reduction of our dependence on foreign sources of fuel, create domestic jobs, and provide revenue to federal, state and local governments.

The reliability of electricity produced using geothermal energy can also benefit utilities that need “baseload” energy. Because operation and maintenance is minimal, geothermal plants generate power a greater percentage of the time than coal and nuclear power plants. This remarkably low down-time gives utility planners greater flexibility to meet electricity demand. In addition, direct-use of geothermal heat contributes to better utility planning by off-setting contingency needs for electricity.

The cumulative production of geothermal energy in all of its forms ranks third among renewables, following hydroelectricity and biomass and ahead of solar and wind. Geothermal energy is becoming increasingly cost competitive with other renewables and traditional sources of energy. In fact, the cost of generating power from geothermal resources has decreased approximately 25 percent over the past two decades. The cost of geothermal electricity currently ranges from about 4 to 8 cents per kilowatt-hour depending on the strength of the resource. The geothermal industry and the U.S. Department of Energy are working together to achieve a goal of 3 cents per kilowatt-hour.

Despite these benefits, the current level of geothermal use pales in comparison to its potential. The total U.S. installed capacity is approximately 2700 MW. According to testimony submitted to the Subcommittee on Energy and Mineral Resources of the Committee on Resources of the House of Representatives on July 22, 2003, the U.S. Geological Survey and the Geothermal Energy Association believe that geothermal energy potential exists to provide over 20,000 MW of electricity in coming years. (One hundred megawatts (MW) provide the residential electricity

needs of a city of 200,000 people.)² The key to greater use of our nation's geothermal resources is a combination of a supportive policy framework, technology advancement and public support.

A Policy Approach to Geothermal Development

In a growing number of states, RPS programs are emerging as a policy option for increasing the use of domestic renewable energy. As renewables portfolio standards create and expand the markets for renewable energy sources, use of geothermal energy could increase. The combined effect of greater use of geothermal energy through compliance with an RPS may help:

- Diversify a state's energy portfolio
- Protect customers from fossil-fuel price spikes and supply shortages
- Improve national security by helping to reduce reliance on imported fuel and electricity
- Reduce the cost of renewable energy technologies by creating and expanding markets for renewable energy sources
- Protect the environment and public health
- Increase local economic development opportunities

The greatest opportunity for new geothermal development in the United States exists in many western states, a region characterized by steadily increasing population and demand for energy. California, New Mexico, and Nevada each have an RPS in place in which geothermal energy is an eligible technology. It is the consensus of the NGC that, given the early experiences with the various RPS states' policies, this report provides a thorough analysis of the advantages, disadvantages, opportunities, and obstacles that states may encounter when considering a renewable portfolio standard.

A link to the final report will be provided at www.geocollaborative.org.

² www.eere.energy.gov/geopoweringthewest/geomap.html

EXECUTIVE SUMMARY

Report Objectives and Content

Geothermal energy production can provide fuel diversity, energy security, economic development, and environmental benefits. State policymakers have recognized these potential benefits by creating specific policies to support geothermal and other forms of renewable energy.

Among the available policy tools, the renewables portfolio standard (RPS) has become increasingly popular in some states. Some stakeholders consider the RPS to be an attractive means of supporting renewable energy. Others view the policy less favorably, and early experience with the RPS in U.S. states has been mixed. Moreover, geothermal energy has not yet been the primary beneficiary of many state RPS policies.

The purpose of this report is to evaluate early experience with state RPS policies, and to specifically highlight the role of geothermal energy in these policies. In particular this report: (1) provides a summary of the status and results of state RPS policies; (2) briefly assesses the advantages and disadvantages of the RPS; (3) critiques the effectiveness of state RPS policies based on a series of objective evaluation criteria; and (4) evaluates approaches to specifically encourage geothermal energy under state RPS policies. The report also includes several appendices that provide detailed summaries of state RPS policies, as well as the results of interviews with 12 relevant stakeholders regarding the RPS. The report concludes by highlighting principles and best practices that we believe would be effective in guiding future RPS design efforts.

Because many of the state RPS policies have only recently been established, this report presents merely a snap-shot of this experience. This study should therefore be considered a living document, with updates made over time as additional experiences are gained and lessons learned.

Conclusions of this report include: (1) the RPS is becoming increasingly popular as a policy option to develop renewable and geothermal energy markets; (2) there are several advantages and disadvantages to the RPS as a tool to develop geothermal energy markets; (3) designing a successful and well-functioning RPS can be challenging, as documented by existing experience with state RPS policies; (4) perhaps because of those challenges, there are a number of design pitfalls with state RPS policies that are discussed in this report; (5) in designing an RPS, a policymaker may wish to consider a set of design principles and best practices that are highlighted in this paper; and (6) geothermal energy, because of its unique characteristics, is likely to fare best under a state RPS that meets certain design criteria.

State Experience with RPS Policies

The RPS ensures that a minimum amount of renewable energy is included in the portfolio of electricity resources. It does so by requiring electric suppliers (otherwise referred to as load-serving entities, or LSEs) to include a minimum amount of renewables in their electricity supply.

The RPS, or RPS-like mandates, has been established in 13 U.S. states: Arizona, California, Connecticut, Iowa, Maine, Massachusetts, Minnesota, Nevada, New Jersey, New Mexico,

Pennsylvania, Texas, and Wisconsin. An important observation is that there is no single way to design an RPS, and each of these states has crafted their policies differently, sometimes radically so. These design variations are discussed in Chapters 2 and 4, and in Appendix A and E.

Though the majority of existing RPS policies have only recently been established, their impact over time *could* be substantial. In fact, these policies have already begun to have an impact; this is especially apparent for wind power, and to a far lesser degree for geothermal.

The Advantages and Disadvantages of an RPS

When considering the application of an RPS, it is important to understand both the advantages and disadvantages of the RPS as a policy instrument, as well as alternative policies that might be applied in lieu of or in addition to an RPS. These issues are discussed in Chapter 3.

We find that the RPS has some potential *theoretical* appeal compared to other renewable energy policies: (1) an RPS can drive a known quantity of new renewable development and can ensure that there are buyers for that energy, (2) it may help lower the total cost of that development by giving LSEs the flexibility to meet their purchase targets in the way they deem best, and encouraging competition among renewable developers, (3) an RPS can be competitively neutral if it is applied equally to all retail electricity suppliers, (4) an RPS may impose relatively low administrative burdens and direct administrative costs on those responsible for overseeing the policy, and (5) an RPS can be applied in both restructured and monopoly markets.

And yet we also find that the RPS has some potential disadvantages relative to other types of renewable energy policies: (1) due to its complexity, the RPS can be difficult to design and implement well, (2) an RPS may be less flexible in offering targeted support to renewable energy than some of the other renewable energy policies, (3) the exact cost impacts of an RPS cannot be known with certainty in advance, (4) operating experience with the RPS remains limited, (5) if an RPS does not lead to the availability of long-term power purchase agreements, the ability to finance new renewable projects will be limited and compliance costs may increase, and (6) an RPS is not *necessarily* suited to supporting diversity among renewable technologies, although an RPS can be designed to do so through the use of resource tiers and credit multipliers.

In addition to the RPS, several other state and federal policy approaches have been used to support geothermal energy: integrated resource planning, tax incentives, renewable energy funds, encouragement of voluntary purchases of green power, and government purchases of renewable energy. Some of these policies may serve as alternatives to an RPS, while others might best be considered complements. Though this document does not evaluate these options in detail, we do provide a brief description these policies, compare them with the RPS, and identify the degree to which they might be complementary to an RPS. We also specifically summarize the degree to which these other policies have been or might be used to support geothermal energy markets.

Developing Criteria to Evaluate State RPS Policies

A number of evaluation criteria might be applied to assess the actual or expected effectiveness of a state RPS policy in driving both new renewable energy development in general, as well as the development of geothermal energy resources more specifically. Chapter 4 introduces and applies evaluation criteria that can be used for making such judgments.

State RPS policies are at different phases of implementation: some have been operating for several years, while others have yet to begin. To accommodate these different phases, our evaluation criteria fall within four broad categories: (1) outcome criteria, (2) policy design criteria, (3) market context criteria, and (4) geothermal-specific criteria. We ultimately develop 21 criteria, listed in Text Box ES-1.

Outcome Criteria: The Good, the Bad, and the Ugly

Despite limited experience to date, a variety of states are succeeding on one or more of the outcome-based criteria. In sum, based on the outcome criteria, Texas, Minnesota, and Iowa rate most highly: these RPS policies have worked or are working. Texas' RPS has perhaps shown the most success overall in effectively supporting renewable energy markets. The Texas policy has driven substantial new wind power additions, has done so with reasonable cost impacts that are being passed on to customers, and retail suppliers appear as if they will fully comply with the policy.

Other state policies have had little to no impact on renewable energy markets so far, and therefore rate poorly on the outcome-based criteria; Connecticut, Maine and Pennsylvania all fall within this category. The success of the remaining states in meeting these criteria is mixed, but some success has been achieved or is expected in a number of different jurisdictions: Arizona, California, Massachusetts, Nevada, New Jersey, New Mexico, and Wisconsin.

Policy Design and Market Context Criteria: Pitfalls

We find that experience with state RPS policies has been decidedly mixed. Some of the more common and critical design pitfalls experienced by states include:

- narrow applicability,
- poorly balanced supply-demand conditions,
- insufficient duration and stability of targets,
- insufficient enforcement, and
- poorly defined or non-existent contracting standards and cost recovery mechanisms for regulated utilities and providers of last resort in competitive markets.

TEXT BOX ES-1: RPS EVALUATION CRITERIA

Outcome-Based Criteria

- Amount of New Renewable Energy Development
- Full Compliance with RPS Policies
- Reasonable and Stable Cost Impacts
- Prudently Incurred Compliance Costs Borne by Ratepayers

Policy Design Criteria

- Broad Applicability
- Carefully Balanced Supply-Demand Condition
- Sufficient Duration and Stability of Targets
- Well-Defined and Stable Resource Eligibility Rules
- Well-Defined and Stable Treatment of Out-of-State Resources
- Credible and Effective Enforcement
- Flexible Verification Mechanisms
- Adequate Compliance Flexibility
- Contracting Standards and Cost Recovery Mechanisms for Regulated Utilities and Standard Offer and Default Service
- Product-Based, as Opposed to Company-Based Compliance

Market Context Criteria

- Presence of Creditworthy Long-Term Power Purchasers
- Stable Political and Regulatory Support
- Adequate and Accessible Developable Resource Potential

Geothermal-Specific Criteria

- Geothermal Development
- Geothermal Resource Availability and Eligibility
- RPS Design Elements that *Specifically* Encourage Geothermal
- RPS Design Elements that *Indirectly* Encourage Geothermal

In addition to these major pitfalls, other pitfalls that states have fallen into are less severe: (1) poorly defined and unstable resource eligibility rules, (2) poorly defined and unstable rules for out-of-state renewable generation, (3) rigid verification mechanisms, (4) inadequate compliance flexibility, and (5) company-based application of an RPS.

Finally, even where the design of an RPS is strong, some state policies do poorly on the market context criteria. In these cases, even an otherwise well-designed policy may fail: (1) lack of credit-worthy long-term power purchasers, (2) unstable political and regulatory support, and (3) inadequate or inaccessible developable resource potential.

Geothermal-Specific Criteria

Only four of the 13 states with an existing RPS have significant geothermal resource potential: California, Nevada, New Mexico, and Arizona. Geothermal electricity, where adequate resource potential exists, is typically an eligible renewable source under RPS policies; Arizona provides the only exception among the 13 existing policies.

While wind power has proven to be the primary beneficiary of state RPS policies so far, geothermal has generally done well, or appears likely to do well, in states with RPS policies in which the geothermal resource base is known, and if other parameters besides the cost of energy delivery are incorporated into the RPS. These parameters include such elements as capacity value and whether the renewable resource is a “least-cost, best-fit match” with a utility’s resource portfolio. The RPS policies in California and Nevada meet these requirements.

Even with these aspects of an RPS in place, however, if the geothermal resource itself is not well known, then the prospects for developing geothermal power plants may diminish. This suggests the need for other government policies or actions to explore the availability of geothermal resources in states where the resource is not proven or well known.

Policy Design Principles and Best Practices

We find there is no single, “ideal” way to design a state RPS. Nonetheless, most effective RPS designs appear to meet a number of minimum requirements. In Chapter 5 we develop a detailed list of broad policy design principles and specific best practice design elements, based on early experience with state RPS policies. We believe that these principles and best practices can be productively used to guide state RPS policy design.

The recommended design principles are as follows:

- **Socially Beneficial.** A well-designed RPS will support increased renewable energy production, and thereby contribute to an improvement in environmental quality, to increased diversity in energy supply, to decreased risk, and to other politically chosen objectives.
- **Cost Effective and Flexible.** A well-designed RPS will be implemented and administered in a straightforward, flexible, cost-effective, and not unduly burdensome manner.
- **Predictable.** A well-designed RPS will provide market stability for all participants, reducing regulatory risk for generators and LSEs and improving the ability of renewable developers to obtain financeable long-term contracts.
- **Nondiscriminatory.** A well-designed RPS will be applied fairly, consistently, and proportionately to all market participants and customers.
- **Enforceable.** An effective RPS will be enforceable, ensuring that the policy's renewable energy targets and broader goals are achieved.
- **Consistency with Market Structure.** A well-designed RPS will be consistent with and complement the structure of a state's electricity market, whether regulated or restructured.
- **Compatibility with Other Policies.** A well-designed RPS will be compatible with other applicable policies and regulations in the state and, where possible, the broader region.

Conclusions: The Role of Geothermal Energy in RPS Policies

With few exceptions, the design principles and best practices described in Chapter 5 (and summarized above) do not *specifically* highlight the role that geothermal energy might play under an RPS. This is by design. The largest challenge with the RPS appears to be avoiding major design pitfalls. Therefore, our analysis leads us to conclude that, to assure that RPS policies are effective in supporting geothermal energy, two major conditions must apply: (1) geothermal must, of course, be eligible, and (2) the RPS should be designed well and implemented effectively in a broader sense.

In constructing a well-designed RPS it will be important for regulators and legislators to recognize the unique features of geothermal energy: geothermal can provide large blocks of baseload power, but the resource is restricted to certain locations and substantial exploration costs and development time are required to prove the adequacy of the resource. To accommodate these features, RPS administrators might wish to place particular emphasis on certain “best practice” RPS design features highlighted in Chapter 5.

- **Even-handed Comparisons of Renewable Sources:** Perhaps most importantly, in designing contracting standards for regulated utilities, renewable energy sources would ideally be compared with one another in an even-handed manner, considering the direct and indirect costs and attributes of each resource (including integration and deliverability characteristics). This may be essential in valuing the unique benefits that geothermal sources provide.
- **Geographic Eligibility:** Determinations on the eligibility of out-of-state renewable plants can also affect the role of geothermal energy under a state RPS. In states with weak geothermal resources, allowing out-of-state generators to qualify will provide access to a market for out-of-state geothermal resources. Conversely, in states with robust geothermal resources, an in-state restriction for eligibility will make in-state geothermal projects less susceptible to lower-priced out-of-state competition.
- **Development Lead Time:** Another important issue for the geothermal industry is the uncertainty in the amount of geothermal resources that exist in certain states and resource

areas, which itself lengthens development lead times for geothermal plants. An RPS in which the targets are known well in advance may be essential to accommodate these lead times.

- **RPS Target Increases and Compliance Flexibility Mechanisms:** Some of the most cost-effective geothermal plants come in large increments. As a result, an RPS that drives substantial geothermal development will be one whose targets are aggressive enough to allow the market to take advantage of geothermal plants that are able to achieve scale economies. For similar reasons, compliance flexibility mechanisms such as banking may be particularly important for geothermal plants.

Beyond those design considerations noted above, state RPS policies may not need additional *specific* encouragement for geothermal energy to adequately support development efforts. This conclusion is driven, at least in part, by the fact that geothermal energy appears likely to compete with some success against other renewable energy sources in those states in which geothermal resources are available and the RPS is reasonably well designed (i.e., Nevada and California).

We acknowledge that the evidence is limited, however, and that other energy sources may prove to benefit more heavily from state RPS policies than does geothermal. Consequently, if relying on “market” forces to ensure geothermal development is deemed insufficient, either because other incentives (e.g., the production tax credit for wind power) skew the competitive playing field or because of a desire to assure a diversity of renewable energy sources, there are at least three methods by which to give geothermal energy more direct support under a state RPS: credit multipliers, technology bands, and resource contribution limits.

1 Introduction

1.1 Background and Objectives

Renewable electricity, including electricity produced from geothermal sources, can provide fuel diversity, security, economic development, and environmental benefits. State policymakers have increasingly recognized these potential benefits through the creation of specific incentives and mandates for renewable energy. Though these policies are often not uniquely targeted at geothermal electricity generators, where substantial resources exist, geothermal may benefit.

Among the available policy tools, the renewables portfolio standard (RPS) has become increasingly popular in some jurisdictions. The RPS ensures that a minimum amount of renewable energy is included in the portfolio of electricity resources. It does so by requiring retail electricity suppliers to include a minimum amount of eligible renewable resources in their electricity supply. To add flexibility and potentially reduce the cost of meeting the requirement, tradable renewable certificates (TRC) can be used to track and verify compliance.

Some stakeholders consider the RPS to be the “ideal” way to encourage renewable energy development; proponents of the RPS claim that it will ensure that renewable energy targets are met at a lower social cost and with less ongoing administrative involvement by the government than other types of renewable energy policies (Rader and Norgaard 1996, Haddad and Jefferiss 1999, Berry and Jaccard 2001, Morthorst 2000). Detailed recommendations for the design of an RPS have been provided in other papers (e.g., Rader and Hempling 2001, Schaeffer et al. 2000).

Despite the recent acclaim and popularity of the RPS, however, the policy also has detractors; as discussed later in this report, just as the RPS has certain advantages relative to other policy types, so too does it have disadvantages. Moreover, with few exceptions (e.g., Wiser and Langniss 2003), little effort has been placed on actually evaluating early experience with the policy. This is in part a result of the fact that the RPS is a relatively new policy, and practical experience in the application of the policy has, until recently, been limited.

The RPS (or RPS-like mandates) has been established in 13 U.S. states, and in a number of other countries. As highlighted later in this report, this early experience has been mixed. On the one hand, experience from Texas and other states demonstrate that a well-crafted and implemented RPS can effectively provide support for renewable energy. Despite this, experience in a number of other U.S. states shows that poorly designed RPS policies are prevalent and that these policies will do little to increase renewable generation.³ More specifically, geothermal energy has not yet been the primary beneficiary of many state RPS policies.

This report was commissioned by the National Geothermal Collaborative (NGC), a group of stakeholders interested in supporting geothermal energy development, as well as those who see potential for efficient, environmentally and economically sound use of the resource, if specific concerns are addressed. The purpose of NGC is to advance the development and use of

³ This is confirmed by other authors; see, for example, Rader (2000).

geothermal energy in the U.S. by identifying issues that impede the use of geothermal energy, establishing dialogue with key stakeholders, and catalyzing activities to overcome obstacles to appropriate development. The NGC vision is that geothermal energy is environmentally, economically and politically sustainable and fully integrated into mainstream energy markets.

The purpose of this report is to describe the status and results of state RPS policies, and to critique the effectiveness of these policies. Though state RPS policies are beginning to create sizable new markets for wind power, the ability of the RPS to support significant expansion of geothermal markets remains unclear. In several ways, geothermal energy resources are unique: geothermal energy often provides large blocks of baseload power, but the resource is restricted to certain locations and substantial exploration costs and development time are often required to prove the adequacy of the resource. Accordingly, the principal objective of this work is not only to evaluate the effectiveness of state RPS policies in driving renewables development generally, but also to specifically highlight the role of geothermal in these policies.⁴

In addition to describing early experience with existing state RPS policies, and judging the effectiveness of these policies based on a series of objective criteria, this report also: (1) briefly assesses the advantages and disadvantages of the RPS relative to other ways of encouraging renewable energy; (2) evaluates approaches to specifically encourage geothermal energy under state RPS policies; and (3) reviews the results of interviews with 12 relevant stakeholders regarding the RPS. The report concludes by highlighting principles and best practices that we believe would be effective in guiding future RPS design efforts.

This report is best viewed as a living document. Because most RPS policies have only recently been established, much is still being learned about the advantages, disadvantages, and appropriate design of an RPS, as well as the unique role of geothermal energy in these policies. This report is therefore merely a snapshot of early experience with the policy; it would be entirely appropriate to review and revise the preliminary findings discussed in this report as more experience is gained.

1.2 Methodology and Report Organization

This report has benefited from the extensive experience of the authors in helping to design, implement, and evaluate state RPS policies. We have also reviewed relevant literature on the RPS, and where appropriate, contacted state officials to gain the most up-to-date knowledge of the operations of state RPS policies.

Importantly, with the assistance of the NGC, we also identified a small and diverse group of stakeholders to interview in the course of our work. The interviews were intended to supplement our own understanding of the RPS, and to offer diverse perspectives on the value,

⁴ The focus of this report is principally on grid-connected geothermal electricity production. An RPS can, however, also support customer-sited geothermal electricity production and the direct use of geothermal heat. These issues are discussed further in Chapter 4.

appropriateness, design, and effectiveness of state RPS policies. We also sought the comments of these stakeholders on a draft version of our proposed state RPS evaluation criteria.⁵

The remainder of this report is organized as follows:

- Chapter 2 provides a more detailed introduction to and description of the RPS, identifies states that have established or are considering RPS policies, and highlights some of the impacts of these policies to date.
- Chapter 3 briefly discusses the advantages and disadvantages of the RPS, and compares the RPS with other means of encouraging renewable energy.
- Chapter 4 identifies a set of evaluation criteria that can be used to judge the effectiveness or likely effectiveness of state RPS policies. The chapter then applies the evaluation criteria to the 13 existing state RPS policies in order to judge the effectiveness and design of these policies, and to identify policy design failures and successes in each state.
- Chapter 5 offers our recommendations and conclusions. The chapter highlights the key successes and failures of state RPS policies, identifies policy design principles and best practices that we believe will be helpful in guiding the design of future RPS policies, and summarizes the role and treatment of geothermal energy under state RPS policies.

In addition to these main chapters, Appendix A provides a detailed table that summarizes the key design variables of the 13 state RPS policies critiqued in the body of the report. Appendix B describes the stakeholder interview process and reviews the results of the interviews; the survey script that we used is provided in Appendix C. Appendix D provides a more thorough description of the evaluation criteria used to judge state RPS policies, while Appendix E offers our detailed evaluation of state RPS policies based on these criteria. Finally, Appendix F provides a resource list of materials from which additional details on the RPS can be obtained, and identifies documents that are referenced in this report.

⁵ Among those interviewed, we sought to include stakeholders with a wide range of perspectives on the role of policy in supporting renewable energy, and a diversity of opinions on the efficacy of specific policy approaches.

2 The RPS in Context

2.1 What Is an RPS?

The RPS is a policy that requires retail suppliers of electricity (otherwise referred to as load-serving entities, or LSEs) to meet a portion of their energy supply needs with eligible forms of renewable energy. RPS policies are generally designed to maintain and/or increase the contribution of renewable energy to electricity supply. The RPS establishes numeric targets for renewable energy supply, and encourages competition among renewable developers to meet those targets. LSEs can meet their requirements with renewable energy facilities that they already own or that they construct, or through bilateral purchases of renewable energy from other suppliers. In some states, LSEs can use tradable renewable certificates, or TRCs, to comply with their RPS requirements. A TRC is created when a megawatt-hour of renewable energy is generated, and it can be traded separately from the underlying electricity generation.

RPS policies can be established at the state or federal level, and can in principal be established either through legislation or via regulatory action. Targeted, legislatively established set-asides for renewable energy date to the 1980s in the United States. The application of uniform renewable energy purchase obligations on all LSEs, with the use of TRCs as an accounting and trading tool, first became popular in the mid-to-late 1990s during state electricity restructuring discussions. In addition, the RPS has since also been applied in regulated electricity markets.

2.2 State RPS Policies: Design and Impacts

State RPS Policies and Their Design

The U.S. Congress has considered the application of the RPS on a federal level, and a number of other countries have recent experience with the RPS as a policy mechanism.⁶ The most extensive and most diverse base of experience with the RPS on a worldwide basis exists in the United States, however, where 13 states have created RPS policies or RPS-like mandates⁷: Arizona, California, Connecticut, Iowa, Maine, Massachusetts, Minnesota, Nevada, New Jersey, New Mexico, Pennsylvania, Texas, and Wisconsin. Features of these 13 policies that particularly deserve note include:

- **Operating Experience:** While the number of states that have created RPS policies is large, experience with the policies remains limited. Few of the states have more than three years of experience with their RPS programs, and some of the policies have been established but have yet to take effect.

⁶ Other countries with operating RPS or similar policies include Australia, Austria, Belgium, Italy, and the United Kingdom. Several additional countries are in the late stages of RPS development and design.

⁷ There is no single definition of an RPS. The 13 states discussed in this paper all have renewable energy purchase obligations that are applied to all or a subset of electricity suppliers. For the purposes of this paper, we define each of these states to have an RPS.

- **Legislative or Regulatory Establishment:** Most of the RPS policies were established via legislation, but the policies in Arizona, New Mexico, and Pennsylvania were established through regulation (AZ and NM) or multi-party regulatory settlement (PA).
- **Restructured or Regulated Markets:** Though more than half of the existing RPS policies are in restructured electricity markets, a growing number of RPS policies have been established in monopoly markets. In particular, four states with an RPS (Iowa, Minnesota, New Mexico, and Wisconsin) have monopoly electric service areas; two states have opened their markets to some competition, but remain monopoly markets to a large degree (California and Nevada); and seven states have opened their electric markets to competition (Arizona, Connecticut, Maine, Massachusetts, New Jersey, Pennsylvania, and Texas).
- **Application and Exemption:** The RPS typically applies to investor-owned electric utilities and competitive energy service providers, but this is not uniformly the case. With few exceptions, publicly owned utilities have been exempted from the RPS requirements.
- **Verification Systems:** TRC trading and verification systems, whether formal or informal, exist in Texas, Massachusetts, Connecticut, Maine, Wisconsin, Nevada, and Arizona. Other states are either using contract-path tracking or have not yet designed a verification system.

An important observation is that there is no single way to design an RPS, and each of the 13 states has crafted their RPS policies differently, sometimes radically so. Some of the key design choices for an RPS are listed in Text Box 1. Appendix A provides a detailed tabular summary of the key design features of each of the 13 state RPS policies, while Chapter 4 and Appendix E offer an evaluation of these policies. cursory observations on the unique characteristics and circumstances associated with each RPS policy include:

- **Arizona's** RPS was established through regulatory action, not via legislation. The renewable energy percentage obligations are low, starting at 0.2% in 2001 and increasing to 1.1% by 2007, but much of the standard (50-60%) must be met with new solar electricity production. The RPS is funded, in large part, through a system-benefits charge.⁸ The RPS is up for review based on a cost-benefit evaluation to be completed in 2003, with future targets and RPS design to be determined based on that review.
- **California's** RPS was established in 2002, and may be the most complex of the state RPS policies. The targets are aggressive, requiring renewable energy additions of 1% each year on top of existing renewable production, until an ultimate target of 20% is reached. Renewable energy procurements are to be governed largely by the California Public Utilities Commission (CPUC) through a process that is not yet fully designed. Annual RPS purchase obligations begin when a utility has achieved creditworthy status, and LSEs are only obligated to purchase renewable energy to the extent sufficient system-benefits charge funds are available to cover any above-market costs of renewable resources.
- **Connecticut** has a two-tiered RPS: Class 1 includes solar, wind, ocean, landfill gas, fuel cells, new run-of-river small hydro, and certain biomass facilities, while Class 2 includes existing run-of-river small hydro, waste-to-energy, and certain other existing biomass facilities. Under legislation passed in 2003, Class 1 targets are to begin at 1% in 2004 and increase to 7% in 2010; the second tier, which can be met with Class 1 or Class 2 resources, has a target that remains constant at 3%. Connecticut's RPS began in 2000, but standard

⁸ A system-benefits charge is, effectively, a small tax on electricity rates, the funds from which can be used, in part, to support renewable energy projects.

offer and default service providers are exempt through 2003, so it has had no effect so far. Legislative changes approved in 2003 offer some hope—only publicly-owned utilities will be exempt from the RPS, and stiff penalties for non-compliance were also adopted.

- **Iowa's** legislature passed a law in 1985 (amended in 1991) requiring the state's investor-owned utilities to purchase 105 average MW of new renewable power. After years of legal battles, the utilities made the requisite purchases of wind power; the obligation is therefore no longer enforced.
- **Maine** nominally has the distinction of having the most aggressive standard, at 30% of load, beginning in 2000. An oversupply of eligible existing resources and lax eligibility rules that, among other things, allow existing high-efficiency cogeneration to qualify, have rendered the policy ineffective.
- **Massachusetts'** RPS focuses on new and incremental generation, and starts at 1% in 2003, increases to 4% in 2009, and increases further thereafter. Unlike the other state RPS policies, the Division of Energy Resources (not the PUC) oversees the policy. An "alternative compliance mechanism" caps the incremental cost of the RPS at 5 cents/kWh, and TRCs are used to verify compliance through a New England wide tracking system.
- **Minnesota's** legislature (in 1994) required Xcel Energy to purchase 425 MW of wind and 125 MW of biomass by 2002, as part of a radioactive waste management settlement, with an additional purchase of 400 MW of wind by 2012 (recently moved up to 2006, as part of the PUC's approval of a proposed transmission line). Legislation in 2003 established a statewide RPS goal of 10% by 2015. All utilities must make "good faith efforts" to achieve this goal with the exception of Xcel, which is required to meet the RPS obligations, at least if certain conditions are met.

TEXT BOX 1: RPS DESIGN ELEMENTS

Structure, Size, and Application of the RPS

- Basis (energy versus capacity requirement)
- Structure (e.g., single tier or multiple tiers)
- Percentage purchase obligation targets
- Start date
- Duration of purchase obligation
- Resource diversity requirements or incentives
- Application to LSEs – who must meet targets
- Product- or company-based application

Eligibility

- Geographic eligibility
- Resource type eligibility
- Eligibility of existing renewable generation
- Definition of new/incremental generation
- Treatment of multi-fuel facilities
- Treatment of off-grid and customer-sited facilities

Administration

- Regulatory oversight body(ies)
- Verifying compliance – TRCs or contract-path
- Certification of eligible generators
- Compliance filing requirements
- Enforcement mechanisms (i.e., penalties)
- Cost caps
- Flexibility mechanisms (banking, borrowing, etc.)
- Implementing future changes to the RPS
- Contracting standards for regulated LSEs
- Cost recovery for regulated LSEs

Interactions Between the RPS and Other Policies

- Interaction with state system-benefits charges
- Treatment of emission credits
- Interaction with a future federal RPS

- **Nevada** replaced a previously existing RPS with a more aggressive policy in 2001. The renewable energy purchase obligation begins at 5% in 2003 and increases to 15% in 2013; 5% of the RPS must come from solar energy. Both existing and new renewable generation may count towards the RPS, as does certain forms of electricity created by waste heat or pressure. Utilities are required to enter contracts with renewable generators of 10 years or more, and contracts must be approved by the PUC under a “just and reasonable” standard.
- **New Jersey**, like Connecticut, has a two-tiered RPS: Class 1 technologies include wind, solar, geothermal, fuel cells, ocean power, landfill gas, and certain biomass technologies, while Class 2 includes certain hydropower and MSW facilities. Purchases of Class 1 technologies must start at 0.5% in 2001, and increase to 4% by 2012; purchases of Class 2 or Class 1 resources remains constant at 2.5%. A recent Task Force to the Governor has recommended significantly strengthening the state’s existing RPS. If adopted, the Class 1 targets would effectively double from 2% to 4% in 2008, with a long-term goal of 20% Class 1 resources by 2020.
- **New Mexico** created an RPS through regulation in 2002, with the rule to take effect in mid-2003. The rule has already been challenged, and has been the subject of legislative discussions; the rule is also currently being challenged in the courts. The purchase targets start at 5% by 2006, increasing to 10% by 2011. Existing and new renewables would both qualify under the RPS, and bonus credits would be given to geothermal, biomass, landfill gas, fuel cell and solar energy (as discussed in Chapter 4 and Appendix A).
- **Pennsylvania’s** renewable energy purchase obligations only apply to certain competitive suppliers of default service – a very small segment of the overall market. The standards are also quite low, and both existing and new renewable generation are eligible.
- **Texas** has perhaps the most well known RPS policy. The policy contains a target of 2000 MW of additional renewables by 2009 (~2.5%), allows TRC trading, and includes explicit penalties for non-compliance. Existing renewable generation is allowed to offset a LSE’s new renewable purchase obligations.
- **Wisconsin’s** RPS is applied in a still-regulated market, and begins at 0.5%, growing to 2.2% by 2011. Up to 0.6% can be met with existing renewable generation.

The RPS has been and continues to be considered in a number of additional states: Colorado, Hawaii, Illinois, Iowa, Maryland, New York, Oklahoma, Rhode Island, Utah, Vermont, and Washington, among others.

It also deserves note that three states – Hawaii, Illinois, and Minnesota⁹ – have established legislatively directed renewable energy goals. These goals are not binding, however, and no specific sanctions exist for a utility that fails to meet the goals. While these goals may prove effective, they are not discussed further in this report.

Finally, besides state RPS initiatives, there have been various proposals in Congress for a national RPS. For example, in 2002 the Senate approved a 10% RPS by 2020, though the proposal failed to clear the House and was not enacted. States with RPS policies could face numerous coordination challenges were a federal RPS to be enacted. Among other things, these include whether the state RPS is to be incremental to the federal RPS; the potential

⁹ The goal in Minnesota is in addition to the obligatory RPS provisions that apply to

Xcel Energy, which are discussed in this report.

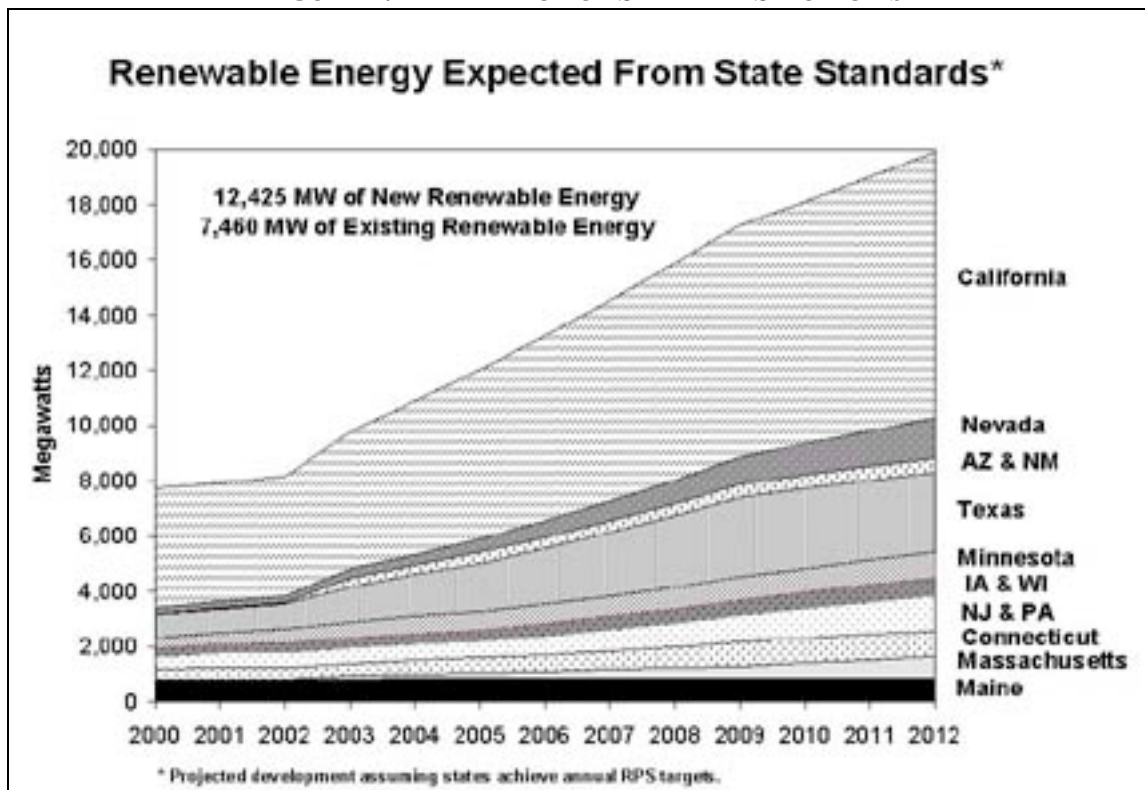
incompatibility between a state RPS placed on retailers and a federal RPS that could be placed on generators; and different verification systems between a state and federal RPS (Wiser 2000).

The Impacts of State RPS Policies

Though the majority of the 13 state RPS policies have just begun, their collective impact over time *could* be substantial. Figure 1 presents estimates by the Union of Concerned Scientists (UCS) of the projected effect of these existing policies on renewable energy development through 2012. The estimates in Figure 1 are derived from estimating the renewable energy generation needed to meet existing state RPS policies, then converting that generation to capacity by applying an average capacity factor of 50%. We note that this figure is somewhat dated, and therefore does not incorporate recent changes to RPS programs in, for example, Minnesota and Connecticut. We also note that although this section emphasizes the impact of state RPS programs, other renewable energy policies (tax incentives, system-benefits charges, integrated resource planning, etc.) will also continue to play a role in renewable energy, and geothermal, development. These other policies are discussed briefly in Chapter 3.

Importantly, the UCS estimates assume that the state RPS programs are designed effectively, and therefore represent an upper bound on the possible impacts of existing state RPS policies; as we show later in this report, the assumption that all state RPS policies will be designed effectively is aggressive. Though one might quibble with some of the details behind the estimate, the figure clearly shows that, in aggregate, the 13 state RPS policies have the possibility of driving a substantial amount of renewable energy development. Unfortunately, because many state RPS policies are at an early stage of implementation or design, it is not possible to estimate the projected mix of renewable resources that will be used to meet individual state RPS policies.

FIGURE 1. THE IMPACT OF STATE RPS POLICIES



Source: Union of Concerned Scientists

While Figure 1 estimates the impacts of state RPS policies in the long run, these policies are already beginning to have an impact; this is especially apparent for wind power, and to a far lesser degree, also for geothermal. In Texas, 915 MW of wind power came on line in 2001 in large part to serve the state's RPS. Iowa's policy has been met with 250 MW of wind installation, while Minnesota's initial mandate for 425 MW of wind and 125 MW of biomass has also largely been met. Wisconsin's RPS has supported approximately 140 MW of renewable energy so far, all but 10 MW of which is wind power, and much of which is new. An interim renewable energy procurement directed by the California PUC, in advance of that state's RPS, has resulted in substantial new procurements by the state's three investor-owned utilities. While the full details of these procurements are not available, the procurement includes at least two contracts with Calpine for a total of 310 MW of existing geothermal generation.¹⁰ In Nevada, a 2001 renewable energy solicitation resulted in contracts for 130 MW of wind, 97 MW of

¹⁰ Though initiated prior to the creation of the Californian RPS, renewable generation purchased under this interim procurement will count towards the state RPS, and the procurement requirement can be considered a "mini-RPS" itself. Under the interim procurement, SCE has entered into five power purchase agreements totalling over 1.5% of SCE's annual retail sales (in at least one filing, SCE has claimed that these contracts would contribute nearly 4% of their retail sales), one of which is for 200 MW of existing geothermal generation and another of which is for 100 MW of new biomass generation. SDG&E, meanwhile, signed contracts with 15 renewable energy projects that will produce nearly 4% of that utility's electricity needs in 2003, rising to approximately 7% in 2004. PG&E has reportedly signed contracts for 1.1% of their electricity requirements, including one contract for 110 MW of existing geothermal power for on-peak delivery and 55 MW for off-peak delivery, and another two contracts for a total of 9 MW of biomass energy. As illustrated by these results, the interim procurement allowed – and even encouraged – utilities to purchase renewable generation from existing in-state facilities.

geothermal, and 50 MW of solar. Arizona's small RPS, meanwhile, has supported nearly 5 MW of solar and 5-10 MW of landfill gas so far. The Massachusetts RPS, though it began in 2003, has already resulted in some merchant landfill gas activity, some incremental production at existing biomass plants, and increased site prospecting by wind, landfill gas, and biomass developers. Although subject to a legal challenge, New Mexico's imminent RPS was perhaps a contributing factor in a 25-year 204 MW wind power contract between FPL Energy and the Public Service Company of New Mexico. Finally, New Jersey's RPS has contributed somewhat to the increased renewable development efforts of renewable companies in the mid-Atlantic region.

3 Comparing the RPS to Other Policy Approaches

Policymakers in the U.S. have long been interested in encouraging the development of renewable (and geothermal) energy markets. Frequently mentioned rationales for this support include the environmental advantages of renewable energy (see, e.g., Serchuk 2000), the ability of renewable electricity to lesson electricity price risks (see, e.g., Awerbuch and Berger 2003, Bolinger et al. 2002), and the impact of renewables deployment on economic development. In addition to the RPS, several other state and federal policy approaches have been used to support renewable energy. When considering the application of an RPS to support geothermal energy, it is useful to consider these other policies as either complements or alternatives to the RPS.

In this chapter we first highlight the theoretical advantages and disadvantages of an RPS relative to other policy mechanisms. We then turn to a discussion of other policies that might be used in lieu of or in addition to an RPS to support renewable energy in general, and geothermal energy in particular; these include integrated resource planning, tax incentives, renewable energy funds, encouragement of voluntary purchases of green power, and government purchases of renewable energy.¹¹ While it is not the role of this document to evaluate these alternative options in detail, in this chapter we briefly describe these policies, compare them with the RPS, and identify the degree to which these other approaches can be complementary to an RPS. Finally, we specifically summarize the degree to which these other policies have been or might be used to support geothermal energy markets. Our evaluation in this chapter has been informed by the stakeholder interviews that we conducted during our research; see Appendix B for a more detailed description of those results.

3.1 Advantages and Disadvantages of an RPS

The use of an RPS to support renewable energy development in general, and geothermal energy in particular, has some *theoretical* appeal compared to other types of policies. After all, in its ideal form some of the advantages of an RPS that are frequently noted include:

- The RPS can drive a known quantity of new renewable development, based on the specific standards that are established, and can ensure that there are buyers for that renewable energy.
- It can help lower the total cost of that development by giving LSEs the flexibility to meet their purchase targets in the way they deem best, and encouraging competition among renewable developers for contracts with LSEs.
- An RPS can be competitively neutral if it is applied equally to all retail electricity suppliers.
- An RPS imposes relatively low administrative burdens and direct administrative costs on those responsible for overseeing the policy.
- An RPS can be applied in both restructured and monopoly market contexts.

¹¹ Note that this list of policies is not exhaustive, and does not include, for example, policies that might facilitate the development of geothermal projects on federal and state lands. Our focus in this chapter is on policies that would stimulate the market for geothermal energy through direct or indirect incentives, as opposed to the broader array of policies that would be useful in reducing barriers to geothermal development more generally.

While the RPS has some theoretical advantages, and several states have applied the RPS to good effect (see Chapter 4), the RPS also has some potential disadvantages relative to other types of renewable energy policies:

- Due to its complexity, the RPS can be difficult to design and implement well.
- An RPS may be less flexible in offering targeted support to renewable energy than some of the other renewable energy policies.
- The exact cost impacts of an RPS cannot be known with certainty in advance.
- Operating experience with the RPS remains limited.
- If an RPS does not lead to the availability of long-term power purchase agreements, the ability to finance new renewable projects will be limited and compliance costs may increase.
- An RPS is not necessarily suited to supporting diversity among renewable technologies, although an RPS can be designed to do so through the use of resource tiers and credit multipliers.

Finally, it deserves recognition that RPS policies do not directly combat other barriers to renewable energy development, including siting and permitting hurdles, resource assessment needs, transmission requirements, and potential disparities caused by subsidies offered to other non-renewable generation sources. Of particular interest to geothermal developers, state RPS policies do little to combat barriers to geothermal development on federal lands. For these reasons, complementary policies may be required to yield the theoretical benefits of an RPS.

Moreover, though purchase mandates such as the RPS have their own inherent advantages and disadvantages, they are but one of several classes of policies that have been or can be used to support renewable energy. In the following sections, the relative merits of other major policy tools are considered.

3.2 Integrated Resource Planning

Traditional utility resource planning involves forecasting load growth and assessing various supply options to meet that load growth at the lowest possible cost, while maintaining reliability. Integrated resource planning (IRP) emerged in the 1980s as an analytic means of incorporating demand-side resources (i.e., energy efficiency and load management) into resource planning, as well as incorporating other factors such as uncertainty and environmental quality. IRP allows a portfolio approach to minimizing costs, subject to reliability requirements, and can incorporate environmental and diversity factors as well.

IRP is best suited to a regulated monopoly context. It is challenging to apply conventional IRP principles in restructured markets where ratemaking authority for new entrants has been ceded to market forces, especially when generation has been divested and there are no stable utility portfolios. In fact, RPS policies have frequently been adopted (in part) to replace IRP during the transition to restructured electricity markets. As a result, in regulated markets, IRP and RPS approaches may be thought of as substitutes in some circumstances, but this is not the case in restructured markets.

Where IRP is feasible and can be thought of as a substitute for an RPS, IRP does have some potential advantages to an RPS:

- **Multi-attribute Decision Making:** In its ideal form, IRP can be an effective way to consider, in a balanced fashion, all of the characteristics, costs, and benefits of renewable energy, conventional generation, and demand-side resources. While an RPS can exert competitive pressures to lower the compliance cost of meeting specific renewable energy targets, IRP can directly address a fuller range of impacts in a multi-attribute analytical framework (reliability, cost, environmental impacts, generation diversity).
- **Investor Risk Reduction:** In addition, IRP decisions may have long-term regulatory support, leading to long-term contracts with renewable generators. In contrast, RPS requirements in the absence of long-term contracting standards are concerned only with meeting annual targets, leaving greater potential risk for investors in renewable generation.
- **Implementation:** As we note throughout this report, designing an effective RPS can be difficult. While developing a balanced IRP plan is also challenging, once that IRP plan is established, regulators may be in a position to more clearly and easily direct resource planning and contracting efforts to achieve the results suggested by the IRP exercise.

IRP also has some potential shortcomings relative to an RPS:

- **Limitations in Competitive Markets:** The use of IRP is largely limited to regulated markets, or to regulated entities in competitive markets, and therefore is not available as a substitute to an RPS in many cases.
- **Competitive Bidding and Externalities:** Features that are sometimes included in utility resource planning, such as competitive bidding, may be problematic for renewables. In IRP processes, renewables have often not been found to be competitive unless environmental or diversity externalities are considered, yet monetizing such externalities has proven contentious and, in some states, administratively burdensome or impossible.
- **Assurance of Impacts:** Unlike an RPS, an IRP planning process does not ensure that renewable or geothermal energy sources will be developed. Moreover, IRP plans have themselves frequently been disconnected from the actual purchases made by electric utilities. With few exceptions, IRP has not yet been a primary driver of geothermal development.

Finally, it deserves note that, in monopoly markets or even for the remaining regulated entities in competitive markets, IRP and RPS policies can play complementary roles. For example, an IRP process may be an effective means of demonstrating the benefits of renewable energy and even determining an appropriate quantity of renewable energy to include in a utility's mix, thereby justifying an RPS. From this perspective, an RPS may be an effective way of implementing the results of IRP.

3.3 Federal and State Tax Incentives for Renewable Energy

Tax incentives at the state and federal levels have often been used to encourage investments in new renewable generation. Targeted tax incentives for renewable energy can and have taken many forms, including federal production and investment tax credits, state income tax credits,

accelerated depreciation, depletion allowances (in the case of geothermal energy), as well as favorable state sales tax and property tax treatment.

At the federal level, federal investment tax credits in the 1970s and 1980s helped the renewable energy industry to begin penetrating the electricity market. Business investments in renewable energy, including geothermal, were eligible for first a 10% investment tax credit in 1978, then a 15% investment tax credit that lasted through 1985 before being reduced to 10% for geothermal and solar in the late 1980s. The 10% federal investment tax credit for business investments in solar and geothermal was made permanent with the Energy Policy Act of 1992 (EPAct). In addition, investments in solar, wind, and geothermal are eligible for five-year accelerated depreciation. EPAct also ushered in the federal production tax credit (PTC) for wind and closed-loop biomass; the PTC currently provides a 1.8¢/kWh tax credit for 10 years to eligible projects that come on-line before the end of 2003. Geothermal energy is not eligible for the PTC, though there have been various proposals to expand the policy's eligibility to include geothermal and other renewable energy sources (and to extend the PTC beyond 2003).¹² The fact that geothermal does not currently receive the PTC, but that wind projects do receive this incentive, significantly affects the relative competitiveness of these two resources.

Targeted state tax incentives for renewable energy, taking the form of income tax, sales tax, or property tax reductions, are also reasonably common. While these state policies provide some incremental support for renewable energy development (Bird et al. 2003), they have historically not been sufficient to motivate substantial development without the support of other additional policy drivers (Rader and Wiser 1999).

Tax incentives for renewable energy projects may be used as either alternatives to an RPS, or as complementary policy mechanisms. As alternatives to an RPS, state and federal tax incentives have both advantages and disadvantages. In particular, tax incentives, especially when applied at the federal level, can be an effective tool for driving new renewable energy projects, depending on the magnitude of the incentive. If the incentive is sizable, renewable energy development may flourish. If a tax incentive is not set high enough, however, it is unlikely to result in much, if any, new renewable energy. Unlike the specific targets associated with an RPS, tax incentives do not result in a specific quantity of renewable generation. Another specific concern is that tax incentives are sometimes short-lived and unstable, leading to "boom and bust" cycles that may not be as conducive to building a strong renewable energy industry as the steady market growth offered by a well-designed RPS.

Alone, or as complements to an RPS, targeted renewable energy tax incentives are perhaps best suited for levelizing the playing field between different generation technologies to account for externalities or offset advantages given to other competing generation types (including nuclear, fossil, and other renewable energy sources). If set at a high enough level, renewable energy tax incentives can be a useful tool for shifting long-term production patterns and choices, but they are imprecise as to their ultimate cost or impact. Because of these different impacts, targeted

¹² Tax incentives cannot be used by publicly owned renewable energy projects. Accordingly, the federal Renewable Energy Production Incentive (REPI) provides a 10-year, 1.5¢/kWh cash payment to public entities that own renewable power plants. REPI is subject to annual Congressional appropriations, however, and uncertainty over the level and timing of those appropriations has significantly reduced the REPI's effectiveness.

renewable energy tax incentives and RPS requirements are often complementary, but are rarely effective substitutes.

3.4 State Renewable Energy Funds

Several states have recently established non-bypassable charges on electricity rates, often termed system-benefits charges (SBC), to collect funds to support renewable energy. In many cases, these funds were established during the transition from regulated to competitive electric markets. Renewable energy funds collected through an SBC or through other means have been established in 15 states, and these funds are expected to collect over \$3 billion to support renewable energy over the next 10 years. The programs typically provide direct monetary support to renewable energy projects via production incentives and grants, as well as indirect support through such activities as customer education, infrastructure development, and market studies. Such funds can be established in both competitive and monopoly markets.

While the specific merits of a renewable energy fund depend heavily on the types of programs it supports, generally speaking it has both advantages and disadvantages to an RPS:

- In contrast to RPS policies, which ensure that a known quantity of renewable energy is achieved but at unknown cost, renewable energy funds collect a specific and known quantity of money but the impact of those funds on renewable generation cannot be determined with precision in advance.
- If policy objectives are slanted towards the local economic benefits of renewables, renewable energy funds may be better suited than an RPS at achieving those objectives because such funds can ensure that renewable energy development occurs in-state, while an RPS may not be legally allowed to restrict eligible resources to those located in a specific state.
- Renewable energy funds are also more flexible than an RPS, and can accommodate a multitude of activities (e.g., resource assessment) and provide market support to a diversity of renewable sources, some of which would likely fare poorly under a standard RPS design.
- A potential disadvantage to renewable energy funds is that, depending on the program design, they may not be competitively neutral. For example, with any competitive supply subsidy, inevitably some market participants may benefit while others do not.
- Renewable energy funds also tend to require a high level of administrative oversight relative to an RPS. Under an RPS, the market determines the outcomes of the policy, while a renewable energy fund requires regular oversight and administrative expense.
- Renewable energy funds also are a tempting target for state legislators searching for monies to balance state budgets. Legislators have tapped renewable energy funds in Massachusetts, Ohio, and Wisconsin to balance state budgets, and funds in California, Connecticut, Illinois, Oregon, and Rhode Island have been targeted as well.

While many states have either an RPS or a renewable energy fund, and they can therefore be seen as alternatives to one another, the two policies are increasingly seen as complementary options. Several states (e.g., Arizona, California, Connecticut, Massachusetts, Minnesota, New Jersey, and Wisconsin) have established both policies. In many of these instances, the RPS is targeted to support the most commercially available and lowest cost renewable sources, while the renewable energy fund supports higher-cost emerging technologies and other broader market

development efforts. In other states, the SBC is used to directly or indirectly buy down the cost of an RPS (Arizona, California), or to otherwise leverage the financing of projects that are eligible under the RPS (Massachusetts).

3.5 Encouragement of Green Pricing and Green Marketing

Some industry observers assert that explicit policy mechanisms are not necessary, and that voluntary consumer purchases of renewable energy may be sufficient. Such voluntary purchases can take one of three forms. *Green pricing* is the practice of a regulated utility offering its customers a choice to pay a premium to support renewable resources. *Green marketing* is the parallel in competitive retail markets, in which retail electricity providers offer their customers renewable energy products. Finally, sellers of *tradable renewable certificates*, often referred to as “green tags,” offer consumers the ability to provide direct financial support to renewable energy outside of the customer-electric supplier relationship.

Voluntary purchases of renewable energy by the general public do not by themselves constitute a public policy mechanism, but direct and indirect encouragement and support for such markets has been a policy mechanism used on a number of occasions. Examples of policy support for voluntary renewable energy purchases include such activities as funding public education efforts that highlight the benefit of renewable energy, adopting environmental disclosure requirements to support electricity product differentiation and consumer information, making utility billing systems available to marketers of “green tags,”¹³ and offering direct incentives for the purchase of renewable energy. Many of these activities have been funded by renewable energy funds, while others have originated through other means.

It is unlikely that voluntary consumer purchases will be a primary market mover for significant quantities of new renewable energy generation, and therefore a substitute for an RPS policy. First, most voluntary purchases of green power to date have been short-term commitments; in some cases, this type of commitment may not be sufficient to support financing of capital-intensive generation projects like geothermal. More importantly, customer participation rates in voluntary green power programs are typically rather low, and (at least in competitive markets) existing renewables sometimes comprise a substantial fraction of the renewable energy content. According to the National Renewable Energy Lab, as of the end of 2002, total green power demand in the U.S. had resulted in about 980 MW of new renewable energy capacity, with another 430 MW either under construction or planned. Only 16 MW of this new capacity is from geothermal projects. Moreover, some of these projects may have also received other policy support, such as SBC funding. Researchers forecast that green power demand may ultimately result in between 900 and 7000 average MW of new renewable energy capacity, depending on a number of assumptions (Wiser et al., 2001). Little of this capacity is likely to be geothermal, however, unless the production tax credit is extended to geothermal energy, with wind likely to continue dominating this market.

¹³ The opening up of utility billing systems in this way originated in New York, and is now being considered in New England and New Jersey (among other states). Note that this does not necessarily involve giving non-utility marketers open access to a utility’s customer information database.

While green markets are therefore unlikely to be a primary supporter of geothermal energy, these markets are often a way for utilities to gain experience with renewables, and may build public support for renewable energy policies. Green pricing and green marketing may also be effective complements to an RPS or other renewable energy policies. Green markets provide an outlet for renewable generation brought on-line in excess of current year policy targets, allowing investors to gain comfort in bringing on-line larger projects that may capture economies of scale. At the same time, the presence of RPS mandates, which are better suited to supporting financing of renewable energy projects than voluntary demand, can lead to moderate quantities of merchant renewable energy being available to the green power market. Many observers have also noted that successful voluntary green power programs can raise the profile and consumer acceptance of renewable energy, thereby leveraging public support for other renewable energy policies.

3.6 Government Purchases

Governments at the local, state, and federal levels can support renewable energy by installing renewable energy facilities on-site, or by making purchases of bulk renewable supply or TRCs. Examples include New York's Governor Pataki issuing an executive order in June of 2001 committing all state facilities to purchase 20% of their energy requirements from renewables by the year 2010, and New Jersey government agencies and universities meeting 12% of their energy needs with green power.

Such purchases are less likely to be seen as alternatives to an RPS than to be seen as stepping-stones to a broader purchase mandate. They are also often seen as setting an example for voluntary renewable energy purchases by the public at large. The primary advantage of government purchases of renewable energy is that they can often be instituted with a minimum of effort, by executive fiat, and with or without broad public support for broader renewable mandates. A primary disadvantage, at least so far, is that the resultant demand for renewable energy may be insufficient to enable financing of new renewable projects. This is because government purchases are typically only for terms of one to five years, and because the government sector only consumes a limited amount of total electricity supply. Similar to voluntary support for green power, government purchases may raise public visibility and support for clean sources of electricity, but they have not been and likely will not be, by themselves, a major market stimulant for new renewable projects.

3.7 Impact on Geothermal Markets

Section 2.2 described the impact of existing state RPS policies on renewable energy supply generally, while Section 4.3 discusses the impact of these policies on geothermal development in particular. Nonetheless, it is important to acknowledge that other state and federal policy approaches – including those discussed in this chapter – have also had and will continue to have an impact on geothermal development.

- **PURPA and Tax Incentives:** Historically, the most successful combination of policy efforts in stimulating geothermal project development has been PURPA implementation and state and federal tax incentives. In fact, most of the geothermal plants on-line today were developed following the passage of PURPA due to (1) high avoided cost price benchmarks in

certain states, leading to long-term favorably priced contracts (e.g., California)¹⁴; and (2) federal and/or state tax incentives.

- **IRP:** Geothermal has also, in some limited cases, successfully competed in IRP processes. In California's biennial resource plan update (BRPU), for example, winning bidders included geothermal projects. FERC struck down the proposed PURPA contracts under the BRPU in 1996, asserting that the proposed buy-back rates exceeded the avoided cost requirements of PURPA. As a result, the BRPU contracts were never implemented. With natural gas prices increasing, geothermal projects may fare even better in future IRP processes.
- **Renewable Energy Funds:** Finally, geothermal projects have received limited support through renewable energy funds. California presents the only example of this to date, with its renewable energy fund supporting a small number of new geothermal projects.
- **Green Power Purchases:** Voluntary customer demand for geothermal energy has been limited so far. There have been a few examples of green power offerings that feature geothermal energy, but NREL estimates that just 16 MW of new geothermal projects were serving the green power market through 2002. To date, there have also been no significant government purchases of geothermal energy.

Looking forward, as we have noted earlier, the various renewable energy policy approaches are inter-related and often potential complements. For example, if a production tax credit was available for geothermal energy, we would anticipate that green marketing of geothermal energy would increase, and geothermal would compete more successfully in IRP processes. Finally, in California, where an RPS and SBC effectively work together, geothermal is expected to continue to be a significant beneficiary of both policies.

¹⁴ Avoided cost rates significantly above the current market level are no longer prevalent, particularly with the use of competitive bidding for power supplies and the development of competitive wholesale markets with visible market indices.

4 Evaluating State RPS Policies

4.1 Overview

A number of evaluation criteria might be applied to assess the actual or expected effectiveness of a state RPS policy in driving both new renewable energy development in general, as well as the development of geothermal energy resources more specifically. The principal goal of this chapter is to introduce and apply criteria for making such judgments.¹⁵

In Section 4.2 we list and briefly describe the 21 evaluation criteria that we developed to evaluate the 13 existing state RPS policies in the United States. These criteria were vetted during the stakeholder interviews, and we therefore also report the opinions of our interviewees towards our evaluation criteria (for more information on the stakeholder interview results, see Appendix B). In Section 4.3 and in Appendix E these criteria are applied to the *existing* state RPS policies identified in Chapter 2. The criteria may also be applied to *future* RPS proposals, and therefore serve as a base for the development of RPS design principles and best practices in Chapter 5.

4.2 Policy Evaluation Criteria

Criteria Categories

State RPS policies are at different phases of implementation: some have been operating for several years, while others have yet to begin. To accommodate the different phases of state RPS implementation, our 21 evaluation criteria fall within four broad categories:

- **Outcome criteria** assess the actual impacts and results of state RPS policies. Where an RPS policy has been operating for several years, an assessment of the impact of that RPS on renewable energy development, economic costs, and other factors can be made. In other cases, however, state RPS policies have not been operating for a sufficient duration to conclusively apply the outcome-based criteria.
- **Policy design criteria** include legislative and regulatory RPS design features that will affect the success of an RPS. Particularly where an RPS has not been operating for sufficient time to judge its success in meeting the outcome criteria, we must instead judge that state's policy against a series of policy design criteria. A well-designed RPS is more likely to be effective in the long run than a poorly designed policy.
- **Market context criteria** are included to reflect the fact that even a well-designed RPS may fail to have its intended effects if the market in which it is applied is not conducive to such a policy, e.g., if viable renewable resource options do not exist or long-term renewable energy contracts are not available.

The criteria that fall within each of these three categories are intended to assess whether an RPS has already or is likely to be effective at driving new renewable resource development at

¹⁵ We note the recent publication of a report by the Union of Concerned Scientists (UCS), which grades states based on their commitment to renewable energy (Deyette et al. 2003). The UCS report focuses on a broader range of policies than does ours, and emphasizes the strength of these policies in theory, while we evaluate actual experience. The two reports are therefore complementary.

reasonable costs and with minimal disruption to the functioning of electricity markets. These criteria are *resource neutral*, and will not be used to assess the effectiveness of a state’s policy in driving geothermal development in particular.

A key goal of the National Geothermal Collaborative, however, is to judge the effectiveness of state RPS policies in supporting geothermal resources. Because the criteria in the above three categories are resource neutral, we also include a fourth category of **geothermal-specific criteria**.

Proposed Evaluation Criteria

We identify and briefly describe our specific evaluation criteria in Table 1, below. We base these criteria on experience with RPS policies in the U.S. and abroad, our own professional judgment, review comments provided by the National Geothermal Collaborative, and comments gathered from the stakeholder interviews. A lengthier description and rationale for these specific criteria can be found in Appendix D.

TABLE 1. RENEWABLES PORTFOLIO STANDARD EVALUATION CRITERIA

OUTCOME CRITERIA	
Amount of New Renewable Energy Development	The principal goal of an RPS is to drive renewable resource development and increased production of renewable electricity.
Full Compliance with RPS Policies	A hallmark of an effective and sustainable RPS is one in which all load-serving entities (LSEs) are in full compliance with the renewable energy purchase obligation. Differential compliance among LSEs is likely to undermine the political stability of the policy as a whole.
Reasonable and Stable Cost Impacts	Load-serving entities, end-use electricity customers, and policymakers desire stable, reliable, and reasonably priced electricity supply. An RPS that unduly raises the cost of electricity to end-use customers, or whose costs vary considerably from one year to the next, is unlikely to be viable over the long run. New resources added to meet an RPS should not substantially impact reliability or add to system costs in a manner not captured in the choice of RPS resources. Compliance with the RPS should not be unduly burdensome.
Prudently Incurred Compliance Costs Borne by Ratepayers	Because the benefits of renewable electricity flow to consumers at large, it is also important that those same consumers bear the costs of the policy. Prudently incurred (i.e., just and reasonable) RPS compliance costs should therefore be recovered from end-use electricity customers.
POLICY DESIGN CRITERIA	
Broad Applicability	A well-designed RPS would ideally apply equally and fairly to all load-serving entities in a state (or, at minimum, to all possible suppliers to any customer whose load is included in the mandate), ensuring that all those who benefit from increased renewable energy production also bear a proportion of the costs.
Carefully Balanced Supply-Demand Condition	An effective RPS will have renewable energy purchase standards of sufficient size and structure coupled with sufficiently tight resource eligibility rules, so as (a) to be binding enough to ensure new renewable energy development, without (b) being so binding as to foreclose feasible compliance.
Sufficient Duration and Stability of Targets	Well-designed RPS policies will be of sufficient duration to allow long-term contracting and financing to occur, and have purchase targets that are stable over time and are not subject to sudden or uncertain shifts.

Well-Defined and Stable Resource Eligibility Rules	The eligibility of specific renewable resources and technologies for a state RPS should be well defined. Ambiguity as to what resources are and are not eligible, or may become eligible, creates market uncertainty for both renewable developers and LSEs.
Well-Defined and Stable Treatment of Out-of-State Resources	Geographic eligibility decisions affect the aggregate impact of an RPS, the location of the benefits delivered by an RPS, and the legal defensibility of the policy as a whole. Well-designed RPS policies have a well-defined, supportable stance on this issue that is both consistent with the stated objectives of the policy as a whole and that is not subject to sudden change.
Credible and Effective Enforcement	An effective RPS must typically be mandatory and impose repercussions on those LSEs that fail to meet the specified renewable energy purchase mandates. Only with credible enforcement will state policymakers ensure that the RPS is met, will renewable developers know that their efforts are not in vain, and will financiers understand the risk of their investments.
Flexible Verification Mechanisms	A variety of approaches can be used to verify compliance with an RPS. The TRC approach is generally preferable because it can simplify verification, provide greater assurance of no double counting, increase contracting flexibility, and lower compliance costs. In monopoly markets with stable resource portfolios and few transmission constraints, however, a contract-path approach may be sufficient. We note here that the use of TRCs for verification purposes does not restrict one's ability to limits imports from other states.
Adequate Compliance Flexibility	Compliance with stringent and unyielding renewable purchase obligations in the face of supply and demand factors that are difficult to predict or control can prove challenging and costly, and may encourage market power. State RPS policies would ideally build in some compliance flexibility. If RPS policies are overly flexible and lenient, however, the likelihood of gaming and non-compliance could intensify, and the complexity of administering the RPS could increase.
Contracting Standards and Cost Recovery Mechanisms for Regulated Utilities and Standard Offer and Default Service Providers	For competitive suppliers, regulators need not specify contracting standards or RPS compliance cost recovery mechanisms. RPS policies have now been implemented in a number of markets that remain regulated, however, and even in purported competitive markets providers of last resort remain regulated. In these cases, regulatory bodies may need to establish standards for how renewable energy should be procured to ensure that renewable projects receive the long-term contracts necessary to attract financing. Regulators must also establish clear mechanisms for the recovery of prudently incurred RPS compliance costs by rate-regulated LSEs.
Product-Based, as Opposed to Company-Based Compliance Mechanisms	A <i>company-based</i> application of an RPS would allow LSEs to meet their RPS obligation through the sale of green power to those customers willing to pay a premium for that product. An emerging best practice, however, is the application of the renewable energy target to each electricity <i>product</i> sold to end-use customers. Such an application ensures that customers are not misled as to the incremental effect of their purchases, that voluntary customer demand for renewable energy is <i>additive</i> to any demand generated by the RPS, and that the cost of the RPS is shared equitably among all electricity users.
MARKET CONTEXT CRITERIA	
Presence of Creditworthy Long-Term Power Purchasers	In some markets, few creditworthy players are willing to enter into long-term contracts for renewable energy. Renewable projects require long-term contracts to receive financing. Markets in which such contracts are unavailable or extremely scarce are unlikely to be conducive to the effective implementation of an RPS.
Stable Political and Regulatory Support	To minimize uncertainty and allow for the staged development of renewable resources, a stable level of political and regulatory support for an RPS is essential.

Adequate and Accessible Developable Resource Potential	Some regions of the U.S. are poorly endowed with renewable resource potential, while in other regions adequate potential may not be cost-effective given transmission constraints, wholesale market rules, and interconnection barriers. To apply RPS obligations in such regions that severely exceed cost-effective resources is a potential recipe for failure.
GEOHERMAL-SPECIFIC CRITERIA	
Geothermal Development	For those states whose RPS policies have been in place for some time, the first evaluation criteria is simply the extent to which geothermal exploration, leasing, development, and construction activities have been stimulated by the policy.
Geothermal Resource Availability and Eligibility	A large number of U.S. states simply do not have cost-effective geothermal resource opportunities. Even among those states in which geothermal is available, geothermal energy may not be eligible under the state's RPS. Where eligible generally, another question is whether geothermal heat or electricity used on a customer's site would be eligible to meet RPS requirements.
RPS Design Elements that <i>Specifically</i> Encourage Geothermal Development	Some states have created RPS designs that <i>explicitly</i> support diversity among renewable resource types in general, and/or the use of geothermal energy. These tools include credit multipliers and diversity bands. Those states using these tools are more likely to see geothermal development activity, all else equal.
RPS Design Elements that <i>Indirectly</i> Encourage Geothermal Development	Other states may not explicitly support geothermal development relative to other renewable sources, but may instead do so indirectly. Such indirect support may come from specific contracting processes or an incorporation of system integration costs into the resource selection process.

Stakeholder Interview Comments

We specifically vetted the above list of evaluation criteria through the stakeholder interviews. In particular, we asked the interviewees to rate each of the criteria as “very important,” “somewhat important,” or “not important.” We also asked: “Are there any criteria that we have missed, and that should be added? Are there any criteria that should be deleted or altered? Are there any other RPS design elements that you believe are critical to the success of the policy? Are there any design elements that will lead to sure failure?”

All of the stakeholders that we interviewed believe that the evaluation criteria are appropriate. None of the respondents suggested specific criteria that should clearly be added, nor did anyone suggest any criteria that deserve deletion. Except for the geothermal-specific criteria, the interviewees generally rated all of the criteria as either “very important” or “somewhat important,” with very few “not important” ratings.

For the outcome criteria, all but one interviewee believe that it is very important or somewhat important that state RPS policies result in new renewable energy development, that there be full compliance with the RPS, that the RPS have reasonable and stable costs, and that prudently incurred compliance costs be borne by ratepayers.

The majority of the interview respondents felt very strongly that a state RPS should be broadly applicable to all load-serving entities in a state; that the RPS should be established recognizing renewable energy supply and demand conditions; that the RPS should be stable and of sufficient duration; that there should be credible enforcement; and that there should be flexible mechanisms for compliance, such as tradable renewable credits. Most interviewees also believe that it is somewhat to very important that a state RPS have: well-defined and stable resource eligibility rules and rules for treating out-of-state renewables; compliance flexibility; and

contracting standards for providers of last resort. In addition, most interviewees felt that it is somewhat to very important that the RPS be product based.

Almost all of the interviewees felt strongly that the three market context criteria—the presence of creditworthy long-term power purchasers, stable political and regulatory support for an RPS, and accessible development resource potential—are all very important.

Interviewees were more divided on the geothermal-specific criteria. The majority of the stakeholders believe that geothermal should be eligible for state RPS policies. The interviewees were split on whether geothermal development is an important criterion on which to evaluate state RPS policies, with roughly equal proportions believing it is very important, somewhat important and not important. Additionally, all interviewees felt it is either somewhat important or not important that there be direct or indirect encouragement for geothermal in a state RPS. It would appear that most of the stakeholders we interviewed are supportive of geothermal energy, but believe that geothermal should compete head-to-head with other sources of renewable generation without direct or indirect methods of support in the RPS policy. Some felt that other methods of supporting geothermal outside of the RPS were more appropriate, such as extending the federal PTC to geothermal.

Interviewees generally felt that all of the potential criteria for evaluating state RPS policies were identified. Stakeholders identified credit trading, assuring utilities of reasonable RPS compliance costs and cost recovery, broad applicability, and price caps as contributing to the success of an RPS. Interviewees identified two elements that might lead to the sure failure of an RPS: not applying the RPS to all parties and the absence of firm penalties.

4.3 Application of the Evaluation Criteria

The evaluation criteria described above were devised to provide a useful framework for qualitatively assessing the actual or likely effectiveness of a state RPS. Nevertheless, it is challenging to precisely evaluate policies based on this framework. We therefore do not conduct a detailed assessment of each of the state RPS policies based on each individual criterion. Instead, in Appendix E we apply these criteria, identify the most critical strengths and weaknesses of the 13 state RPS policies currently in place, and offer an overall qualitative assessment of each of the existing policies. In this chapter we summarize our key findings from this assessment, discussing each category of criteria in turn. As with most evaluations, a significant amount of judgment was required on our part to complete this assessment.

Outcome Criteria: The Good, the Bad, and the Ugly

Many of the state RPS policies have not been in place long enough to judge them comprehensively based on the outcome criteria. Nonetheless, Appendix E shows that, despite limited experience to date, a variety of states are succeeding on one or more of these criteria.

Of the 13 state RPS policies currently in place, **Texas** has clearly shown the most success overall. The Texas policy has driven substantial new wind power additions, has done so with reasonable cost impacts that are being passed on to customers, and retail suppliers appear as if

they will fully comply with the policy. We do acknowledge, however, that relative to aggregate electricity usage in the state, the Texas RPS contains a very modest renewables requirement.

The renewable energy mandates in the regulated markets of **Iowa** and **Minnesota** have also succeeded in meeting their stated objectives, have met with full compliance (after substantial delay in Iowa), and have had reasonably stable costs supported by end-use customers.¹⁶

The success of other states in meeting these criteria is mixed, but some success has been achieved or is expected in a number of different jurisdictions:

- **Arizona's** policy has led to some modest new renewable energy development (most notably, solar), with costs recovered through rate surcharges, but full compliance with the renewable energy targets has not been achieved.
- **California's** RPS requirement is among the most aggressive in the nation. The three major investor-owned utilities have already procured a significant amount of renewable resources in a 2002 interim procurement, in advance of the RPS. RPS design decisions have not yet been entirely finalized, however, so the ultimate effectiveness of the policy remains somewhat uncertain. Whether full compliance with the 20% requirement will be achieved is also somewhat uncertain given the potential scarcity of SBC funds to pay for the above-market cost of renewable energy; in California, renewable procurement costs that are deemed to be above-market are to be covered by the state's SBC, limiting the cost of the policy.
- **Massachusetts** has a well-designed policy that is leading to increased renewable energy development activity in New England. Whether that development activity results in substantial additions to new renewable energy supply, at reasonable and stable costs, remains unclear given the current scarcity of long-term contracting.
- **Nevada** has an aggressive policy that has already led to new renewable energy contracts. Costs are likely to remain reasonable and stable, with prudently incurred costs passed on to customers. Utility compliance will not be complete, however, at least in the initial years.
- **New Jersey's** policy has had an indirect influence on renewable energy development in the region, but will not alone help build new markets for renewable energy for years to come unless the RPS targets are strengthened.
- **New Mexico's** policy has only recently been established, but could drive reasonably sized renewable energy development in the future. Whether the state's utilities will comply with the standard depends on the fate of the policy as a whole: the utilities have sought to overturn the policy before the legislature and the courts.
- **Wisconsin's** program rates highly on the outcome criteria: utilities are complying and in many cases over-complying, costs are reasonable and stable, and prudently incurred costs are being passed on to ratepayers. With a low overall RPS standard combined with early over-compliance, however, the policy is unlikely to drive substantial additional development for years to come.

Other state policies have had little to no impact on renewable energy markets so far, and therefore rate poorly on the outcome-based criteria.

¹⁶ With regards to Minnesota, this assessment is based on the original Xcel mandate, not the renewable requirements included in 2003 legislation.

- **Connecticut's** policy has had no effect on new renewables supply thus far, though with recent changes to the statute, the RPS in that state appears to have been greatly improved.
- **Maine's** policy is designed in a way that also ensures that no new renewable energy development will occur, and the policy will have no impact without fundamental redesign.
- **Pennsylvania's** policy has had no impact on new renewable energy supply, and with few suppliers required to comply with the policy, its impact will remain muted.

In sum, based on the outcome criteria, Texas, Minnesota, and Iowa rate most highly: these policies have worked (Iowa) or are working (Texas and Minnesota). Connecticut, Maine, and Pennsylvania receive failing grades.¹⁷ All other states operate in a gray area where either: (1) some success has been achieved, but that success is not complete, or (2) the policy has not been operating long enough to fairly judge its success on the outcome-based criteria

Policy Design Criteria: Common Pitfalls

Experience with state RPS policies is clearly mixed. Some states have succeeded with their policies, in part due to strong design features, while the policies in many other states are not operating as was expected. It is evident from this experience that crafting a well designed RPS is a balancing act: a number of elements need to be designed well, and if any one design element falls short, the policy may fail to achieve its objectives. Equally clear is that U.S. states have implemented policies that contain a variety of design pitfalls.

Based on our evaluation, the key design weaknesses and strengths of each state's RPS are briefly summarized in Table 2, below (see Appendix E for discussion and further details).

¹⁷ Legislation passed in mid-2003 that will greatly strengthen the RPS in Connecticut. Legislative changes are also being considered in Maine.

TABLE 2. RPS POLICY DESIGN STRENGTHS AND WEAKNESSES, BY STATE

State	Design Strengths	Design Weaknesses
AZ	- reasonable supply-demand balance ensuring some limited new supply, especially solar - well defined and stable resource and geographic eligibility rules - reasonably broad application, with some exemptions - adequate verification and compliance flexibility - cost recovery mechanisms exist for utilities	- uncertainty in duration and stability of targets due to 2003 evaluation of policy - lack of enforcement and non-compliance penalties has resulted in significant under-compliance with the standards - unclear eligibility of geothermal resources - legality of in-state restriction for some resources is unclear - company based application of RPS and even encouragement of green power sales to meet RPS
CA	- supply-demand balance ensures substantial new renewables development - broad applicability, with partial exemption to publicly owned utilities - well defined and stable resource eligibility rules - policy duration is sufficient - PUC and CEC given authority to develop effective enforcement, compliance flexibility, and verification - detailed contracting standards and cost recovery mechanisms to be established - legislation appeared to exclude out-of-state resources, but the CEC has allowed those resources to qualify	- policy design complexity and uncertainty - decisions that might best be left to the market are instead made administratively in part because of use of SBC funds to support over-market costs - availability of SBC funds may limit impact of policy - exemption of non-creditworthy utilities may delay impact of policy, but unlikely to have major long-term effect
CT	- few strengths in original RPS, but new legislation improves RPS design - supply-demand balance ensures new renewables development - reasonably broad application, with publicly owned utilities exempt - duration and stability of targets appear reasonable - enforcement is strong, with penalty of 5.25¢/kWh - adequate verification and compliance flexibility - some long-term contracting standards for utilities	- original RPS had many weaknesses: it was not broadly applicable, with exemptions provided providers of last resort who dominate the market; the supply-demand balance was poor; there was uncertainty in the duration and stability of targets; it had poorly defined resource eligibility rules, with “sustainable” biomass not adequately defined; and it had vague noncompliance penalties - new RPS legislation improves RPS, but possible weaknesses include: biomass eligibility rules remain vague; scope of geographic eligibility and inter-region TRC trading is unclear; and not clear if policy applies on company or product basis
IA	- supply-demand balance and policy design led to 250 MW of wind installation - well defined and stable resource and geographic eligibility rules - reasonably broad application, with publicly owned utilities exempt	- with delays and legal maneuvers, policy took more than 15 years to implement; policy stability and enforcement were therefore both problems - legality of in-state restriction is unclear, though it was never successfully challenged
ME	- reasonably well defined and stable resource and geographic eligibility rules - reasonably broad application, with publicly owned utilities exempt - adequate verification and compliance flexibility - product-based application of targets	- supply-demand balance is poor, with eligible supply far outweighing RPS-driven demand - uncertainty in duration and stability of targets given policy review required after 5 years of experience - vague noncompliance penalties - perhaps too lenient in compliance flexibility
MA	- reasonably broad application, with publicly owned utilities exempt - duration and stability of targets are strong - well defined and stable resource eligibility rules - enforcement is likely to be adequate, with alternative compliance mechanism of 5¢/kWh - adequate verification and compliance flexibility - product-based application of targets	- lack of contracting standards for standard offer and default service contributes to deficiency of long-term contracts - some uncertainty in long-term treatment of out-of-region resources - supply-demand balance weakness possible in early years, due to insufficient lead time provided to bring new renewables on line

State	Design Strengths	Design Weaknesses
MN	- supply-demand balance and policy design has already led to substantial wind and biomass - well defined resource and geographic eligibility rules - duration and stability of targets are strong - contracting guidelines and cost recovery mechanisms - while penalties are not explicit, regulatory oversight has ensured compliance - flexible compliance is allowed in future years	- original mandate and more recent RPS legislation are not broadly applicable; only Xcel is obligated - in the past, utility has tried to green price its obligated renewable energy capacity (company-based application) 2003 legislation has unclear rules for geographic eligibility 2003 legislation is not entirely clear on the circumstances in which Xcel might be relieved of its RPS obligations, but such circumstances clearly exist
NV	- supply-demand balance ensures substantial new renewables development - reasonably broad applicability, with exemption for publicly owned utilities - well defined and stable resource and geographic eligibility rules - duration and stability of targets appear strong - adequate verification and compliance flexibility - contracting standards and cost recovery mechanisms	- legality of geographic requirements is unclear - aggressive purchase requirements may strain resource availability in the long term - supply-demand balance weakness in early years, with insufficient lead time to bring new renewables on line - vague noncompliance penalties not yet a concern, but could become an issue in the future - eligibility recently expanded via legislation
NJ	- reasonably broad applicability, with exemption to publicly owned utilities - duration and stability of targets appear strong, with consideration given to increasing the policy's stringency - legislative definition of eligible biomass is unclear, but regulatory authorities have clarified the situation somewhat	- supply-demand balance is poor in early years, with existing supply exceeding RPS-driven demand - unclear rules for geographic eligibility - strong and flexible compliance mechanisms do not exist - enforcement mechanisms are somewhat limited and vague - contracting standards once the RPS becomes binding may become an issue for basic generation service supply - policy appears to apply on a company basis
NM	- reasonably broad applicability, with exemption to publicly owned utilities - supply-demand balance should drive new renewables - duration of policy appears strong - reasonably well defined and stable resource and geographic eligibility rules - adequate verification and compliance flexibility - contracting standards and cost recovery mechanisms to be overseen by regulatory commission	- stability of policy in doubt as utilities are challenging regulatory jurisdiction of PUC - enforcement mechanisms remain to be developed - whether costs of policy can be recovered from green power customers (company-based compliance) remains unclear
PA	- resource eligibility rules are reasonable clear and well defined - policy effectively applies on a product basis	- not broadly applicable, with all but a very few electric service providers exempt - poor supply-demand balance ensures that new renewable generation will not be required to meet policy - unclear policy duration - enforcement mechanisms are unspecified - geographic eligibility rules are not specified - strong and flexible compliance mechanisms do not exist
TX	- supply-demand balance ensures substantial new renewables development - reasonably broad applicability, with exemption to publicly owned utilities - well defined and stable resource and geographic eligibility rules - duration and stability of targets are strong - adequate verification and compliance flexibility - enforcement is strong and vigorous - policy applies on a product basis	- legality of geographic requirements is unclear - some have argued that RPS should provide greater compliance flexibility to LSEs, given run-up in TRC prices in late 2002
WI	- supply-demand balance ensures some new supply - broad applicability, with few exemptions - well defined resource and geographic eligibility rules - enforcement is somewhat vague, but in a regulated market this has done little damage - adequate verification and compliance flexibility	- low RPS standard ensures limited new supply - duration of policy is somewhat vague

Rather than describing these weaknesses and strengths by state in detail (see Appendix E), here we identify and provide examples of some of the more common and critical design pitfalls

experienced by state RPS policies to date. These are pitfalls that other states may wish to avoid, as they have the possibility of completely undermining the objectives of an RPS:

- **Narrow Applicability:** Many states provide partial exemptions in meeting RPS requirements, the most common of which is to exempt publicly owned electric utilities from meeting the standards. Such minor exemptions, while not ideal and certainly not competitively neutral, will not generally do major damage to an RPS. More comprehensive exemptions, however, can destroy the potential impact of RPS requirements. In Connecticut, for example, the legislature originally exempted providers of last resort from meeting the RPS; these providers serve the customers that have chosen not to switch to a competitive provider, and account for over 95% of the total load in the state. Furthermore, in a competitive market like Connecticut, when an RPS requirement does not apply to every potential supplier, it is not competitively neutral and creates barriers to entry. Similarly, Pennsylvania applies their RPS to only a small portion of the overall market, in this case competitive providers of default service (see Appendix E for additional detail), to poor effect.
- **Poorly Balanced Supply-Demand Conditions:** Maine provides the quintessential example of a state with a poorly balanced supply-demand condition. Even with a nominally high RPS obligation, resource eligibility rules are so expansive that eligible supply far exceeds demand. As a result, the policy has had no effect on new renewable generation in the region. Other states that have had similar, yet less severe, problems include Connecticut, New Jersey, and Pennsylvania. Still other states may face the opposite condition: RPS-driven demand may exceed available renewable energy supply. The RPS policy in Massachusetts may eventually face this problem due to siting and permitting constraints. Still other states have left insufficient time between finalizing the implementation rules of their RPS and the incidence of the first standard, with early non-compliance or shortages of renewable energy generation a likely result. Massachusetts and Nevada may fall in this camp.
- **Insufficient Duration and Stability of Targets:** The renewable energy targets inherent in some state RPS policies are too unclear or of inadequate duration to provide sufficient certainty to renewable energy investors. Arizona's policy suffers from this failure, with a 2003 cost-benefit evaluation that will determine the fate of the policy. The duration of Maine's policy is also unclear, with a legislatively established review of the policy to occur after just 5 years of experience (by 2005). In other cases, the fate of the standard after a certain date is simply left unspecified: this is the case in Pennsylvania and other states.
- **Insufficient Enforcement:** We find that some states have inadequate enforcement. Arizona provides the best example. With no penalties for non-compliance, and with specified ratepayer surcharges being collected to help fund the RPS, the utilities appear to have largely opted to comply with the policy only up to the amount of funds that have specifically been collected for that purpose; full compliance has not been achieved. In other cases, the implications of non-compliance are left vague or unspecified: this is the case in Maine, Minnesota, Nevada, New Jersey, New Mexico, and Pennsylvania. In regulated markets, such as Minnesota, Nevada, and Wisconsin, we find that such vague enforcement may be sufficient: as long as obligated utilities know that the regulator is serious, they will comply. In restructured markets, however, a more clear non-compliance penalty such as that used in Texas may be preferred.
- **Poorly Defined or Non-Existent Contracting Standards and Cost Recovery Mechanisms for Regulated Utilities and Providers of Last Resort in Competitive Markets:** This

design pitfall has emerged as a critical failure that now faces several states. In restructured markets, providers of last resort (including default, basic and/or standard offer service providers) serve the needs of those customers not served by a new competitive electricity supplier. As a practical matter, these providers therefore serve the majority of customer load and remain regulated by state PUCs. These providers typically rely on short-term contracts to serve this load. Absent contracting standards that require or encourage long-term renewable energy contracts, and cost recovery mechanisms that allow prudently incurred costs to be passed on to customers, the RPS compliance efforts of these LSEs may be sub-optimal. In Massachusetts, for example, a lack of contracting standards has (in part) led to short-term myopia and the absence of long-term contracting; whether this can be resolved by the private market, or requires regulatory or policy intervention remains to be seen. The same situation may ultimately arise in New Jersey and other states. In regulated states, meanwhile, the need for contracting standards is even more evident. Here, the key design variable to consider is how to design those standards in a way that gives utilities the ability to flexibly use their discretion in making renewable energy purchases, while at the same time ensuring the prudence of the costs that are then incurred. In Arizona, the lack of well-defined standards (combined with the unclear fate of the RPS) has arguably led the utilities to procure more costly (but smaller and therefore lower total cost) PV systems than to contract for a larger quantity of potentially lower-cost solar thermal electric generation.

In addition to these major pitfalls, other pitfalls that states have fallen into are less severe. These pitfalls may not undermine the overall goals of RPS policies, but may make the achievement of those goals more costly, uncertain, or undesirable:

- **Poorly Defined and Unstable Resource Eligibility Rules:** Renewable resource eligibility rules in some states are poorly defined and unstable. Several states have sought to limit eligible biomass generation to “sustainably” harvested sources, for example, without an adequate definition of what that term means: Connecticut and, to some extent, New Jersey fall into this category.
- **Poorly Defined and Unstable Rules for Out-of-State Renewable Generation:** Other states have left the eligibility of out-of-state generation unclear: New Jersey, Pennsylvania, Minnesota, and Connecticut, for example, are somewhat unclear on their geographic eligibility requirements. Still other states have applied “in-state” restrictions on eligibility or rules that have a similar effect, potentially risking legal challenge under the Interstate Commerce Clause and the North American Free Trade Act (NAFTA). Arizona, Iowa, Nevada, and Texas could all face such a challenge.
- **Rigid Verification Mechanisms:** The use of TRCs is not an absolutely essential element of a state RPS. This is especially true in regulated, vertically integrated markets where internal transmission constraints are limited: Minnesota and Iowa, for example, have implemented successful requirements without the use of TRCs. In all other cases, however, the use of TRCs provides substantial benefits. Despite this, a couple states do not yet use TRCs as an accounting and trading tool – New Jersey and Pennsylvania are the obvious examples.¹⁸ We note here that the application of TRCs for verification purposes does not require wide

¹⁸ A credit trading system is being considered for PJM, however, which would support the RPS requirements in New Jersey and Pennsylvania.

geographic eligibility. Nevada, for example, has used TRCs to good effect while still placing severe limits on the eligibility of renewable generators located in adjacent states.

- **Inadequate Compliance Flexibility:** Some states may not build in sufficient compliance flexibility into their programs. Though experience is not yet sufficient to closely judge RPS policies based on this criterion, some stakeholders in Texas argued for additional flexibility in response to the late 2002 run-up in TRC prices in that state.¹⁹
- **Company-Based Application of an RPS:** While not a critical design element for an RPS overall, product-based application is the preferable approach, for the reasons discussed in Table 1, above. And yet, a number of states have instead chosen to allow a company-based application, risking consumer confidence in green power markets; Arizona falls into this category.

Finally, though not an explicit criterion, many of the stakeholders that we interviewed (see Appendix B) revealed an underlying view that the design of RPS policies should be as simple as possible. **Undue design complexity** might therefore also be considered a possible pitfall. The California policy is clearly the most complex and involved of the state RPS policies in place today, with substantial ongoing responsibilities given to the CPUC and CEC. The degree of complexity derives in large part from the fact that, unlikely most RPS policies, the state's system-benefits charge is to be used to cover the above-market cost of renewable energy purchases, requiring a higher degree of regulatory oversight. A fear exists among some stakeholders that this design complexity and regulatory oversight will undermine the policy's overall effectiveness because it may limit "market" decisions, and because the entire design process may bog down in regulatory design details and be subjected to continual review and attack. We acknowledge, however, that whether this is a major design pitfall is an open question.

Market Context Criteria

Even where the design of an RPS is strong, some existing state policies do poorly on the market context criteria. In these cases, even an otherwise well-designed policy may fail.

- **Lack of Credit-Worthy Long-Term Power Purchasers:** In regulated markets, utilities can be obligated to purchase renewable energy under long-term contract. Such is the case in Nevada, California, New Mexico and other states. In these cases, the question that remains is one of creditworthiness. Though it is likely to be a transitional problem, the Nevadan RPS has already faced some hurdles on this score, with some renewable developers hesitant to sign contracts with the state's utilities because of credit concerns. California solved this problem by simply exempting non-creditworthy utilities from making annual RPS purchases. In restructured markets, the lack of long-term contracting can be more endemic, a result of the design of the restructured industry. Even in Texas, only the utilities have been willing to enter long-term contracts for renewable energy supply, with the smaller competitive electricity retailers content to purchase TRCs on the short-term market. At the least, in restructured markets, regulators may need to establish renewable energy contracting standards for those providing service to customers who have chosen *not* to switch to a competitive supplier. This has not occurred in a number of states, however, leading to predictable problems in financing renewable energy development. Massachusetts provides

¹⁹ The Texas PUC raised the TRC deficit allowance from 5% to 10%.

perhaps the best example where, as discussed in depth in Appendix E, few suppliers have thus far been willing to enter into long-term contracts with renewable generators.²⁰ The effect has been to slow renewables development and create a tight renewables supply condition.

- **Unstable Political and Regulatory Support:** The long-term fate of the RPS in several states is unclear given wavering political support. In Arizona, for example, a 2003 cost-benefit assessment and the application of the policy through the regulatory (as opposed to legislative) process have led to substantial uncertainty. New Mexico's policy, also applied through regulatory action, has been challenged as well. The RPS in Maine, meanwhile, seems to face almost yearly legislative proposals for redesign or even elimination.
- **Inadequate or Inaccessible Developable Resource Potential:** Most state RPS policies have not been operating for sufficient time to test supply constraints. However, concerns do exist in Massachusetts that supply may not ultimately be able to keep up with demand, at least from in-region sources. Texas, meanwhile, has run into transmission adequacy issues in delivering west Texas wind to the state's load centers, although the Electric Reliability Council of Texas (the grid administrator in Texas) has approved a package of transmission expansions and improvements in west Texas that will provide some relief.

Geothermal-Specific Criteria

Geothermal electricity, where adequate resource potential exists, is typically an eligible renewable source under RPS policies. States in which geothermal electricity is not automatically eligible include: Arizona, Connecticut, Iowa, Massachusetts and Minnesota. Of the 13 state RPS policies, however, only four are in states where substantial geothermal resource potential exists in-state or in nearby states: Arizona, California, Nevada, and New Mexico. Therefore, the lack of eligibility in four of the other nine states should be of relatively little concern; only in Arizona is a lack of automatic eligibility potentially worrisome.

While this report has emphasized utility-scale geothermal applications, geothermal energy can also be used on a customer's site to serve electrical or heat applications. In some states, customer-sited geothermal electricity would be eligible to receive TRCs, and contribute to state RPS policies. In other cases, such customer-sited applications are not eligible under the RPS. Similarly, RPS policies could offer TRCs to customer-sited geothermal heat applications, though today only in Texas would such applications clearly be allowed under the existing RPS statutes. The ineligibility of geothermal heat applications in some states may be due to lack of awareness of the availability of the resource.

It is perhaps a commonly held view that wind power has been the primary beneficiary of state RPS policies, with geothermal energy not playing as significant a role. The availability of the federal production tax credit makes wind power an especially potent competitor, and there is no doubt that wind power has been the primary player in state RPS policies so far. A review of the evidence, however, suggests that geothermal energy is also beginning to play a significant role, at least in those states in which significant resource potential exists. Because it is an attractive baseload resource, geothermal is likely to continue to play a role in some states. Below we

²⁰ We note that the Massachusetts Renewable Energy Trust released a RFP in June 2003 to purchase TRCs on a long-term basis that may help to alleviate this problem.

summarize the early experiences of the four states in which both an RPS and geothermal resource potential exists. Again, our focus is on utility-scale geothermal electricity applications.

- **Nevada:** Nevada's RPS is already beginning to stimulate geothermal development in that state. For example, Nevada Power's and Sierra Pacific Power's first renewable energy solicitation yielded contracts that include 130 MW of wind, 97 MW of geothermal, and 50 MW of solar thermal electric power. At typical project capacity factors, the 97 MW of geothermal capacity will contribute over 60% of the total electricity delivered under these contracts. With additional renewable solicitations expected, geothermal energy appears poised to significantly benefit from the Nevadan RPS.

Nevada's apparent early success is the result of a reasonably well-designed RPS that scores well on many of the evaluation criteria described in this chapter. With respect to the geothermal-specific criteria, geothermal energy is both eligible in Nevada and significant development activity has commenced. Moreover, while Nevada's RPS does not contain design elements that *specifically* encourage geothermal (e.g., credit multipliers, geothermal bands, etc.), it does include at least two design elements that offer *indirect* support: (1) consideration of integration costs and reliability impacts, and (2) in-state TRC trading.

With respect to the first point, Nevada's RPS regulations require electric utilities to submit renewable energy contracts to the PUC for approval under a "just and reasonable standard." In making that determination, the PUC must consider several factors, including the utility's system peak capacity requirements, conditions and limitations of the utility's transmission system, and provisions in the power purchase contract such as scheduling requirements, unit contingent provisions, ancillary service requirements, and whether the utility provider has any economic dispatch rights. This language provides the utilities some discretion to select those contracts that offer the best combination of low-cost supply and attractive delivery profiles. Such considerations played a significant role in the success of geothermal energy in the utilities' first renewable solicitation. Specifically, as a result of utility concerns on the integration of wind power in the Nevada electrical grid, the utilities set a hard limit of 150 MW of wind in the initial renewables solicitation (50 MW in northern Nevada and 100 MW in southern Nevada). Sierra Pacific Power and Nevada Power cited company-performed, but not released, studies that sudden changes in the output of wind projects might cause the utilities to violate reliability standards of either the North American Electric Reliability Council or the Western Electric Reliability Council.²¹ Consideration of these reliability impacts led, in part, to the selection of certain geothermal projects, despite the fact that the geothermal bids came in at a higher cents/kWh level than did the wind bids.²²

In-state trading of TRCs has also been vital to the successful implementation of the Nevadan RPS, and its support for geothermal energy. Sierra Pacific Power and Nevada Power, both

²¹ Both companies note that they will reassess these limits as they gain operational experience with wind projects, and believe they may be able to offset some operational impacts with Hoover Dam hydro generation, which can respond quickly to changes in wind output.

²² Reportedly, the winning geothermal bidders will provide energy at 4.2-5 cents/kWh, with three contracts escalating at 1%, and one staying flat. The winning wind projects apparently quoted 3-4 cents/kWh, with 1% annual increases. The solar thermal electric plant is reportedly priced at 16-17 cents/kWh.

jointly owned by Sierra Pacific Resources (a holding company), are not interconnected to any significant extent, so renewable electricity cannot easily be transmitted between northern and southern Nevada. Furthermore, the vast majority of the existing renewable generation in the state is located in the north (in Sierra Pacific's service territory), and most proposals for new non-solar renewable generation have also come from projects in the north.²³ Because TRC trading is allowed for in-state renewable facilities, however, the utilities have been able to contract with renewable projects largely in the northern part of the state, with separate TRC trade between Sierra Pacific and Nevada Power, benefiting the geothermal projects located in the northern areas of the state.²⁴ While TRC trade is allowed, however, there are also strong restrictions to TRCs generated from facilities located outside of the state; this also has been important for geothermal because the Nevadan RPS might otherwise be met with inexpensive TRCs from out-of-state renewable generators.

Geothermal development in Nevada is likely to continue its fast pace as a result of the state's RPS, especially if wind integration continues to be a major concern. The contracting processes followed by the state's utilities, which includes acknowledgement of the different values that geothermal and wind bring to an electricity system, will indirectly encourage geothermal development. The success of geothermal in Nevada is also at least partly due to the geothermal projects already operating in the state, as the geothermal resource is proven, and there is a successful track record of geothermal project installation and generation.

- **California:** The Californian RPS requires utilities and competitive energy service providers to meet an overall 20% RPS by 2017, in 1% annual increments over an utility's existing renewable energy level, or baseline, to be determined by the CPUC. Geothermal energy is eligible under the Californian RPS, and development activity is set to increase based on the new policy. While procurements under the state's RPS have not yet begun, as an indication, Calpine received two contracts under the state's interim renewables procurements in 2002: one for 110 MW of on-peak and 55 MW of off-peak existing geothermal from the Geysers, and the other for 200 MW of existing geothermal from the Geysers.²⁵ California's RPS has no design elements that *specifically* encourage geothermal development, but how geothermal fares under the Californian RPS will depend in large part on how provisions of the legislation are implemented; these RPS elements might *indirectly* encourage geothermal development.

In particular, California's RPS legislation specifically requires electric utilities to select renewables on a "least-cost, best-fit" basis, including consideration of indirect costs from transmission investments and the costs of integrating and operating RPS-eligible renewable energy resources. The legislation also requires consideration of the delivery profile of the renewable generator (as-available vs. baseload, vs. peaking). The detailed implementation rules for these provisions have not been finalized by the CPUC, and even once these rules are

²³ In fact, Nevada Power did not receive enough renewable energy proposals in its 2001 renewable energy solicitation to comply with the Nevadan RPS.

²⁴ Note that there is some risk that renewable energy credit trading in Nevada may come to an early end, as the Nevada PUC put a sunset date of August 1, 2005 on TRC trading, unless the Nevada Legislature appropriates funding to allow the Nevada PUC to administer the program.

²⁵ The 110/55 MW contract was priced at an all-in cost of \$54/MWh.

set, there will be some discretion given to LSEs in the application of the rules. These details will have a sizable impact on the role that geothermal plays under the state's RPS.

Nonetheless, the fact that integration costs, capacity value, and delivery profiles are to be considered in the utilities' renewable energy procurements will likely be a significant boost for geothermal energy. Indeed, some analysts project geothermal to be a major player under the state's RPS. For example, Morris (2003) states that "no reasonable compliance scenario can be constructed without having geothermal generating capacity more than double from its current level by 2017, and provide at least 50 percent of the state's renewable electricity supply at that time." As in Nevada, continued geothermal market development will be aided by the presence of existing geothermal plants, and the knowledge that additional geothermal resource potential exists in the state.

An important detail in the Californian RPS is whether incremental production at existing geothermal sites is to count towards an LSE's baseline of renewable purchases, or can be used to meet the annual 1% increase above that baseline. In particular, geothermal facilities in service before September 26, 1996 can only adjust a LSE's renewable energy baseline, not contribute to the 1% annual incremental RPS requirement, unless specifically determined by the California Energy Commission (CEC) to be incremental. The RPS legislation instructed the CEC to recognize as "incremental" increases in electrical production that results from capital investments that have been made to reverse or slow declining output at a geothermal steamfield. In June 2003, the CEC announced it will limit the designation of incremental geothermal generation to generation resulting from eligible capital expenditures, such as repowering or refurbishing generating equipment, increasing steamfield production through increased water injection, or using geothermal energy more efficiently such as adding a binary bottoming cycle. The CEC will draw up more specific eligibility guidelines for determining incremental geothermal production before the end of 2003. Not clear is whether incremental geothermal will be eligible or not for payments from California's systems benefit charge fund—the CEC also will ultimately rule on this issue.

- **New Mexico:** New Mexico's RPS has not yet formally taken effect, so its impact on geothermal is impossible to assess at this time. The policy does, however, contain RPS design elements that would *specifically* encourage geothermal development. In particular, while every MWh of wind generation is to receive one TRC, geothermal energy will create two TRCs for every MWh of generation. Accordingly, if the "above-market" cost of geothermal energy is less than twice that of wind power, geothermal should compete well within this market. New Mexico is the only state so far to design an RPS that specifically encourages geothermal development in this way.

While New Mexico's RPS has been challenged before the New Mexico Supreme Court, and its fate is uncertain, it also contains design elements that might indirectly support geothermal energy. For example, under the rule, each utility must file with the New Mexico Public Regulation Commission a long-term plan for satisfying the RPS by November 2003. The plan must include a "diversified portfolio" with "reasonable levels" of wind, geothermal, solar, biomass and hydro, suggesting that renewable resource diversity will be an important element in complying with the RPS. In addition, utilities must explain, for each renewable

resource, if there is available transmission capacity, the dispatch flexibility of the renewable energy and capacity, and the reliability, availability, and environmental benefits of the renewable energy and capacity. By October 2004, and annually thereafter, each utility must file its proposed renewable energy portfolio, including power, energy and ancillary service requirements. Such provisions suggest that utilities will have some flexibility in determining which renewable resources they will rely on to comply with the RPS. There are no installed geothermal projects in New Mexico, however, and the geothermal resource is not as well understood as in California and Nevada. It is therefore unclear whether even these attempts to directly or indirectly encourage geothermal development will be enough to stimulate the necessary investments in resource assessment and site prospecting.

- **Arizona:** Arizona is one of a few states in which geothermal energy is not automatically eligible under the state's RPS. Apparently, this decision was based, in part, on evidence presented at the time the rule was established that the geothermal resource in the state was insufficient to support electricity production. This evidence derived from studies conducted in the 1980s and the 1990s, which indicated that geothermal resources in Arizona may be sufficient to support direct use geothermal such as aquaculture and greenhouse heating, but are perhaps not high enough to support electricity generation. In late 2002, however, Arizona Public Service (APS) received authorization from the Arizona Corporation Commission to count power from a geothermal facility towards the state's RPS. According to APS, Vulcan Power will build a 20 MW geothermal facility, with the first 2 MW planned to come on line in 2005. The Arizona Corporation Commission decided not to re-open their RPS regulations to make geothermal an eligible technology under the RPS on a blanket basis, as that may have taken several months to a year; instead, the Commission chose to approve a simple waiver for the specific geothermal project, which took only about a month. Even were geothermal eligible under the Arizonan RPS, however, there would be little incentive for significant development at this time. This is because the state's existing RPS has low purchase obligations that are mostly directed towards solar generation..

To sum up, geothermal has done well, or appears likely to do well, in states with RPS policies in which the geothermal resource base is known, and if other parameters besides the cost of energy delivery are incorporated into the RPS. These parameters include such elements as capacity value and whether the renewable resource is a "least-cost, best-fit match" with a utility's resource portfolio. The RPS policies in California and Nevada meet these requirements.

Even with these aspects of an RPS in place, however, if the geothermal resource itself is not well known, then the prospects for developing geothermal power plants may diminish; this may be the case in both New Mexico and Arizona. Consequently, there may be a need for other government policies or actions to explore the availability of geothermal resources in states where the resource is not proven or well known. This could involve programs sponsored and funded by state system-benefits charges, if they exist, or U.S. government agencies such as the Department of Energy.

5 Recommendations and Conclusions

This final chapter begins by providing an overall summary of the report highlights (Section 5.1). We then identify a set of general RPS design principles and specific best practices that we believe will be helpful in guiding future efforts to design and implement state RPS policies that will be supportive of renewable energy development generally, and geothermal development in particular (Section 5.2). Finally, we specifically discuss the role of geothermal energy in state RPS policies (Section 5.3).

5.1 Report Highlights

The RPS is becoming an increasingly popular policy to encourage renewable generation. As noted in Chapter 2, the RPS has been implemented in 13 states and in a number of countries overseas. Roughly a dozen additional states are considering such a policy. While wind power has been the primary beneficiary of state RPS policies to date, geothermal energy is also beginning to benefit from these policies.

There are both advantages and disadvantages to the RPS relative to other renewables policies. Chapter 3 shows that the RPS has some potential *theoretical* appeal compared to other policies: (1) the RPS can drive a known quantity of new renewable development and can ensure that there are buyers for that renewable energy, (2) it may help lower the total cost of that development by giving LSEs the flexibility to meet their purchase targets in the way they deem best, and encouraging competition among renewable developers, (3) an RPS can be competitively neutral if it is applied equally to all retail electricity suppliers, (4) an RPS may impose relatively low administrative burdens and direct administrative costs on those responsible for overseeing the policy, and (5) an RPS can be applied in both restructured and monopoly markets.

And yet we also find that the RPS has some potential disadvantages relative to other types of renewable energy policies: (1) due to its complexity, the RPS can be difficult to design and implement well, (2) an RPS may be less flexible in offering targeted support to renewable energy, (3) the exact cost impacts of an RPS cannot be known with certainty in advance, (4) operating experience with the RPS remains limited, (5) if an RPS does not lead to the availability of long-term power purchase agreements, the ability to finance new renewable projects will be limited and compliance costs may increase, and (6) an RPS is not *necessarily* suited to supporting diversity among renewable technologies, although an RPS can be designed to do so through the use of resource tiers and credit multipliers.

Our analysis leads us to conclude that, in order to assure that RPS policies are effective in supporting geothermal energy, geothermal must be eligible and the RPS should be well-designed. While eligibility of geothermal has not been universal, neither has it been controversial, since nearly all RPS policies that omit geothermal energy are in states where there is no developable resource. The features of an RPS that is effectively tailored to the unique characteristics of geothermal energy are discussed in Section 5.3. At least two states, Nevada and California, appear to have developed their policies in a way that will support geothermal development on a large scale; these experiences were discussed in Chapter 4.

As further highlighted in Chapter 4, of the 13 state RPS policies in existence today, Texas' approach has been the most successful so far in driving new renewable capacity at reasonable cost. The renewable energy requirements in Iowa and Minnesota have also been successful. The verdict on other state RPS policies is more mixed, either because the RPS has not been in place long enough to evaluate results, or because some success has been experienced but that success is still incomplete. These states include Arizona, California, Massachusetts, Nevada, New Jersey, New Mexico and Wisconsin. The RPS policies in three other states—Connecticut, Maine and Pennsylvania—have had little or no impact on renewable energy markets so far.

Clearly, a number of poorly designed RPS policies exist, and these policies will do little to advance renewable energy broadly, or geothermal energy in particular. The creation of well-designed RPS policies has proven challenging. This report has therefore identified some of the most critical design pitfalls that various existing state RPS policies have already experienced. These pitfalls, which can be avoided in the future, include narrow applicability of the RPS, poorly balanced renewable energy supply and demand conditions, insufficient duration and stability of the RPS, weak enforcement, and poorly defined contracting standards for regulated utilities in regulated markets and providers of last resort in competitive markets. In addition, we have highlighted market context criteria that, if not present, may undermine even a well-designed RPS, including the presence of credit-worthy long-term power purchasers, a stable level of political and regulatory support, and adequate and accessible renewable resource potential.

Though experience with state RPS policies is still limited, and much will be learned in future years, we have now clearly gained some knowledge of the conditions and design features necessary to make an RPS policy work. Just as important, we understand that getting most design elements right will not matter if one of the major design pitfalls is present. The lesson of this experience is that the details matter. Developing a successful RPS appears to require a clear delineation of objectives; attention to detail; sufficient analysis to assure a reasonable supply-demand balance; and a delicate balancing of design elements in response to objectives or design principles which sometime conflict.

To aid legislators and regulators in developing and implementing a successful RPS that will support geothermal markets, we offer three recommendations. First, policy makers may wish to clearly state the objectives of the RPS, especially in enabling legislation (if applicable). If there are multiple objectives, some guidance on prioritization may be helpful as well. Many states have failed to develop a clear set of objectives in advance of policy implementation, resulting in poorly designed RPS policies. Second, while legislative mandates, rather than RPS policies initiated via regulation, may result in greater regulatory certainty and predictability, legislators rarely have the expertise or time to devote the necessary attention to detail. Furthermore, the compromise typical of legislative work can easily result in an awkward RPS design rather than a fully integrated and balanced RPS policy. Because of this, there may be a role for the NGC and other organizations to develop, or support the development of sample RPS legislation and regulatory rules to guide orderly and balanced RPS development. Finally, we offer a series of preliminary design principles that might be used to guide legislators and policymakers in crafting successful RPS policies, and a series of best practices consistent with these principles. These principles and best practices are described in the following section.

5.2 Policy Design Principles and Best Practices

There is clearly no single, “ideal” way to design a state RPS. Nonetheless, most effective RPS designs seem to meet a number of minimum requirements. Our analysis of early RPS experience suggests a series of broad policy design principles and specific best practice design elements, identified and described below. These seven principles and related best practices derive from our own experience with RPS policies, from the stakeholder interviews summarized in Appendix B, and from the RPS design criteria and state evaluations presented in Chapter 4. We believe that these principles and best practices can be productively used to guide state RPS policy design.²⁶ Nonetheless, we also acknowledge that experience with RPS policies remains somewhat limited. It would therefore be appropriate to revisit these preliminary principles and best practices as additional experience is gained.

Before we begin, three additional items bear mentioning. First, the implications of some of the design principles and best practices differ depending on whether an RPS is applied in a regulated or restructured market context. Simply put, an RPS applied in a still-regulated market will, to some degree, require different design characteristics than an RPS applied in a restructured market; where such difference exist, we note them below. Second, the evaluation of specific RPS design options often requires balancing conflicting policy principles. While the principles and best practices developed below can guide design decisions, considered policy tradeoffs will remain essential. Finally, the reader will note that a number of the “best practices” are listed under more than one “principle.”

The recommended design principles are as follows. *A successful RPS policy will be...*

1. Socially beneficial;
2. Cost-effective and flexible;
3. Predicable;
4. Nondiscriminatory;
5. Enforceable;
6. Consistent with market structure; and
7. Compatible with other policies.

Principle #1: Socially Beneficial. A well-designed RPS will support increased renewable energy production, and thereby contribute to an improvement in environmental quality, to increased diversity in energy supply, to decreased risk, and to other politically chosen objectives.

Best practices for implementing this principle ensure that:

- The RPS standard and eligibility rules are structured such that the supply-demand balance is sufficiently binding to lead to new renewable generation.
- Renewable energy purchase requirements increase over time to result in increasing benefits.

²⁶ The seven RPS policy design principles described here have been loosely adapted from principles developed by consulting team members for the Massachusetts Division of Energy Resources and its RPS Advisory Group in 2000.

- An RPS is designed to increase the *net* amount of renewable electricity serving a state; attrition of existing renewables should be prevented, or offset by increased new renewable energy development.
- The RPS applies to as many potential suppliers of retail load as possible so that overall RPS targets can be met and cannot be easily bypassed.
- Fuel, technology, and vintage eligibility decisions are guided by policy objectives, by an assessment of the social benefits of particular resources and technologies, and by an evaluation of the need of those projects to receive extra-market revenue from an RPS.²⁷
- Customer-sited renewables projects that otherwise meet policy objectives and renewable energy applications that *save* electricity (e.g., geothermal heat) are considered for eligibility.
- Whether and under what conditions out-of-state projects are eligible is also guided by the social objectives of the RPS (of course, legal and practical constraints also apply).
- If policymakers want to assure a certain level of resource diversity among renewables, they might consider: (1) specific resource bands or tiers, (2) credit multipliers, or (3) complementary policy approaches (e.g., system-benefits charges, tax incentives, etc.).

Principle #2: Cost Effective and Flexible. A well-designed RPS will be implemented and administered in a straightforward, flexible, cost-effective, and not unduly burdensome manner.

Best practices for implementing this principle ensure that:

- Renewable energy purchase requirements are achievable given the available resource potential and other potential supply constraints, including the credit quality of the LSEs.
- Sufficient lead-time exists between when an RPS target is set (or increases) and when it takes effect to accommodate project development, permitting and construction timelines.
- An effective RPS is administered in a simple, straightforward fashion, minimizing regulatory intervention where possible.
- In most cases, tradable renewable credits are used for trading and verification purposes to maximize flexibility and lower compliance, transaction, and administrative costs (note that this *does not* require broad geographic eligibility).²⁸
- Where there are serious concerns about the costs of an RPS, due especially to potential supply scarcity or market power, policymakers may wish to consider establishing a cost cap.²⁹ A cost cap can mitigate concerns of unbounded RPS compliance costs. An effective cost cap is one that is set at a multiple of expected RPS compliance costs, so that LSEs are encouraged as much as possible to procure renewable energy to comply with the RPS.

²⁷ States may have multiple underlying policy objectives, and those objectives may vary from state to state (e.g., local environmental improvement, reduction in global climate gasses, resource diversification, local economic development). As a result, best practices for geographic eligibility and technology eligibility depend upon the underlying objectives of the policy. At the very least (unless greenhouse gas reductions are the *only* objective), eligibility rules might be designed to encourage some local generation.

²⁸ In some limited cases, the use of tradable renewable energy credits may not be as important. In particular, the use of TRCs is not as essential in markets with vertically integrated regulated monopolies, located in states with few internal transmission constraints.

²⁹ For example, one cost cap design would grant LSEs the ability to pay a specified cents/kWh price instead of directly procuring renewable energy, with funds collected from the charge used to support renewable energy in other ways. Another approach would be to lower the aggregate targets for renewable energy if costs rise above a certain threshold.

- Compliance flexibility tools such as early compliance, banking, and annual (or, especially in the case of regulated markets, even multi-year or rolling-average) compliance periods are considered.
- Consideration is given to allowing RPS administrators *limited* flexibility to accelerate or slow the RPS percentage increases (with sufficient notice) in the event of well-defined and extreme circumstances.³⁰
- Clarity is provided on eligibility rules (including technology, fuel, vintage, and location) so market participants can assess eligibility *before* making significant financial commitments.³¹
- Consideration is given to establishing long-term contracting standards for regulated utilities and regulated providers of default and standard offer service, particularly if conditions suggest that long-term purchases will not result absent such requirements. Such standards should generally assure that the lowest-cost compliance strategies are used, and that even-handed comparisons of different renewable energy sources are made (considering direct and indirect costs).

Principle #3: Predictable. A well-designed RPS will provide market stability for all participants, reducing regulatory risk for generators and LSEs and improving the ability of renewable developers to obtain financeable long-term contracts.

Best practices for implementing this principle ensure that:

- Legislative and regulatory support for the RPS policy and its detailed design are strong, and that regular changes or even elimination of the policy are unlikely.
- RPS policies have renewable energy targets that are of sufficient duration and stability to minimize risk and enhance the likelihood of long-term contracting.³²
- Eligibility rules (including technology, fuel, vintage, and location) are well defined and stable, not subject to sudden change.
- Rules for the RPS are clearly defined, and that any material changes to the policy come with ample notice and lead-time, and that changes occur only within narrowly defined parameters.
- Enforcement mechanisms are established that provide confidence to renewable energy developers that LSEs will make their required renewable energy purchases.
- The RPS applies to all potential suppliers to any retail load covered by the RPS so that the overall RPS targets cannot be easily bypassed, creating uncertain aggregate renewable obligations.
- Clear long-term contracting standards are established for regulated utilities and regulated providers of standard offer and default service, if necessary, to help assure long-term contracting.

Principle #4: Nondiscriminatory. A well-designed RPS will be applied fairly, consistently, and proportionately to all market participants and customers.

Best practices for implementing this principle ensure that:

³⁰ In most cases, this allowance should be limited, clearly bounded, and exercised only with ample notice, to reduce regulatory risk.

³¹ In addition to clear eligibility rules in RPS legislation and regulation, this also includes providing pre-certification and advisory rulings to developers on the eligibility of proposed renewable facilities.

³² This includes assuring that a target percentage requirement, once achieved, is maintained long enough to allow the amortization of generation investments and support long-term financing.

- The RPS applies to all suppliers of retail load in the state, and thereby spreads the costs and benefits of the policy to all.³³
- The RPS applies to all potential suppliers to any retail load covered by the RPS so that the policy does not create barriers to competitive entry.
- The RPS applies on an energy basis, requiring megawatt-hour purchases of renewable electricity (or TRCs) rather than megawatt-denominated capacity targets.³⁴
- Prudently incurred RPS compliance costs are recovered in electricity rates.³⁵
- LSEs are required to meet the minimum RPS requirements for *each product* that they sell (product-based as opposed to company-based compliance).
- Eligibility decisions are made fairly and are guided by policy objectives, by an assessment of the social benefits of particular resources and technologies, and by an evaluation of the need of those projects to receive extra-market revenue from an RPS.
- Customer-sited projects that otherwise meet the eligibility criteria qualify for the RPS, and renewable energy applications that *save* electricity (e.g., geothermal heat) are also considered for eligibility.
- In designing contracting standards for regulated utilities and regulated standard offer and default service supply, renewable energy sources are compared with one another in an even-handed manner, considering the direct and indirect costs and attributes of each resource (including integration and deliverability characteristics).

Principle #5: Enforceable. An effective RPS will be enforceable, ensuring that the policy’s renewable energy targets and broader goals are achieved.

Best practices for implementing this principle ensue that:

- Clear rules for enforcement in cases of non-compliance are established.
- For competitive providers, enforcement might include automatic financial penalties, suspension on the ability to sign up new customers, and supplier license revocation. For regulated standard offer and default service providers in restructured markets, the latter options are not available; instead, financial penalties can be combined with requirements for filing procurement plans and with authorized rate recovery only for prudently incurred costs.
- Consideration is given to alternative compliance mechanisms, in which suppliers are given the opportunity to pay a set price into a fund in lieu of procuring renewables, to offer a less punitive approach to enforcement.
- In regulated markets, the need for automatic financial penalties is lessened. Instead, strong oversight by regulators with control over renewable energy procurement practices and rate

³³ Some exemptions are possible without dramatically weakening the policy – publicly-owned utilities for instance – but will dilute the strength of the RPS.

³⁴ This is not to say that LSEs should place no value on “capacity,” simply that the RPS itself should require a certain amount or percentage of renewable electricity production, not simply renewable capacity additions. An RPS that only requires renewable capacity additions will provide no encouragement for performance, and will encourage LSEs to contract with renewable projects that operate at low capacity factors (but that nonetheless have high capacity ratings).

³⁵ In a regulated market or for regulated standard offer and default service providers, regulators would deem expenditures prudent through oversight of the procurement process. In competitive markets, the dynamics of competition provide automatic discipline on pricing, and suppliers will only be able to charge what the market bears; if suppliers incur imprudent costs, they automatically risk full recovery of costs.

recovery may be sufficient. Nonetheless, clear implications for noncompliance ensure that obligated parties take the requirement seriously.

Principle #6: Consistency with Market Structure. A well-designed RPS will be consistent with and complement the structure of a state's electricity market, whether regulated or restructured.

Best practices for implementing this principle ensue that:

- The RPS applies to all potential suppliers to retail load so that the policy does not create barriers to competitive entry.
- In most cases, the RPS relies on renewable credits to demonstrate compliance, because the use of TRCs does not constrain least-cost contracting for commodity electricity (note that this *does not* require broad geographic eligibility).³⁶
- The RPS builds in compliance flexibility, especially in competitive markets, to account for the poor credit and uncertain load of competitive electricity providers.
- Clear long-term contracting standards are established for regulated utilities and regulated providers of standard offer and default service, with sufficient regulatory oversight to ensure prudent compliance practices.
- In regulated markets and for regulated providers of standard offer and default service, prudently incurred RPS compliance costs will be recovered in electricity rates.

³⁶ The only reasonable exception is in vertically integrated monopoly markets with few transmission constraints, or where an RPS applies to a single entity.

Principle #7: Compatibility with Other Policies. A well-designed RPS will be compatible with other applicable policies and regulations in the state and, where possible, the broader region.

Best practices for implementing this principle ensure that:

- Compliance flexibility mechanisms such as TRC banking are designed to minimize or mitigate conflicts with fuel source and/or emissions disclosure requirements, or other policies.³⁷
- Other renewable energy policies (system-benefits charges, tax incentives, etc.) are designed in a way that does not inappropriately distort the market for RPS compliance in favor of some market participants relative to others.³⁸
- In the presence of markets for emissions rights, renewable electricity or TRCs remain fully bundled, with all emissions rights intact and not sold to other parties (unless policymakers do not believe that a reduction in these emissions is a key goal of the RPS).³⁹
- State RPS rules are developed that authorize the RPS administrator to accommodate the possible creation of a federal RPS in the future.⁴⁰

5.3 The Role of Geothermal in RPS Policies

With few exceptions, the preliminary design principles and best practices described above do not specifically highlight the important role that geothermal energy might play under an RPS. This is by design. In earlier chapters to this report we found that several states have had success with an RPS, but that in many other states the verdict is mixed. The largest challenge with the RPS appears to be avoiding major design pitfalls. Therefore, our analysis of early RPS experience leads us to conclude that, to assure that RPS policies are effective in supporting geothermal energy, two conditions must apply: (1) geothermal energy must, of course, be eligible,⁴¹ and (2) the RPS should be designed well and implemented effectively in a broader sense.

In constructing a well-designed RPS, however, it will be important for regulators and legislators to recognize the unique features of geothermal energy: geothermal can provide large blocks of baseload power, but the resource is restricted to certain locations and substantial exploration costs and development time are required to prove the adequacy of the resource. To accommodate

³⁷ We have not previously discussed this issue in this report. For more information, see Grace et al (2001).

³⁸ It may be appropriate for policymakers to provide more support to certain renewable energy technologies than others. For example, photovoltaics may do poorly under a standard RPS, so other support mechanisms may be necessary. For any given renewable energy application under an RPS, however, other forms of support would ideally be provided on a proportionate basis to minimize market distortions. If this were not the case, outside financial support for a specific renewable energy project would give that project a competitive advantage over other renewable energy projects in the region, not based on cost-effectiveness but based on external policy forces. The most common example noted by geothermal stakeholders is the fact that the federal production tax credit for wind power does not extend to geothermal projects.

³⁹ We have not previously discussed this issue in this report. For more information, see Grace and Wiser (2003).

⁴⁰ We have not previously discussed this issue in this report. For more information, see Grace and Wiser (2003) or Wiser (2000).

⁴¹ To support on-site uses of geothermal energy, policymakers might also consider making customer-sited geothermal electricity and heat applications eligible under an RPS.

these features, RPS administrators might wish to place particular emphasis on certain design principles and best practices noted earlier. Although these design principles and best practices are not explicitly geothermal-specific, several best practices are particularly important from the perspective of geothermal energy:

- **Even-handed Comparisons of Different Renewable Sources:** Perhaps most importantly, in designing contracting standards for regulated utilities and regulated standard offer and default service supply, renewable energy sources would ideally be compared with one another in an even-handed manner, considering the direct and indirect costs and attributes of each resource (including integration and deliverability characteristics).⁴² This is required in Nevada and California, but is not strictly required in many other states, and may be necessary in valuing the benefits that geothermal sources provide to an electricity system relative to other renewable sources.
- **Geographic Eligibility:** Determinations on the eligibility of out-of-state renewable plants can also play an important role in whether or not a state RPS creates markets for geothermal energy. In states with little or no geothermal resource, a focus on broader regional, national or global objectives may support the eligibility of out-of-state projects, enabling access to a state RPS market for out-of-state geothermal resources. Conversely, in states with robust geothermal resources, specifying local objectives as preeminent may narrow the geographic scope and thereby leave in-state geothermal projects less susceptible to lower-priced out-of-state competition, but at the potential risk of incurring a legal challenge under the U.S. Commerce Clause.
- **Development Lead Time:** An important issue for the geothermal industry is the uncertainty that exists in the amount of geothermal resources that exist in certain states and resource areas. Geothermal companies are often reluctant to engage in detailed exploration of new geothermal resource areas unless they have a power purchase agreement, which can extend the development cycle of geothermal projects to three-to-five years. The prospect of a well-designed RPS that creates a growing and reliable long-term market for geothermal energy could help ameliorate these concerns by creating the incentives necessary for the industry to justify the long-term investments required for resource exploration. Because geothermal projects tend to have a longer and more costly development cycle, an RPS should be of sufficient duration, with steadily increasing RPS target levels, to give geothermal developers the confidence they need to invest in potentially costly and time-consuming geothermal resource prospecting and resource assessment activities.
- **RPS Target Increases and Compliance Flexibility Mechanisms:** Finally, some of the most cost-effective geothermal plants come in larger increments than other more modular renewable technologies (e.g., solar). As a result, an RPS that drives substantial geothermal development will be one whose targets are aggressive enough to allow the market to take advantage of geothermal plants that are able to achieve scale economies. For similar reasons, compliance flexibility mechanisms such as banking may be particularly important for

⁴² Fully competitive wholesale markets will generally internalize these costs, so that generators can compete head-to-head fairly based on TRC prices alone.

geothermal plants whose size may exceed the scale of the annual increase in the RPS target (allowing a larger project to count its production towards RPS requirements in future years).

Beyond those design considerations noted above, state RPS policies may not need additional *specific* encouragement for geothermal energy to adequately support development efforts.⁴³ This conclusion emerges from early state experience with the RPS and from the stakeholder interviews detailed in Appendix B. It is also driven, at least in part, by the fact that geothermal energy appears likely to compete with some success against other renewable energy sources in those states in which geothermal resources are available and the RPS is reasonably well designed. Nevada and California provide good examples. Because it is an attractive baseload resource, geothermal energy is likely to continue to play a significant role in some state RPS programs. If geothermal energy were eligible to receive the production tax credit, it would be in an even stronger position.

We acknowledge that this evidence is limited, however, and that other energy sources may prove to benefit more heavily from state RPS policies than does geothermal. Consequently, if relying on “market” forces to ensure geothermal development is deemed insufficient, either because other incentives (e.g., the production tax credit for wind power) skew the competitive playing field or because of a desire to assure a diversity of renewable energy sources, there are at least three methods by which to give geothermal energy more direct support under a state RPS: credit multipliers, technology bands, and resource contribution limits. New Mexico provides the best example of credit multipliers, providing a credit multiplier of two for biomass and geothermal for every kWh of such generation. Technology bands, on the other hand, require that LSEs meet their RPS obligation with a minimum amount of specific renewable resources. Arizona and Nevada provide the best examples, albeit for solar energy, and both contain specific solar purchase bands. Finally, states can restrict the contribution of certain lower-cost technologies under an RPS. For example, an earlier version of New Mexico’s proposed RPS would have limited the contribution of wind to 50% of that state’s overall RPS level.

⁴³ As discussed in Chapter 4, however, there may be a need for other government policies or actions to explore the availability of geothermal resources in states where the resource is not proven or well known. This could involve programs sponsored and funded by state system-benefits charges, if they exist, or U.S. government agencies such as the Department of Energy.

Appendix A: Detailed Summary of State RPS Design

Table A-1: RPS Requirement and Eligibility			
	RPS Requirement	Eligible Resources	Eligibility of Out-of-State Renewables
ARIZONA	0.2% in 2001, rising 0.2%/yr to 1% in 2005, and to 1.05% in 2006, then to 1.1% for 2007-2012. The ACC will conduct a cost-benefit test in 2003 to determine whether the RPS should continue to increase after 2004, or stay at 0.8%. The Working Group will complete the cost/benefit analysis by June 30, 2003. At least 50% of the RPS must be new solar electricity through 2003, and at least 60% starting 2004.	New is defined as being generation installed on or after January 1, 1997. Solar renewables include: PV and solar thermal electric. Non-solar renewables include: solar hot water and air conditioning, and in-state landfill gas, wind, and biomass. Solar hot water and solar air conditioning can contribute to the non-new solar portion of RPS if the provider contributed to the installation of the system. R&D investments can reduce the RPS target by up to 10% in 2001 and 5% in 2002-03. Customer-sited applications are eligible.	Out-of-state solar is eligible if it is proven that the power reaches Arizona customers. Wind, landfill gas, and biomass must be in-state. Renewable energy credit multipliers provide additional incentives for in-state solar.
CALIFORNIA	IOUs must increase their renewable supplies by at least 1% per year starting January 1, 2003, until renewables make up 20% of their supply portfolios. The 20% requirement must be reached no later than 2017, but utilities may not have to meet the requirement if SBC funds are exhausted before the requirement is met: costs of renewables over a to-be-determined market price must be paid for by the state's SBC fund. Competitive Energy Service Providers (ESPs) are required to start increasing renewables by 2006 or when their direct-access contracts expire, whichever comes first. IOUs do not need to make annual RPS purchases until they are creditworthy.	Biomass, solar thermal electric, photovoltaics, wind, geothermal, fuel cells using renewable fuels, existing hydro under 30 MW, digester gas, landfill gas, ocean wave, ocean thermal, or tidal currents. New hydro only eligible if it does not require new or incremental appropriations or diversions of water. Geothermal existing before September 26, 1996 is eligible only for adjusting a retail electric provider's baseline quantity of renewable energy, not for meeting the incremental 1% requirements. Eligible biomass has fuel supply requirements. A restricted set of solid waste facilities is also eligible.	RPS legislation appeared to preclude out-of-state generation, except generators with a dedicated transmission line to the state. However, a CEC ruling clarified this language, and will allow out-of-state generators to be eligible assuming that those generators deliver electricity into California. Legislative clean-up language covering the eligibility of out-of-state generators is also under consideration.
CONNECTICUT	New Requirements After 2003 Legislation: Class I: 1% in 2004, 1.5% in 2005, 2% in 2006, 3.5% by 2007, 5% in 2008, 6% in 2009, 7% by 2010, and thereafter. Class II: 3% in 2004 and thereafter. Original Requirements: Class I or II Technologies: 5.5% in 2000, 6% in 2005, 7% in 2009 and thereafter. Class I Technologies: 0.5% in 2000 + 0.25%/yr to 1% in 2002, 6% in 2009 and thereafter.	Class I: solar, wind, ocean, low emission advanced renewable conversion, landfill gas, fuel cells, new run of river hydro less than 5 MW, and biomass with sustainability and emissions criteria. Customer-sited renewable generation is eligible. Class II: MSW, existing biomass that meets emissions criteria, and existing run of river hydro less than 5 MW.	Renewable energy sources within the NEISO, or within the jurisdiction of NY, PA, NJ, MD and DE provided that the DPUC determines that such states have a comparable RPS.
IOWA	105 average MW (~2 percent of 1999 sales) applied to investor-owned utilities.	Wind, solar, MSW, methane recovery, and biomass.	Out-of-state renewables were not eligible.

Table A-1: RPS Requirement and Eligibility

	RPS Requirement	Eligible Resources	Eligibility of Out-of-State Renewables
MAINE	30% of retail sales in 2000 (start of retail competition) and thereafter as a condition of licensing. PUC will revisit RPS within 5 years after retail competition (by 2005).	Fuel cells, tidal, solar, wind, geothermal, hydro, biomass, MSW facilities under 100 MW, and high efficiency cogeneration. Self-generation is not eligible. High efficiency cogeneration is defined as being constructed before 1997 and that meets an efficiency standard.	Initial RPS required that energy be physically delivered to the ISO-NE control area or the Maritimes control area. The PUC is in process of incorporating the NEPOOL certificates trading system. System will allow New England resources to be eligible, as will be renewable electricity production delivered to New England.
MASSACHUSETTS	1% of sales from new renewables by 2003 +0.5%/yr. to 4% in 2009. 1% increase per year thereafter until date determined by Division of Energy Resources (DOER). No RPS for existing renewables. DOER will adopt RPS standard if there is significant attrition. At legislature's request, DOER has pledged to assess the viability and impact of an RPS for existing renewables by Oct. 1, 2003.	New renewables with a commercial operation date after 1997, including: solar, wind, ocean thermal, wave, tidal, fuel cells using renewable fuels, landfill gas, digester gas, and low-emission advanced biomass, which is defined in detail in DOER RPS rule and includes fuel, technology, and emissions requirements. Existing generators that produce over an historic baseline of production are eligible for the excess production. Off-grid and customer-sited generation are eligible, as is co-fired biomass; DOER can add technologies after hearings.	Using NE GIS system. New England resources are eligible, as is renewable electricity production delivered to New England. Off-grid generation and behind-the-meter generation are eligible if located in-state.
MINNESOTA	For Xcel: initial requirement was 425 MW of wind and 125 MW of biomass by 2002. 400 MW more wind was subsequently required by 2012, which in 2003 was moved to 2006. Legislation in 2003 established a 10% renewable energy "goal" for all utilities in the state, but the 10% goal is a "requirement" only for Xcel; other utilities have to show "good faith efforts." Requirement starts at 1% in 2005, and increases by 1% each year until it reaches 10% in 2015. Not less than 0.5% must be met with biomass in 2005, increasing to 1% by 2010. Xcel's requirement is only binding if the additional renewables meet economic and reliability tests. For Xcel, 300 MW of the 10% requirement must come from wind by 2010. Of this 300 MW, 100 MW must be from small wind projects, while 100 MW of the remaining 200 MW may be owned by Xcel. Legislation also reduced earlier 125 MW goal for biomass to 110 MW, and required the signing of a specific 10-20 MW PPA for biomass.	Original Xcel Mandate: Wind and biomass. 10% Goal: solar, wind, hydro under 60 MW, biomass (including MSW), and hydrogen provided that after 2010 the hydrogen must be produced from renewable energy. Existing MSW under long-term contract is only eligible if a rate adjustment is made. The renewable fuels portion of cofiring is eligible, but only if the cofiring occurs in clean fossil plants. Eligible plants do not include those previously mandated for Xcel, so 10% requirement is additional to earlier requirements. PUC may establish credit multipliers.	For first 425 MW of wind and 125 MW of biomass, in-state was not strictly required, but was agreed upon by the parties. The next 400 MW of wind may be from out-of-state. Geographic eligibility for 10% goal is somewhat unclear in legislation. Appears to allow out-of-state to meet 10%, if electricity is sold into MN. Legislation also says that PUC may facilitate the trade in TRCs between neighboring states, if those neighboring states have a comparable RPS.

Table A-1: RPS Requirement and Eligibility

	RPS Requirement	Eligible Resources	Eligibility of Out-of-State Renewables
NEVADA	5% in 2003 and increasing by 2% every two years, ending at 15% in 2013 and thereafter. At least 5% of the RPS standard must be from solar (PV, solar thermal electric, or solar that offsets electricity, and perhaps even natural gas or propane).	Solar (including solar that offsets electricity, and perhaps even natural gas or propane), wind, geothermal and biomass (includes agricultural waste, wood, MSW, animal waste and aquatic plants). Legislation in 2003 adds electricity produced from certain forms of waste heat or pressure under 15 MW in size as eligible. Certain small hydro plants (including pumped hydro used at mines) under 30 MW in size are also now eligible, with limitations on water diversion, date of installation, and water use. On-site renewable generation qualifies. Distributed renewable generation receives extra-credit multiplier (1.15), except that customer-sited PV receives a far larger credit multiplier (2.4). Waste tire plants are not eligible, except that customer-sited waste tire facilities that use “reverse polymerization” qualify for 0.7 credits per kWh. If an IOU helps fund an end-user’s solar thermal energy system that offsets electric use, then the IOU can count the consumption reduction against the RPS requirement.	Eligible renewables can be located in-state or out-of-state with a dedicated transmission line to an in-state utility. The transmission line cannot be shared with more than one other non-renewable generator.
NEW JERSEY	Class I or II Technologies: 2.5% with no sunset Class I technologies: 0.5% by 2001; 1% by 2006; +0.5%/yr increase to 4 percent by 2012 and then remaining at 4% indefinitely. A Task Force to the Governor of New Jersey has recommended strengthening the RPS significantly. It is expected that the Board of Public Utilities will initiate a rulemaking in 2003 to seek to implement those recommendations.	Class I: solar, wind, fuel cells, geothermal, wave or tidal, methane gas from landfill, and biomass facilities that are considered sustainable, based on NJBPU and DEP criteria. Class II: hydro facilities less than 30 MW and MSW facilities in regions that have retail competition. MSW facilities must meet New Jersey air pollution requirements.	Out-of-state generation is eligible as long as the power flows to PJM or NYISO control areas. Class II technology must come from areas open to retail competition. On-site generation can count towards the RPS if located in-state, has a 100 kW capacity or less, and is a Class I technology.

Table A-1: RPS Requirement and Eligibility

	RPS Requirement	Eligible Resources	Eligibility of Out-of-State Renewables
NEW MEXICO	The Public Regulation Commission (PRC) passed the RPS rule on December 17, 2002, and the rule becomes effective July 1, 2003. The RPS requires 5% of retail sales to be renewable by 2006. RPS requirements increase by at least 1% a year, and utilities must reach 10% by January 1, 2011 and thereafter.	The New Mexico RPS places values on different renewables in order to encourage a diverse mix of renewable resources. The rates are listed below: - 1 kWh wind or hydro = 1 kWh toward compliance; - 1 kWh biomass, geothermal, LFG, or fuel cell = 2 kWh; and - 1 kWh solar = 3 kWh. Other restrictions on resources include: co-firing or fuel switching facilities may only count the biomass contribution toward the requirement; renewables developed in combination with a fossil fuel source may be eligible, but only the renewable portion counts toward the requirement; and, eligible hydro is limited to facilities of 5 MW or less.	Undefined “preference” given to in-state resources; otherwise, renewable electricity must be delivered in-state.
PENNSYLVANIA	For PECO, West Penn, and PP&L, 20 percent of residential customers served by competitive default provider: 2% in 2001, increasing 0.5%/year. For GPU, 0.2% in 2001 for 20% of default service customers increasing to 80% in 2004 and thereafter.	Solar, wind, sustainable biomass, ocean, geothermal. GPU is allowed some waste coal and one municipal solid waste plant.	Out-of-state generation is eligible.
TEXAS	Legislation established capacity targets: 1280 MW by 2003, 1730 MW by 2005, 2280 MW by 2007, 2880 MW by 2009 (of this, 880 MW can be from existing generation). Regulatory rules translate capacity targets into energy-based purchase obligations.	Solar, wind, geothermal, hydro, wave or tidal, and biomass including landfill gas. Self-generation is eligible if it meets metering requirements. To be eligible to produce TRCs and meet the incremental RPS goals, a facility must either be considered new or be small. A new facility must have an initial operation date after Sept 1, 1999. A facility is small if it has a capacity of less than 2 MW. Existing renewable facilities can offset an LSE’s renewable energy purchase obligations, but are not allowed to trade TRCs.	Out-of-state generation is not eligible for TRCs, unless there is a dedicated transmission line into the state. If the proper out-of-state transmission exists, these TRCs can count towards a supplier’s RPS requirement, but will not count towards the aggregate capacity goals established in the legislation.
WISCONSIN	0.5% by 2001, increasing to 2.2% by 2011; 0.6% can come from facilities installed before 1998.	Wind, solar, biomass, geothermal, tidal, fuel cell generation that uses only renewable fuel, and hydroelectric generation with a capacity of less than 60 MW.	Out-of-state is eligible.

Table A-2: Tracking, Penalties, Exemptions, and Funding

	Tracking System and Flexibility Mechanisms	Penalty Mechanisms	Exempt Providers	Supportive RPS Funding
ARIZONA	LSEs can bank or trade renewable energy credits via compliance filings with the ACC. No central renewable energy credit registry or credit trading system exists or is planned. Excess purchases of renewables can be counted towards future annual RPS requirements or sold to other LSEs. Waivers can be requested. Arizona has a detailed system of credit multipliers for early installation before 2003, in-state installation or content, distributed solar, net metering, and utility green pricing. A multiplier works in the following way: if an LSE earns an additional 0.5 credit, then 1 kWh = 1.5 kWh. Multipliers are additive, to maximum of 2, through 2003. LSE can offset _ of requirement in 2001, _ of requirement in 2002-03, and 1/5 of requirement thereafter if they invest in an Arizona solar manufacturing facility.	No explicit penalties until at least 2004. Starting 2004, if new solar requirements are not met, then the ACC <i>may</i> be able to fine an LSE 30¢/kWh; whether this is allowed is to be determined after the 2003 cost/benefit evaluation. The proceeds would then likely go to a solar electric fund to finance solar facilities. But, today, no penalties exist for non-compliance.	The RPS initially only strictly applies to IOUs. Electric Service Providers (ESPs) do not have to participate until 2004, but if they choose to participate before that date, then they may receive Environmental Portfolio Surcharge (EPS) funds. Cooperatives, which are subject to ACC regulation, are collecting the EPS and must submit an RPS plan to the ACC or request further exemptions. Some have requested exemptions, while others have achieved partial compliance. Municipalities and the Salt River Project are outside of ACC jurisdiction, so they are exempt.	ESPs, Coops, and IOUs can receive funds from the EPS fund to help fund the RPS. IOUs are also eligible for RPS support by reallocating DSM funds derived from the Systems Benefits Charge.
CALIFORNIA	Excess renewables procurement in one year can carry over to subsequent years, or inadequate procurement in one year can carry over to no more than the following three years. The CPUC is designing the details. The CEC is charged with the responsibility of designing and implementing an accounting system to verify compliance with the RPS. The CEC is expected to develop an electronic system for the long-term; whether TRCs are allowed to trade separate from electricity is to be determined by the CPUC later. IOUs are not required to make annual RPS purchases if they are not creditworthy. LSE obligations are limited by availability of SBC funds to cover above-market costs of purchases.	Legislation allows CPUC to punish non-compliance though their general authority. Details of non-compliance penalties, if any, have not yet been finally established by the CPUC.	Munis and irrigation districts are to implement RPS policies, but can do so in a flexible manner under the oversight and direction of their own governing boards. IOUs are not required to make yearly RPS purchases until they are creditworthy.	California's renewable energy SBC fund is to be used in large part to cover the above-market cost of LSE purchases of renewable energy under the RPS. LSEs are not required to meet RPS targets absent the availability of SBC funds for this purpose.

Table A-2: Tracking, Penalties, Exemptions, and Funding

	Tracking System and Flexibility Mechanisms	Penalty Mechanisms	Exempt Providers	Supportive RPS Funding
CONNECTICUT	Will use the NEPOOL Generation Information System (GIS), which allows full certificate trading in New England. Also allows participation in TRC programs within NY, PA, NJ, MD and DE if approved by CT PUC. Suppliers can make up deficiencies within the first three months of the succeeding calendar year.	Electric suppliers that fail to comply during a year must pay 5.5 cents/kWh; collected funds are to be used to support the development of Class I renewable technologies through deposit to the “Renewable Energy Investment Fund.” Such penalties are not recoverable in rates for distribution utilities.	Under original law, through 2003, providers of standard offer and default service were exempt; this is no longer the case beginning 2004. Municipals and cooperatives are exempt. Any supplier that provides electricity solely from Class II sources is exempt.	SBC for renewable energy exists in state. The Connecticut Clean Energy Fund would fund RPS-eligible projects, and is required to fund 100 MW of projects under long-term contract.
IOWA	Contract-path, with no banking. Legislative requirement for installed capacity.	No explicit penalty, except through traditional utility regulatory oversight and enforcement by the Iowa Utilities Board.	The capacity requirement was only placed on IOUs.	No.
MAINE	Presently, credit trading is not allowed. However, the PUC has opened a rulemaking for adopting the NEPOOL Generation Information System, which would allow full certificate trading in New England. If an LSE does not meet the 30% requirement, but has met at least 20% of the requirement during a compliance period, then the deficiency can be made up during the next compliance period so that over the two periods there is an average of at least 30% eligible resources. This “cure” period can be further extended for LSEs that can demonstrate ownership interest in new facility that will come on line within 2 years. If LSE service begins less than 6 months prior to December 31, compliance period extends to the next December 31.	Non-compliance can result in license revocation, fines, or whatever the Commission deems appropriate. If a retail electric provider is threatened with license revocation, the Commission may provide the retail electric provider the ability to make a payment into the “renewable resource research development fund.” The payment would be based on the difference in cost between ISO-NE market prices for eligible and non-eligible energy for every deficient kWh. Penalties can be waived if RPS could not be met due to market conditions.	Municipalities, cooperatives, and any entity exempt from electric restructuring do not have to meet the portfolio requirement.	No.

Table A-2: Tracking, Penalties, Exemptions, and Funding

	Tracking System and Flexibility Mechanisms	Penalty Mechanisms	Exempt Providers	Supportive RPS Funding
MASSACHUSETTS	Will use the NEPOOL Generation Information System (GIS), which allows full certificate trading in New England. LSEs can apply certificates to subsequent years. Excess certificates applied to a subsequent year cannot exceed 30% of a providers RPS requirement for that year. Early compliance mechanism existed for 2002.	Alternative compliance mechanism allows LSEs to pay 5¢/kWh to cover RPS requirements if they chose not to purchase renewable energy certificates. If an LSE does not comply with either the RPS or associated reporting requirements, the Commission will issue a public notice of the deficiency, will require an LSE to submit a 3-year plan detailing how future requirements are to be met, and can refer the LSE to the Department of Telecommunications and Energy Licensure, which can take further action, including license revocation.	Municipalities, cooperatives, and any entity exempt from electric restructuring do not have to meet the portfolio requirement.	SBC for renewable energy exists in state. The Massachusetts Renewable Energy Trust is considering how it will support the development of long-term renewable energy contracts under the RPS.
MINNESOTA	Original Xcel mandate: deadline-based capacity obligation. 10% Goal: PUC may establish a TRC program. Upon creation of an RPS in a neighboring state with comparable resource eligibility, PUC may facilitate TRC trade between states. For all utilities except Xcel, the 10% is a goal, requiring “good faith efforts.” Xcel’s 10% requirement is subject to “least cost planning” requirements; if implementation of requirement will jeopardize reliability, or is uneconomic, then requirement may be waived.	Original Xcel mandate, and the new 10% goal, were required by legislation, and overseen by utility regulators. No explicit penalties beyond standard tools available to regulators.	Xcel energy required to meet original renewable energy purchases, and required to meet 10% renewable energy goal, if the requirement does not impose undue economic or reliability impacts. All other utilities in state must demonstrate “good faith efforts” to meet 10% goal; whether these efforts result in full or partial compliance is not yet clear.	Minnesota’s renewable energy fund is largely seeking to fund projects that would not otherwise succeed under the Xcel requirement and RPS. 2003 renewables goal allows MN utilities that are in compliance with goal to apply 5% of their energy efficiency funds to support in-state renewable energy projects, with more restrictive eligibility rules for biomass.

NEVADA	The Nevada PUC approved the use of tradable renewable energy credits in November 2002. TRCs are valid for a period of four compliance years following the compliance year in which the TRC was issued. Dist. gen. receives extra-credit multipliers. LSEs obligated to meet “estimated” RPS requirements	Administrative fines can be levied by the NPUC of at least the cost differential between the cost of renewable energy and the cost of system power, unless an LSE can claim an exemption because not enough renewable power is available despite best efforts. This fine cannot be claimed in a rate case or paid-off by retail customers.	Neither cooperatives nor municipal utilities are required to participate.	None.
NEW MEXICO	New Mexico plans to use renewable certificates to track transactions between utilities and renewable suppliers. Certificates may be traded, sold or transferred. Unused certificates may be applied for no more than four years from the date of issuance.	The PRC’s order says that specific penalties will be developed.	Rural cooperatives and munis are exempt from the RPS. Texas-New Mexico Power Company is exempt until its all-requirements contract expires or is renegotiated.	None specified.
NEW JERSEY	Legislation allowed the BPU to develop a renewable energy trading program in consultation with the New Jersey Department of Environmental Protection. Such a system has not yet been developed. The state is working with PJM to develop an energy tracking system within the ISO that may or may not include credit trading. Flexible penalties for non-compliance.	An LSE that is not in compliance is required to make-up that shortfall in the following year. An LSE that remains out of compliance may be required to submit quarterly reports and may be subject to license revocation or fines, or be unable to take new customers. If a basic general services provider (BSG) is fined, they will be prohibited from recovering fines in rates.	Public power agencies do not have to comply with RPS requirements. Electric power suppliers and BGS providers both must comply with RPS requirements.	SBC for renewable energy exists in state. The administrator does fund RPS-eligible projects located in New Jersey.

Table A-2: Tracking, Penalties, Exemptions, and Funding				
	Tracking System and Flexibility Mechanisms	Penalty Mechanisms	Exempt Providers	Supportive RPS Funding
PENNSYLVANIA	Tracking system not addressed. RPS percentage requirements may be decreased if renewable requirements increase default service costs more than 2 percent.	None specified.	All but limited number of competitive suppliers serving default service load are exempt.	SBCs for renewable energy exist in state. These funds may support renewable projects that are eligible under the RPS.
TEXAS	First state to create and use tradable renewable credits, administered by the Electric Reliability Council of Texas (ERCOT). ERCOT awards TRCs to registered renewable facilities on a quarterly basis, keeps track of retailers' TRCs, retires TRCs that are over 3 years old, and allocates the statewide renewable energy responsibility to competitive retailers. All TRCs have a compliance life of 3 years, after which ERCOT will retire the credits. Early compliance allowance and 3-month settlement period are also provided. Before 2003, an LSE is allowed a 10% TRC shortfall in any given year. After 2003, no shortfalls are allowed. If an LSE has a pre-2003 deficit, then the shortfall must be made up in the next compliance period.	Penalty for noncompliance is set at the lesser of \$50/MWh per deficient TRC or 200 percent of the average market TRC value for the deficient credits. The retailer must prove the average market value to the Public Utilities (PUCT). The PUCT may not impose a penalty on an LSE if the PUCT determines that "events beyond the reasonable control" of the retail electric provider prevented complying with the RPS. The PUCT defines such events as "weather-related damage, mechanical failure, lack of transmission capacity or availability, strikes, lockouts, actions of a governmental authority that adversely effect the generation, transmission, or distribution of renewable energy from an eligible resource under contract to a purchaser," but not failure of the spot or short-term market to supply renewables.	Municipal power producers do not have a TRC requirement unless they open their markets to retail competition, but can sell TRCs to obligated LSEs.	None.
WISCONSIN	Utilities in excess of their RPS requirement can apply to the PUC for TRCs that can be traded with other providers or banked to apply to subsequent RPS requirements. Unlimited banking is allowed. Total retail sales determined by calculating a 3-year rolling average of LSE's retail sales.	Fines of \$5,000 - \$500,000 can be levied for non-compliance. Wisconsin PUC also has typically regulatory powers over regulated utilities.	IOUs, municipalities, and cooperatives are all subject to the RPS requirement; limited exemption given to certain providers.	State has SBC fund that is targeted at non-RPS eligible resources.

Table A-3: Compliance, Cost Caps, Unusual Aspects, and Status

	Compliance Verification and Monitoring	Rate or Cost Caps and Recovery Allowances	Unusual Aspects of the RPS	Legislative and Regulatory Status
ARIZONA	A working group established by the ACC will evaluate the cost/benefit of the RPS in 2003 to see if the standard should continue to increases beyond 2004. LSEs must give reports on sales and their power portfolios demonstrating compliance with RPS on an annual basis.	The ACC will evaluate the RPS from a cost-benefit perspective in 2003 to determine whether increases in the RPS in 2004 and beyond should continue. The availability of EPS and SBC funds has to some degree capped the aggregate cost of the RPS so far.	Set-aside requirement for new solar energy. Arizona's RPS was established via ACC regulation, not legislation. RPS cost recovery through SBC and EPS. R&D investments allowed to reduce RPS requirements. Use of multiple credit multipliers. Solar hot water and air conditioning are eligible.	Commission order in April 2000. Rulemaking later in 2000, completed in March 2001. This RPS was a revision and expansion to a solar RPS passed in 1996. Comprehensive review of policy in 2003 to determine RPS status and level from 2004 onward.
CALIFORNIA	Electrical corporations must prepare and update RPS procurement plans that are reviewed by the CPUC. The plans must show that the corporation can satisfy its RPS requirements. The CPUC will review the results of every electrical corporation's renewable solicitation to determine if the contract terms of bidders are acceptable.	The CPUC must set benchmark prices for renewable energy purchases. Renewable costs over this to-be-decided long-term market price will be covered by the SBC fund. The CPUC will establish the benchmark after the closing date of a competitive solicitation. RPS targets need not be met if sufficient SBC funds are not available.	Relies on benchmark market price and funding of costs above that benchmark by state's existing SBC fund for renewable energy. Munis and irrigation districts required to implement their own RPS requirements.	Legislation passed in late 2002. RPS regulatory rules to be established by CPUC and CEC in 2003. Ongoing procurement decisions to be made throughout life of program.

Table A-3: Compliance, Cost Caps, Unusual Aspects, and Status

	Compliance Verification and Monitoring	Rate or Cost Caps and Recovery Allowances	Unusual Aspects of the RPS	Legislative and Regulatory Status
CONNECTICUT	Annual case to determine whether distribution utilities have met RPS. Annual compliance demonstration procedure.	5.5 cents/kWh penalty effectively sets cap for TRCs, and therefore the RPS. Distribution utilities will recover costs of, at a minimum, the 100 MW of long-term renewable contracts required by 2007.	Under original requirement, standard offer and default service providers were exempt. Under revised 2003 law, the exemption ended. Not later than 2007, distribution utilities must file with the DPUC one or more long-term contracts totaling at least 100 MW with new Class 1 technologies that receive funding from the “Renewable Energy Investment Fund” and whose price is not more than 5.5 cents/kWh over wholesale prices. Costs are recoverable in rate provided that the contracts are long enough to allow financing (not less than 10 yrs). Renewable energy sources within the jurisdictions of NY, PA, NJ, MD and DE are eligible provided that such states have a comparable RPS. May be able to simply purchase TRCs from those states.	Legislation in 1997. Licensing regulation in 1998 established certain RPS provision. Revisions to lay in 1999. RPS began on July 1, 2000. Significant revisions to law in 2003.
IOWA	About 250 MW of renewables (mostly wind) came on-line in response to the requirement. The program is currently inactive.	None specified. Cost of renewable energy procurement recovered in rates.	First state to impose a renewables requirement, although it took years of litigation before it was implemented.	Legislation established in 1981, and revised in 1991. Multiple legal challenges occurred.
MAINE	On or before May 1 of each year, a retail electric provider must submit a report showing program compliance. The Commission can request additional information or choose to audit a retail electric provider.	None.	Fossil cogeneration is eligible. Voluntary payment into renewable energy R&D fund to avoid license revocation if not in compliance with RPS. Multiple flexibility mechanisms.	Restructuring legislation in 1997. PUC worked out design details in 1998. Revisions to RPS in May 1999. RPS took effect March 1, 2000.
MASSACHUSETTS	LSEs must submit annual compliance filings.	Alternative compliance mechanism allows LSEs to pay 5¢/kWh to cover RPS requirements if they chose not to purchase renewable energy certificates. Funds collected through this mechanism will be used by Massachusetts Renewable Energy Trust to support renewable energy.	Alternative compliance mechanism.	Restructuring legislation in 1997. Rule finalized in 2002. RPS began in 2003.

Table A-3: Compliance, Cost Caps, Unusual Aspects, and Status

	Compliance Verification and Monitoring	Rate or Cost Caps and Recovery Allowances	Unusual Aspects of the RPS	Legislative and Regulatory Status
MINNESOTA	Original Xcel Mandate: No need for annual compliance plans because deadline-based capacity obligation applies to one utility. 10% Goal: By June 2004 PUC must issue order that details criteria to measure utility efforts. Every 2 years, PUC issues report to legislature on utility efforts. Utilities must periodically file reports that indicate plans, activities, and progress toward meeting goal.	Original Xcel Mandate: None specified. Cost of renewable energy procurement recovered in rates. 10% Goal: PUC may develop TRC program. In doing so, the PUC shall develop a system that limits the cost of TRCs. Additionally, 10% requirement as applied to Xcel is only binding if certain economic and reliability tests are met.	Wind and biomass requirement for Xcel Energy applied as part of nuclear waste disposal settlement. 10% goal applies “requirement” on Xcel, and “good faith efforts” on other utilities in state. TRC program with other states may develop if neighboring states have comparable RPS. Detailed specification of certain wind and biomass purchases under Xcel’s 10% goal. Partial use of EE funds to support in-state renewables.	Law in 1994 required Xcel to meet renewable obligations. 1999 PUC order determined that 400 MW for wind by 2012 was in the public interest, and 2003 order determined that 400 MW must be built by 2006. 2003 legislation established 10% renewable energy goal.
NEVADA	LSEs must submit an annual report to the NPUC, and must submit quarterly reports to the TRC trading program administrator stating the renewable generator and the number of TRCs purchased from each renewable generator.	No explicit cost cap, but individual contracts are to be evaluated and approved by the NPUC. If contracts for renewable energy are found to contain acceptable prices by the NPUC, then the provider is allowed to recover all associated costs.	5% solar energy set-aside and extra-credit multipliers for customer-sited renewables and customer sited PV in particular. Solar offsets are eligible, as is certain forms of waste heat and pressure. Metering not required for systems under 10 kW and for solar thermal systems. Contracts must exceed 10 years.	Legislation signed in 2001. Initial RPS rules completed in 2001; revised in 2002. Legislation in 2003 altered provisions for customer-sited generation, and altered eligibility rules more generally. RPS began in 2003.
NEW JERSEY	ESPs and BGS providers must file a report every March 1 showing that their RPS requirements were met for the previous calendar year.	A BGS provider’s RPS compliance costs have to be justified to the BPU if a provider wishes to recover them in retail rates.	Hydro and MSW facilities qualify only if in a state that allows retail competition. Detailed criteria for biomass eligibility.	Restructuring legislation in 1999. Interim rule adopted in 2001. RPS began in fourth quarter of 2001. Task Force made recommendations in 2003 for strengthening of the RPS; BPU may consider implementing recommendations in 2003.
NEW MEXICO	Utilities must file a long-term strategy with the PRC. The plan must show a diversified renewable portfolio. Utilities must also file an annual power portfolio plan and an annual portfolio summary. RPS compliance must be addressed in both.	If a utility portfolio filing is approved, the utility is entitled to 100% recovery of any stranded costs that result from its efforts to meet the RPS.	RPS established via regulation, not legislation. The PRC order requires utilities to offer a voluntary renewable energy tariff for customers who want to purchase additional renewables. Credit multipliers to encourage renewable resource diversity.	Original RPS delayed until 2007. PRC order revising original RPS finalized in late 2002, and takes effect in mid-2003. RPS begins in 2006. RPS currently being challenged in court.

Table A-3: Compliance, Cost Caps, Unusual Aspects, and Status

	Compliance Verification and Monitoring	Rate or Cost Caps and Recovery Allowances	Unusual Aspects of the RPS	Legislative and Regulatory Status
PENNSYLVANIA	None specified.	RPS percentage requirements may be decreased if renewable requirements increase default service costs more than 2 percent.	Purchase requirement applies only to certain competitive default suppliers. RPS percentage requirements may be decreased if renewable requirements increase default service costs more than 2 percent.	Restructuring legislation in 1996. Individual utility settlements in 1998.
TEXAS	ERCOT submits an annual report to the PUCT. The report covers new facilities, tracks MWh from new renewable facilities, and tracks competitive retailer participation and compliance.	Effective cap of 5 cents/kWh given penalty mechanism. A renewable facility's above-market cost cannot be included in a municipality retail provider rate, a cooperatives base rate, a power cost recovery factor, stranded cost recovery mechanism, or any other fixed or variable end-user charge to be eligible for the RPS.	Capacity targets converted to energy by conversion factor of 35 percent for 2002 and the first three quarters of 2003, and then adjusted to reflect generator performance data. Conversion factor readjusted every two years. RECs only for new renewable generation, but existing renewable generation can reduce RPS requirements for suppliers.	Legislation in 1999. Final rule complete in December 1999. RPS begins in 2002, with early compliance in 2001. Small changes to TRCs program made in 2003.
WISCONSIN	Annual compliance filings covering the previous calendar year are due every April 15 th .	Prudently incurred costs are recovered from ratepayers.	Credit trading allowed only for utilities that over comply with their RPS requirement.	RPS legislation passed in 1999. Final regulation adopted April 2001.

Appendix B: Stakeholder Interview Results

Methodology and Objectives

In order to supplement our own understanding of the RPS, we conducted a series of interviews with a cross section of stakeholders. These interviews provide a diverse set of perspectives on the value, appropriateness, and design of RPS policies. We also sought comments on a draft of our state RPS evaluation criteria, discussed in more depth in Chapter 4. The survey used to guide the interviews is provided in Appendix C. The survey contains 18 questions, and the interview results are described below. Because we promised not to attribute interview responses with specific interviewees, our summary is necessarily broad.

We specifically sought to include stakeholders with a wide range of perspectives on the role of policy mandates in supporting renewable energy, and a diversity of opinions on the efficacy of the RPS in particular. After creating a proposed list of interviewees, members of the NGC helped us finalize our interview list. We sought to interview 12 stakeholders that fell in several basic categories: (a) geothermal companies and trade associations, (b) state PUCs and energy offices, (c) obligated entities (i.e., utilities and other load serving entities), and (d) consumer and environmental advocates. We placed particular attention on interviewing stakeholders located in states with substantial geothermal resource potential. Interviewees included: Dan Schochet (Ormat), Christine Watson (Utah Energy Office), Dick Byers (Washington Utilities and Transportation Commission), Marilynn Semro (Seattle City Light), Tom Rawls (Green Mountain Energy), John Nielsen (Land and Water Fund of the Rockies), Chris Wentz (New Mexico Department of Minerals), Colin Duncan (Sierra Pacific Power Co.), Virinder Singh (PacifiCorp), Liz McDannel (Southern California Edison), Karl Gawell (Geothermal Energy Association), and Bob Cooper (Nevada Attorney General's office).

Overall Assessment of the RPS

In the first part of each interview we posed general questions about the value of renewable energy policies, the advantages and disadvantages of the RPS in particular, and whether other renewable policies might be more effective than the RPS.

Almost uniformly, the twelve interviewees expressed support for policies to promote renewable energy technologies. Concerning the RPS, no interviewee expressed outright opposition to the policy, and four respondents believe that the RPS is the best policy option. The other eight interviewees listed both positive and negative features of the RPS. The positive feature of an RPS that many people cited was the creation of a long-term market for renewables, while some interviewees said the mandate aspect of an RPS was the main negative feature. One person expressed concern that an RPS may force development of renewable energy resources in regions that do not have enough transmission, or may stimulate renewable energy resources that may not be needed by a utility or may not be a good match for a utility's resource portfolio (e.g., the RPS might stimulate intermittent energy sources when only peaking power is needed).

When asked whether other policy options might be more effective than an RPS, most interviewees did not favor one renewable energy policy over all others, but instead saw different policies as useful in different circumstances, and often as complementary tools. Some noted that renewable energy may be developed under IRP, but that IRP-derived support for renewable energy is not guaranteed. In fact, one commenter noted that the largest utility in their state has called for renewable energy development in their IRP for several years, but has not delivered on those plans. Others saw IRP as complementary to an RPS because IRP can create the long-term planning framework for renewable energy, with the RPS acting as a backstop. Interestingly, people saw the RPS in these circumstances differently, with some viewing the RPS as a ceiling and some seeing the RPS as a floor.

Some of the interviewees specifically indicated that the PTC should be expanded to include other technologies besides wind power, as the combination of a PTC and an RPS benefits wind power over other renewable energy technologies. Others discussed state tax credits, but at least one interviewee said that such incentives have not been effective at the state level because the maximum incentive amount is typically too small to permit large-scale renewables deployment. Some interviewees also thought that expedited permitting for renewable energy projects should be explored. Still others simply said that nothing is more effective than an RPS in catalyzing a market for renewable energy.

State RPS Assessment

The second section of the interviews included two questions:

- Of the states that have an RPS today, are there any you believe are likely to be particularly successful? Why do you think these state RPS policies are likely to be successful?
- Of the states that have an RPS today, are there any you believe are not likely to be successful? Why do you think these state RPS policies are not likely to be successful?

Not everyone was familiar with many of the state RPS policies. The opinions expressed were therefore somewhat vague and often based on anecdotal information. Many respondents cited Texas as the state with the most successful RPS. Typical reasons cited for the success of that state include the size of the obligation, the increasing level of the obligation over time, the availability of good wind resources, a well-functioning TRC system, and well-established and effective rules. One interviewee did note, however, that transmission problems have emerged in west Texas. Nevada is also cited as a potential success, with a sizable but achievable RPS target and a TRC system. However, concern was expressed that the credit troubles of Nevada's two utilities may make it difficult for those utilities to fully comply with the policy. New Mexico was also seen as likely to have a successful RPS because of strong support by that state's Public Service Commission. Another commenter believed that New Jersey and Massachusetts would ultimately have successful RPS policies, though they will be slow to develop.

Less opinion was voiced about states with RPS policies that are viewed as not successful. One interviewee noted that Maine's RPS is set at a lower level than the amount of eligible resources. Another commenter indicated that the renewable energy purchase standards under the New Jersey RPS may have been set at too low of a level in the early years, and may therefore not result in substantial additions of new renewable capacity. In addition, one respondent asserted

that because renewables are not widely available in Massachusetts and New Jersey, and may be high-cost, a system-benefits charge may be necessary in addition to the RPS.

California's RPS received mixed reviews. Some noted the high level of the RPS standard and the use of system-benefits funds as positives. Others, however, are concerned about the complexity of the policy and mentioned as problematic the fact that much of the implementation will be conducted through rulemakings by two state regulatory agencies (the California Energy Commission [CEC] and the CPUC). One person expressed frustration at the level of complexity of the policy, calling it "hugely burdensome" and a "huge mess."

Best-Practice RPS Design

The survey then asked a series of questions on specific design features of the RPS. Interviewees again expressed a range of opinions in response to these questions.

- **Support for Existing and/or New Renewable Resources:** Most respondents believe that existing renewable generating plants should be eligible for an RPS, but that the RPS should be set at a high enough level to drive the development of new renewable resources. Utilities especially wanted assurances that their existing investments in, or power purchases with, existing renewable plants would be eligible under state RPS policies. Those who only want the RPS to support new renewables expressed concerns about supporting technologies that may not need policy support, such as large hydropower facilities.
- **Resource Eligibility:** All respondents support the inclusion of geothermal, solar, and wind under RPS programs. There was a wide range of responses on whether to include other technologies. Most respondents support including biomass, although some want tight definitions on what are considered eligible biomass fuels; other interviewees want tight emissions standards for biomass as well. The interviewees were also split on whether to include hydropower. Three interviewees oppose including hydro, two support including only "incremental" hydro, and three others support including hydropower but only with significant attention paid to the implementation details (e.g., how to treat out-of-state hydro). A number of respondents oppose including waste-to-energy or tire-burning generating plants in an RPS, but one stakeholder would include these technologies if they had to meet tight emissions standards.
- **Eligibility of Out-of-State Resources:** Most interviewees supported making out-of-state renewables eligible, within some geographic limits, e.g., within a power pool or within a region. One person suggested giving in-state renewables bonus credits (more than 1 MWh of credit for every 1 MWh of actual generation), as a means of respecting the Interstate Commerce Clause but still giving some preference to in-state facilities. Less support was given to making renewables from anywhere in the country eligible for a state RPS, partly because of a desire to encourage renewables at least in a particular region, and partly because of concerns over double counting or gaming. Some suggested that renewable electricity must be delivered into the state with the RPS (thereby restricting eligibility to resources that are able to deliver their electricity into the state without undue costs), and expressed skepticism about allowing TRCs to be imported into a state without the associated renewable electricity.

- **Compliance Verification and TRCs:** All but one respondent supports tradable renewable certificates, asserting that the use of TRCs can avoid transmission constraints, widen a geographic market, ease compliance for obligated entities, and help ensure that higher quality and potentially lower cost renewable energy resources are used. The interviewees diverged on the appropriate geographic eligibility of credit trading, however: two people suggested that credit trading be limited to adjoining states, one person suggested a region, another person suggesting a power pool, and a final person expressed support for national trading of TRCs, as long as they can be tracked accurately. One commenter, while supporting TRCs, noted that a sink still must be found for the electrons, and that additional transmission may be needed to access those areas that are rich in renewable resources.

Supporting Geothermal Energy with an RPS

We then asked specific questions on the use of an RPS to directly support geothermal energy. The first question in this sequence asked the interviewees whether they believe that RPS policies should be designed to encourage diversity among different renewable sources. The interviewees were split on whether diversity among renewable energy technologies should be encouraged in a state RPS policy. Some were supportive, citing the use of technology set-asides such as the solar provisions in Arizona and Nevada, or granting certain technologies additional credit such as the approach used in New Mexico. One utility interviewee thought it should be left to individual states to decide. Three others interviewees were opposed to these kinds of provisions, believing that they would raise the costs of complying with an RPS, and that such preferences work against the goal of an RPS to promote vigorous competition among all eligible sources.

Next, we asked about the barriers that exist to the use of geothermal energy in meeting RPS obligations. Interviewees cited a number of barriers, such as higher costs of energy for geothermal; permitting difficulties, especially on public and tribal lands; the lack of geothermal eligibility for the federal PTC; that geothermal is a baseload resource and there is more of a need for peaking resources; perceptions that geothermal energy may not be entirely renewable or sustainable, given resource depletion experience at the Geysers; and lack of public knowledge about the environmental benefits of geothermal energy.

Finally, we asked whether the interviewees believe that RPS policies should be designed to specifically encourage geothermal energy, and if so, how. Most interviewees did not support directly encouraging geothermal energy under a state RPS, such as through the use of a separate tier for geothermal sources. One person said they would support giving geothermal additional renewable energy credits, since geothermal is not eligible for the federal PTC. Two interviewees said it should be left to states to decide whether certain renewable technologies need specific policy encouragement. Four interviewees, while not in favor of direct support mechanisms for geothermal in a state RPS, would support other measures to improve the competitiveness of geothermal under a state RPS, such as state or federal tax credits and ranking renewable energy resources on the basis of “all costs” in any utility bidding solicitations held to procure renewable resources. One interviewee suggested that the use of an IRP process that recognizes the risk associated with possible fossil-fuel price escalation would be an appropriate tool for indirectly encouraging geothermal energy.

Appendix C: Stakeholder Interview Script

Introduction

The National Geothermal Collaborative is an organization sponsored by the U.S. Department of Energy that consists of a broad range of public- and private-sector stakeholders; the organization is exploring the barriers to environmentally, economically, and politically sustainable geothermal energy production. The National Geothermal Collaborative has recently contracted with Exeter Associates, Sustainable Energy Advantage, and Wiser Consulting to help it understand and evaluate state renewables portfolio standards as a tool to encourage geothermal electricity development.

As part of our evaluation, we've been asked to interview a representative range of stakeholders that may have opinions about the appropriateness, value, and design of state renewables portfolio standards. Here we define renewables portfolio standards, or RPS, as policies that require utilities and other retail electricity suppliers in a state to procure a certain fraction of their electricity from eligible renewable electricity sources. As you may know, 15 states have created these kinds of policies so far: Arizona, California, Connecticut, Hawaii, Illinois, Iowa, Maine, Massachusetts, Minnesota, Nevada, New Jersey, New Mexico, Pennsylvania, Texas and Wisconsin.

If you are available, we'd like to ask you a few questions about your opinions on this type of renewable energy policy. We want to assure you that your specific responses to our questions will be kept in confidence. In our final report, we intend to identify those individuals who we interviewed without attributing any particular interview response with the specific individual. Instead, our write-up will describe the results of the interviews in more general terms.

Overall Assessment

We'd first like to ask you about your general views on renewable energy policies and the RPS.

1. Do you believe that there should be policies to support or encourage renewable energy development?
2. There are a variety of ways that a state might support the development of renewable energy markets, such as the renewables portfolio standard, tax incentives, integrated resource planning, and so on. In your opinion, what are the advantages and disadvantages of an RPS compared to other types renewable energy policies?
3. Are there renewable energy policies besides an RPS that you believe might be more effective in promoting renewable energy? If so, which policies and why?

State RPS Assessment

We'd now like to ask two more detailed questions about the 15 states that have already established an RPS, to the extent that you are familiar with these policies.

4. Of the states that have an RPS today, are there any you believe are likely to be particularly successful? Why do you think these state RPS policies are likely to be successful?
5. Of the states that have an RPS today, are there any you believe are not likely to be successful? Why do you think these state RPS policies are not likely to be successful?

Best-Practice RPS Design

There are many ways of designing an RPS. We'd like to get your opinion on some of these design choices.

6. Do you think an RPS should support both existing renewable energy projects and new renewable projects, or just new renewable projects? Why?
7. Are there particular renewable energy technologies that you believe should always be included as eligible in an RPS? Are there any renewable energy technologies that should not be supported by an RPS?
8. States with RPS policies have developed different rules for the eligibility of out-of-state renewable facilities. How do you believe state RPS policies should treat out-of-state facilities? Should only in-state facilities be eligible? Facilities in adjoining states? Facilities in a broader region or power pool? Nationally?
9. There are different ways of verifying compliance with an RPS. One approach is with tradable renewable energy credits. Do you support the use of renewable energy credits for RPS compliance? Why or why not?

Using an RPS to Encourage Resource Diversity

10. Do you believe state RPS policies should be designed to encourage diversity among different renewable energy sources (i.e., support multiple types of renewable energy, not just one)? Why or why not?
11. Other than resource constraints, what specific barriers do you believe exist in using geothermal energy to comply with state RPS policies?
12. Do you believe state RPS policies should be designed to specifically encourage geothermal energy? If so, how do you believe that an RPS should be designed to support this goal?

Review of Evaluation Criteria

We have been asked by the National Geothermal Collaborative to evaluate the 15 state RPS policies based on an agreed-upon set of evaluation criteria. Our proposed list of evaluation criteria is below. Please review and rank the criteria on this list as very important, somewhat important, and not important. For further explanation, please refer to the attachment, “Proposed Evaluation Criteria for Renewables Portfolio Standards.”

13. **Outcome criteria** assess the actual, or projected, impacts and results of state RPS policies. Please evaluate the relative importance of each of the following:

	Very Important	Somewhat Important	Not Important
OUTCOME CRITERIA			
Amount of New Renewable Energy Development	_____	_____	_____
Full Compliance with RPS Policies	_____	_____	_____
Reasonable and Stable Costs	_____	_____	_____
Prudently Incurred Compliance Costs Borne by Ratepayers	_____	_____	_____

14. **Policy design criteria** include legislative and regulatory RPS design features that will affect the success of an RPS. Please evaluate the relative importance of each of the following:

	Very Important	Somewhat Important	Not Important
POLICY DESIGN CRITERIA			
Broad Applicability	_____	_____	_____
Carefully Balanced Supply-Demand Conditions	_____	_____	_____
Sufficient Duration and Stability of Targets	_____	_____	_____
Well-Defined and Stable Resource Eligibility Rules	_____	_____	_____
Treatment of Out-of-State Resources	_____	_____	_____
Credible and Effective Enforcement	_____	_____	_____
Flexible Verification Mechanisms	_____	_____	_____
Adequate Compliance Flexibility	_____	_____	_____
Contracting Standards and Cost Recovery Mechanisms for Standard Offer and Default Service Providers	_____	_____	_____
Product-Based Compliance Mechanisms	_____	_____	_____

15. **Market context criteria** reflect the fact that even a well-designed RPS may fail to have its intended effects if the market in which it is applied is not conducive to such a policy. Please evaluate the relative importance of each of the following:

	Very Important	Somewhat Important	Not Important
MARKET CONTEXT CRITERIA			
Presence of Creditworthy Long-Term Power Purchasers	_____	_____	_____
Stable Political and Regulatory Support for an RPS	_____	_____	_____
Accessible Developable Resource Potential	_____	_____	_____

16. Because a principal goal of the National Geothermal Collaborative is to judge the effectiveness of state RPS policies in supporting geothermal projects, we have also developed **geothermal-specific criteria** to directly evaluate each state RPS from the perspective of driving new geothermal development. Please evaluate the relative importance of each of the following:

	Very Important	Somewhat Important	Not Important
GEOHERMAL-SPECIFIC CRITERIA			
Geothermal Development	_____	_____	_____
Geothermal Resource Availability and Eligibility	_____	_____	_____
RPS Design Elements that Directly Encourage Geothermal Development	_____	_____	_____
RPS Design Elements that Indirectly Encourage Geothermal Development	_____	_____	_____

17. Are there any criteria that we have missed, and that should be added? Are there any criteria that should be deleted or altered?

18. Are there any other RPS design elements that you believe are critical to the success of the policy? Are there any design elements that will lead to sure failure?

Appendix D: RPS Policy Evaluation Criteria

In Chapter 4 we identified and applied a list of policy evaluation criteria to assess the actual or likely effectiveness of state RPS policies. Here we again list those criteria, but also provide a lengthier rationale for their inclusion.

Outcome Criteria

We assume that the principal goals of state RPS policies are to drive new renewable development at reasonable cost without unduly disrupting the functioning of electricity markets. With that in mind, four outcome-based criteria are used.

- Amount of New Renewable Energy Development: The principal goal of an RPS is to, over time, drive renewable resource development and the increased production of renewable electricity.
- Full Compliance with RPS Policies: A hallmark of an effective and sustainable RPS is one in which all load-serving entities (LSEs) are in full compliance with the renewable energy purchase obligation. If LSEs are not in full compliance with the policy, it suggests that incentives to comply are insufficient, supply is insufficient to meet targets, some other policy design feature is lacking, or the market context is not conducive to the RPS, as designed. Perhaps more importantly, differential compliance among LSEs is likely to undermine the political stability of the policy as a whole.
- Reasonable and Stable Cost Impacts: An RPS is intended to drive new renewable energy development, under the expectation that renewable electricity may cost more in the short-term but that the long-term benefits of diversification offset the added costs. Nonetheless, load-serving entities, end-use electricity customers, and policymakers desire stable, reliable, and reasonably priced electricity supply. Compliance with the RPS should not be unduly burdensome. An RPS that unduly raises the cost of electricity to end-use customers is unlikely to be viable over the long run. Accordingly, we qualitatively evaluate: (a) whether the price of renewable electricity under an RPS is reflective of true marginal costs (or whether, alternatively, the price has been bid above long-term marginal cost due to market power or supply constraints); (b) whether new renewable projects are attracting capital at commercially attractive rates to minimize the unit cost of capital-intensive renewable plants; (c) whether the cost of the RPS appears stable from one year to the next, and (d) whether new resources added to meet an RPS have substantially impacted reliability or added to system costs in a manner not captured in the choice of RPS resources.
- Prudently Incurred Compliance Costs Borne by Ratepayers: Load-serving entities are concerned that an RPS will raise their costs without providing direct offsetting benefits. Because the benefits of renewable electricity flow to consumers at large, it is also important that those same consumers bear the costs of the policy. Prudently incurred (i.e., just and reasonable) RPS compliance costs should therefore be recovered from end-use electricity customers. Clear guidance to this effect is especially important in regulated markets, and for standard offer and default service providers, where electric utility regulators (and not the competitive market) make cost recovery decisions.

Policy Design Criteria

Particularly where an RPS has not been operating for sufficient time to judge its success in meeting the outcome criteria above, we must instead judge that state's policy against a series of policy design criteria. Our ten criteria include:

- Broad Applicability: A well-designed RPS would ideally apply equally and fairly to all load-serving entities in a state (or, at minimum, to all possible suppliers to any customer whose load is included in the mandate), ensuring that all those who benefit from increased renewable energy production also bear a proportion of the costs. Exempting major electricity suppliers from RPS obligations weakens the overall effectiveness of the policy.
- Carefully Balanced Supply-Demand Conditions: An effective RPS will have renewable energy purchase standards of sufficient size and structure coupled with sufficiently tight resource eligibility rules, so as (a) to be binding enough to ensure new renewable energy development, without (b) being so binding as to foreclose feasible compliance. Purchase standards should also be achievable: the start date of the policy should accommodate the time it takes for new renewable projects to be developed and come on line, and incremental increases in the standard over time should be achievable at reasonable cost.
- Sufficient Duration and Stability of Targets: Minimizing the cost of new renewable energy development requires that developers have access to low-cost financing. Related, minimizing uncertainty for those obligated to purchase renewable energy requires that the RPS clearly specify the renewables purchase obligations well in advance. Both of these needs require an RPS to be of sufficient duration to allow long-term contracting and financing to occur, and to have purchase targets that are stable over time and are not subject to sudden or uncertain shifts.
- Well-Defined and Stable Resource Eligibility Rules: The eligibility of specific renewable resources and technologies for a state RPS should be well-defined. Ambiguity as to what resources are and are not eligible creates market uncertainty for both renewable developers and LSEs, thus hindering long-term contracting. Resource eligibility rules should also be stable, and not subject to sudden change.
- Well-Defined and Stable Treatment of Out-of-State Resources: States have taken different approaches to the eligibility of out-of-state renewable energy facilities. Geographic eligibility decisions affect the aggregate impact of an RPS, the location of the benefits delivered by an RPS, and the legal defensibility of the policy as a whole. There is no absolute, "correct" approach to the eligibility of out-of-state renewable generators. Well-designed RPS policies, however, have a well-defined, legally supportable stance on this issue that is both consistent with the stated objectives of the policy as a whole and that is not subject to sudden change.
- Credible and Effective Enforcement: An effective RPS must typically be mandatory and impose repercussions on those LSEs that fail to meet the specified renewable energy purchase mandates. Only with credible enforcement will state policymakers ensure that the RPS is met, and will renewable developers know that their efforts are not in vein. In competitive markets, automatic financial penalty mechanisms (or alternative compliance systems) are typically considered preferable as they ensure that penalties are levied fairly, and without excessive discretion. In regulated markets, the need to automatic financial penalties may be less severe if regulatory bodies are serious in their efforts to compel

regulated utilities to comply, but the threat of sanction (even if the sanction somewhat undefined) will generally remain critical.

- Flexible Verification Mechanisms: A variety of approaches can be used to verify compliance with an RPS. The two most common approaches are the use of tradable renewable certificates (TRCs) and the use of contract-path tracking. While both of these approaches can work effectively, the TRC approach is generally preferable in that it can simplify verification, provide greater assurance of no double counting, increase contracting flexibility, and lower compliance costs. These benefits are especially acute in competitive (wholesale and retail) markets and where a state has substantial internal transmission constraints. In markets characterized by stable resource portfolios (monopoly or otherwise) and few internal transmission constraints, a contract-path approach may be sufficient. We note here that the use of TRCs for verification purposes does not restrict one's ability to limit imports from other states.
- Adequate Compliance Flexibility: Stringent and unyielding renewable purchase obligations can prove challenging and costly, and may encourage market power. Renewable sources often have variable output patterns, come on line in large and discrete blocks, and sometimes meet siting and permitting challenges that make both success and timing difficult to predict. LSEs, particularly in competitive markets, cannot predict their load, and therefore their renewable energy obligations, with precision. Given these circumstances, state RPS policies would ideally build in some compliance flexibility. In addition to the use of TRCs, common sources of compliance flexibility include: (1) extended settlement periods for demonstrating compliance, (2) banking and/or make-up of TRCs or RPS compliance, (3) credit for early compliance, (4) force majeure waivers, and (5) alternative compliance mechanisms that effectively cap the cost of an RPS. By the same token, if RPS policies are overly flexible and lenient, the likelihood of gaming and non-compliance could intensify, and the complexity of administering the RPS could increase.
- Contracting Standards and Cost Recovery Mechanisms for Regulated Utilities and Standard Offer and Default Service Providers: In competitive markets, regulators need not specify renewable energy contracting standards or RPS compliance cost recovery mechanisms. RPS policies have now been implemented in a number of markets that remain regulated, however, and even in purported competitive markets the default service providers (which may constitute the largest LSEs in a market where most customers have not chosen to switch providers) remain regulated by the state. In these cases, state regulatory bodies may need to establish reasonable and clear standards for how renewable energy is to be procured to ensure that renewable projects receive long-term contracts that can support financing. As important, these same regulators must establish clear mechanisms for the recovery of prudently incurred RPS compliance costs by rate-regulated LSEs. Without such mechanisms, LSEs will have every incentive to stall or complicate achievement of the RPS, or to favor lowest-risk rather than least-cost compliance strategies. LSEs should, at a minimum, be held harmless for prudently incurred compliance costs, and might even be offered a financial incentive to encourage compliance.
- Product-Based, as Opposed to Company-Based Compliance Mechanisms: A *company-based* application of an RPS would allow LSEs to meet their RPS obligation through the sale of green power to those customers willing to pay a premium for that product, thereby shifting the cost of the RPS to a subset of customers. An emerging best practice among state RPS policies, however, is the application of the renewable energy target to each electricity

product sold to end-use customers (e.g. every customer purchase must include the minimum proportion of renewables), as opposed to on an aggregate, LSE-wide basis. Such an application ensures that voluntary customer demand for renewable energy is *additive* to any demand for renewable electricity generated by the RPS, and that the cost of the RPS is shared equitably among all electricity users. Product-based application of an RPS therefore reduces the possibility of consumer fraud and confusion in green power markets, and provides confidence to consumer that their green power purchases will add additional renewable energy supply above and beyond that which is required by state law.

Market Context Criteria

Even a well-designed RPS is likely to fail if applied in a market that is fundamentally not conducive to renewable energy development. As such, the following three market-context criteria are used:

- Presence of Creditworthy Long-Term Power Purchasers: The current credit crunch in the electricity industry poses substantial challenges to the financing of new generation in generation. Moreover, in some competitive markets, the combination of (a) utility divestiture of generation assets, (b) utility retrenchment to “wires” companies, and (c) uncertain company-specific load obligations, has left few creditworthy players willing to enter into long-term contracts for renewable generation. More so than generators that burn fossil fuels (and thus have avoidable costs in depressed markets), renewable projects require long-term contracts to receive financing. Markets in which such contracts are unavailable or extremely scarce are unlikely to be conducive to the effective implementation of an RPS.
- Stable Political and Regulatory Support for an RPS: We have already emphasized the need for stability and certainty in the detailed rules of an RPS. More generally, to minimize uncertainty and allow for the staged development of renewable resources, a stable level of political and regulatory support for an RPS is essential. RPS policies that are established through regulation, without enabling legislation, may be more likely to be subject to ongoing revision or outright elimination upon legal, legislative, or regulatory challenge. Ongoing and vigorous efforts to change or eliminate an RPS, whether established by legislative or regulatory mechanisms, may also demonstrate a lack of political support.
- Adequate and Accessible Developable Resource Potential: Some regions of the U.S. are poorly endowed with sizable and reasonably priced renewable resource potential. Other regions may have adequate potential, but that potential may not be accessible or cost-effective given transmission constraints, wholesale market rules, and interconnection barriers. To apply an RPS in such regions that is so large as to severely strain available, cost-effective resource potential would be folly.

Geothermal-Specific Criteria

A key goal of the National Geothermal Collaborative is to judge the effectiveness of state RPS policies in supporting geothermal resources. While the criteria identified earlier are resource neutral, the following four evaluation criteria are intended to address the question of whether a state RPS has or is likely to support geothermal project development in particular.

- Geothermal Development: For those states whose RPS policies have been in place for some time, the first evaluation criteria is simply the extent to which geothermal, exploration, leasing, development, and construction activities have been stimulated by the state's policy.
- Geothermal Resource Availability and Eligibility: A large number of U.S. states simply do not have cost-effective geothermal resource opportunities. Only RPS policies in states within eligibility regions that have adequate resource potential have any possibility of driving geothermal development. More specifically, even among those states in which geothermal is available, geothermal may not be eligible under the state's RPS rules. Where eligible generally, another question is whether geothermal heat or electricity used on a customer's site would be eligible to meet RPS requirements.
- RPS Design Elements that *Specifically* Encourage Geothermal Development: Some states have created RPS designs that *explicitly* support diversity among renewable resource types in general, and/or the use of geothermal energy. Those states are more likely to see geothermal development activity, all else equal.
- RPS Design Elements that *Indirectly* Encourage Geothermal Development: Other states may not explicitly and differentially support geothermal development relative to other renewable sources, but may instead do so indirectly. Such indirect support may, for example, come from specific contracting processes or an incorporation of system integration costs into the resource selection process, which may work against wind power relative to a baseload source such as geothermal.

Appendix E: State RPS Evaluations

Arizona

EVALUATION SYNOPSIS

Arizona has a small, solar-focused RPS that began in 2001 and that has created some demand for new renewable energy in the state. Though well designed in some respects, uncertainty over the long-term fate of the policy and the lack of penalties are key weaknesses. A cost-benefit evaluation in 2003 will determine whether the standard is to continue to rise after 2004. Geothermal is not automatically eligible under the RPS, and the policy is not of sufficient size to significantly benefit geothermal energy. Nonetheless, there is at least one small geothermal project that has been granted eligibility under the RPS.

OVERALL RESULTS

Arizona's RPS is creating a market for some new solar and non-solar generation. Solar capacity installed to date is nearing 5 MW, with an additional 5-10 MW of landfill gas also supported; several additional MWs of renewable energy are also planned. A 20 MW geothermal project has received the approval of the ACC as an eligible resource under the RPS. Because the RPS contains no explicit penalties, the utilities appear to be content to meet their RPS obligations only to the extent that sufficient environmental portfolio surcharge (EPS) and system-benefits charge (SBC) funds exist. As a result, the utilities have generally been in compliance with their non-solar purchase requirements, but have not fully complied with the solar requirements; the level of non-compliance is substantial. The cost of the policy is stable. Though a small RPS in percentage terms, aggregate costs are not insignificant due to the solar requirement. Perhaps because the duration of the policy is uncertain, utilities have opted to comply with central-station, modular PV facilities rather than larger and likely more cost-effective solar-thermal electric installations. Compliance costs are successfully being recovered through pre-existing EPS and SBC charges.

POLICY DESIGN STRENGTHS

Arizona's RPS standard and eligibility rules were designed to ensure that some new renewable energy supply is required. Eligibility rules are clear and well defined, as are rules for out-of-state generation eligibility. The policy exempts some providers (munis, ESPs for a limited time, and coops upon request), but applies to most of the major suppliers in the state. The verification system and level of compliance flexibility both appear sufficient for the time being, with limited TRCs and banking allowed.

POLICY DESIGN WEAKNESSES

Uncertainty in the duration and stability of the policy is undermining its effectiveness. Perhaps because of the policy's uncertain fate (and perhaps inadequate contracting standards), utilities have chosen to build more costly but modular central-station PV as opposed to contracting for presumably lower-cost but less modular solar-thermal electric generation. Because penalties are not assessed in cases of non-compliance, utilities appear to be willing to comply only to the extent that sufficient EPS and SBC funds exist, and substantial under-compliance has resulted. Uncertainty over the eligibility of geothermal remains, as a case-by-case determination is now required. The legality of the in-state restriction for certain resources is also unclear. Company-based application of the RPS, and even encouragement of green power sales to achieve RPS compliance, is not customer friendly.

MARKET CONTEXT

Creditworthy long-term power purchasers have been willing to commit to renewable energy. Political and regulatory support, however, is not stable, with a cost-benefit analysis in 2003. Establishment of the RPS via regulation creates incentive for tinkering and policy change as the ACC itself turns-over. Adequate resource potential is of no concern given the small overall standard.

GEOHERMAL-SPECIFIC EVALUATION

Arizona's RPS is too small in percentage terms to drive significant geothermal development. Nonetheless, there is some geothermal development activity in Arizona, including one project that has been granted RPS eligibility. Case-by-case determination of geothermal eligibility is a disadvantage for geothermal companies. No direct or indirect incentives exist to encourage geothermal development under the RPS.

California

EVALUATION SYNOPSIS

California's RPS is among the most aggressive in the nation, potentially requiring large amounts of new renewables. It is also among the most complex RPS policies, with a significant and ongoing role for the CPUC. The CPUC and CEC appear to be aggressively implementing the policy. With numerous key design details yet to be determined by the regulators, however, it is too early to know for certain the impacts of the policy. SBC funding may limit the ultimate impact of the policy, while exemptions provided to utilities that are not creditworthy may limit additional renewable procurement in the near term, though this is unlikely to affect development in the long-term.

OVERALL RESULTS

No procurements under the RPS have yet taken place. A CPUC-required interim renewables procurement in 2002 resulted in numerous contracts for renewable energy, including two sizable contracts with Calpine for existing geothermal; details on many of the contracts have not yet been released. The RPS is very aggressive, with over 2500 aMW of new renewable generation potentially required by 2017. The RPS is limited by the availability of SBC funds to cover the above-market cost of renewable energy, however; full compliance with the policy targets may therefore not be achieved on schedule. Utilities must comply with the RPS through long-term contracting, so above-market costs are likely to be reasonably stable. The incremental cost of renewable generation may rise over time, because the aggressive policy may strain resource availability. Because the policy is limited by the availability of SBC funds, however, the aggregate annual cost of the policy will not increase. With CPUC oversight and with above-market costs being covered by the SBC, the utilities' prudently incurred costs will be recovered.

POLICY DESIGN STRENGTHS

California's RPS is aggressive. IOUs and ESPs are both responsible for meeting the RPS over time, and even publicly owned utilities are required to design and meet their own RPS requirements (though they are given substantial discretion in doing so). Resource eligibility rules are reasonably well defined, with some exceptions. The RPS legislation was unclear in its treatment of out-of-state resources, but a CEC ruling clarified that such projects would be eligible for the RPS. The policy's duration is solid, but there is some uncertainty, since SBC funding has only been authorized for 5 years. Enforcement mechanisms are still being established, as are flexibility mechanisms and compliance verification systems. In principal, the CPUC and CEC are given the authority to implement each of these details, with adequate compliance and verification flexibility likely.

POLICY DESIGN WEAKNESSES

Policy design complexity and uncertainty are potentially key weaknesses; the degree of complexity derives in large part from the fact that, unlike most RPS policies, the state's system-benefits charge is to be used to cover the above-market cost of renewables purchases. A great deal of authority is therefore given to the CPUC and CEC to design the policy, including (1) defining the benchmark price above which the SBC will cover the above-market cost of renewable purchases, and (2) establishing a least-cost, best-fit process to select winning renewable energy bidders. Decisions that might best be left to "the market" are instead to be made administratively. A fear exists among some stakeholders that the entire design process may bog down in regulatory details and be subjected to continual attack. Another arguable weakness is that the availability of SBC funds may limit the ability of the RPS targets to be achieved. Aggressive purchase requirements may also strain resource availability in the long-term.

MARKET CONTEXT

Utilities are required to enter into long-term (> 10 year) contracts for renewables, but RPS targets are waived for utilities that are not creditworthy – likely a transitional "problem." Regulatory support is strong today, but may be hard to maintain over the long run as the CPUC changes hands; this is especially problematic given the degree of regulatory oversight required in California's policy. Adequate renewable resources are available to meet the near-term targets, but could become somewhat constrained over time given aggressive targets.

GEOTHERMAL-SPECIFIC EVALUATION

Geothermal is eligible under the RPS, and if the RPS is implemented well, geothermal should see sizable new markets. Development activity has been present in the state for some time, and the 2002 interim procurement resulted in at least two geothermal contracts. The RPS does not provide specific encouragement of geothermal, but the least-cost, best-fit process is likely to favor baseload geothermal projects over intermittent resources.

Connecticut

EVALUATION SYNOPSIS

Connecticut has had among the most poorly designed RPS policies in the nation. Given exemptions provided to standard offer and default service supply, along with a host of other policy weaknesses, the RPS has so far had no effect on the renewable energy market. The only saving grace is that, in 2003, legislation was passed to “fix” many of the problems with the policy, most importantly applying the RPS to standard offer and default service supply.

OVERALL RESULTS

Connecticut’s RPS has been wholly ineffective to date, and has led to no new renewables development thus far. This is because the majority of customer load has been exempt from the RPS. The cost of the policy has been negligible, and what costs do exist have been passed through to customers via competitive pricing. Legislation in 2003 holds the promise of significantly improving the RPS, however.

POLICY DESIGN STRENGTHS

The policy’s weaknesses have historically far outweighed its strengths. Legislative changes in 2003, however, do hold out promise. Under the new legislation, applicability of the RPS will be broad, with only publicly owned utilities exempt from the requirement. The duration of the standard appears reasonable in the legislation, though the implementing regulations have not yet been issued. Enforcement appears likely to be more than adequate, with legislation applying a 5.25 cent/kWh penalty for renewable purchase shortfalls; funds collected through this penalty are to be used to support Class 1 renewable resources. The new standards should drive some new renewables development. Verification and compliance flexibility are both workable (Connecticut will use the NE GIS certificates system, and perhaps TRC systems in neighboring regions as well). Not later than 2007, distribution utilities must file with the DPUC one or more long-term contracts totaling at least 100 MW with new Class 1 technologies. Costs are recoverable in rate provided that the contracts are long enough to allow financing (not less than 10 yrs). This may provide sufficient incentive for some long-term contracting.

POLICY DESIGN WEAKNESSES

The policy has not historically been broadly applicable, and through 2003 has exempted standard offer and default service supply. These two utility services serve the vast majority of customer load in Connecticut (customer switching in the state has been extremely limited), so over 95% of the state’s load has not been required to meet RPS targets. Only competitive suppliers, which to date have been unable to establish a foothold in the state, have had to comply. As a result, the supply-demand balance has been poor: there has been little demand for renewable energy. The policy itself has also been unstable, as there were continuous efforts to revise the statute to make the policy more effective. Eligible biomass under the initial RPS was required to be from “sustainable” sources, with no definition provided by the legislature or by regulators. The eligibility of out-of-region generation has historically also been unclear. In conjunction with these flaws, non-compliance penalties were vague. The policy has been applied on a company-wide basis so far, but this is likely to change with the adoption of the NE GIS. The new 2003 legislation significantly improves the RPS, but there remain several weaknesses. First, biomass eligibility rules remain unclear in legislation. Second, the scope of geographic eligibility and TRC trading is unclear in the statute. Third, it remains unclear whether the standard is applied on a product- or company-basis.

MARKET CONTEXT

Historically, political and regulatory support for the CT RPS has been weak. The availability of long-term contracts from creditworthy parties has also been a major concern in New England. This is in part due to the design of competitive markets in the region, whereby no LSE can be certain of their long-term load obligations. The current credit crunch in the electricity industry has also not helped the situation. The contracting standards for distribution utilities (requiring a 100 MW long-term purchase) included in the 2003 RPS amendments may ease this barrier.

GEOTHERMAL-SPECIFIC EVALUATION

Geothermal resources are not realistically available in the region, and in fact geothermal does not even appear to be eligible under the Connecticut RPS. As a result, no direct or indirect mechanisms exist to support geothermal.

Iowa

EVALUATION SYNOPSIS

Iowa's renewable energy mandate was met with wind power installations in the late 1990s. The policy was established in a regulated market, and is no longer driving development in the state.

OVERALL RESULTS

Iowa's renewable energy mandate was met with 250 MW of wind power in the late 1990s, and full compliance was achieved after years of legislative and legal wrangling. The cost of the policy has been stable, and utility costs are recovered from ratepayers.

POLICY DESIGN STRENGTHS

The policy met its purpose: to install 105 aMW of new renewable energy. Resource eligibility rules were well defined, and resources were required to be located in the state. Supply and demand were well balanced, with new resources required to meet the policy's targets. The state's IOUs were obligated to make the renewable energy purchases, with just the state's publicly owned utilities exempted, and cost recovery was allowed.

POLICY DESIGN WEAKNESSES

With legal maneuvers and other delays, this policy took more than 15 years to implement. Policy stability was therefore a major problem, as was enforcement. The legality of the in-state requirement might be questioned, but since the policy has been met, it is a moot point.

MARKET CONTEXT

Creditworthy long-term power purchasers (the IOUs) ultimately purchased renewable energy to comply with the mandate, but not until after years of legislative and legal challenges. Adequate resource potential existed to easily meet the 105 aMW requirement.

GEOHERMAL-SPECIFIC EVALUATION

Geothermal resources are not realistically available in the state, and in fact geothermal was not even eligible under the state's policy.

Maine

EVALUATION SYNOPSIS

Maine has among the most poorly designed RPS policies, despite a seemingly aggressive 30% purchase requirement. With supply of eligible resources far above the RPS target, and a host of other policy weaknesses, this RPS is likely to have little to no effect on the renewables market absent legislative changes. It also does little to meet its limited aim of supporting existing in-state biomass generators.

OVERALL RESULTS

Maine's RPS has been completely ineffective, and has led to no new renewable development thus far. This situation is likely to persist, absent changes in the RPS statute itself. The cost of the policy is small, and what costs do exist are passed through to customers via competitive pricing. LSEs have been in full compliance with the policy.

POLICY DESIGN STRENGTHS

The policy's weaknesses far outweigh its strengths. That said, resource eligibility rules and the treatment of out-of-state resources have been reasonably clear and well defined. The policy is broadly applicable, exempting only publicly owned utilities. Verification and compliance flexibility mechanisms are adequate. Product-based application of the policy is customer friendly and helps support the voluntary green power market.

POLICY DESIGN WEAKNESSES

The supply-demand balance for the Maine RPS is poor: eligible resources far outstrip the RPS targets. Loose eligibility rules, allowing existing hydro and cogeneration to qualify, have led to this circumstance. The duration and stability of the standard can also be questioned; with a policy review after 5 years, the long-term fate of the RPS is uncertain. Non-compliance enforcement is somewhat vague, with perhaps too much flexibility given to those that fail to comply.

MARKET CONTEXT

The availability of long-term contracts from creditworthy parties is unimportant because the policy only supports existing generation, which is not in need of long-term contracts. The policy lacks regulatory and legislative stability, as there are seemingly continuous efforts to alter the RPS to make it more effective, or to eliminate it altogether. Given the nature of the standard, adequate resource availability is not an issue.

GEOTHERMAL-SPECIFIC EVALUATION

Geothermal resources are not realistically available in the region, though geothermal is eligible under the state's RPS. No direct or indirect mechanisms exist to support geothermal.

Massachusetts

EVALUATION SYNOPSIS

Massachusetts' RPS took effect in 2003. The policy itself is well designed and promises to drive new renewable energy development in the region, but a lack of long-term contracting is already posing significant challenges. Siting difficulties in the region will also negatively impact renewable energy development opportunities.

OVERALL RESULTS

It is too early to report definitive results. There is some increased renewable development activity in the region, including merchant landfill gas activity and substantial new wind power development, both on- and off-shore. Long-term contracts have not been made available to generators, however, substantially reducing new development opportunities to date. Full compliance with the RPS is expected from obligated LSEs, but compliance in the early years may include payments to the Alternative Compliance Mechanism (ACM) – a 5 cent/kWh buy-out payment that can be made in lieu of purchasing TRCs. The incremental cost of MA-eligible renewable resources has averaged ~2.5 cents/kWh thus far, and supply and demand appear to be in balance for 2003. With stalled new development, however, and an increasing RPS purchase standard, the cost of TRCs could well rise to the ACM level of 5 cents/kWh in future years. A lack of long-term contracting could exacerbate the situation and lead to temporal fluctuations in the cost of TRCs, though the ACM provides a cap on that variability. RPS compliance costs are to be passed on to end-use customers for default and standard offer service, at the worst through balancing account treatment. Contracting standards and imprudence issues may arise, because the providers of standard offer and default service have not yet been willing to enter into long-term contracts for renewable energy, preferring instead to decrease their risk and purchase certificates on the short-term market or pay into the ACM. These short-term strategies are likely to be more costly in the long run than entering into long-term renewable energy contracts. Accordingly, there have been renewed calls for contracting standards for standard offer and default service. The Massachusetts SBC fund has stepped in to try to support long-term contracting under the RPS.

POLICY DESIGN STRENGTHS

Massachusetts' RPS is relatively well designed. Applicability is broad, with only publicly owned utilities exempt from the requirement. The duration and stability of the standards are good, and resource and geographic eligibility rules are well defined and reasonably stable. Enforcement is likely to be adequate, especially with the ACM, and verification and compliance flexibility are both reasonable (Massachusetts uses the NE GIS certificates system, and allows for limited banking of certificates). The standard is applied on a product basis.

POLICY DESIGN WEAKNESSES

The primary weakness is that the policy lacks contracting standards for standard offer and default service suppliers. These suppliers serve the majority of MA load, but have been unwilling to enter long-term renewable transactions thus far. The current treatment of out-of-state generators is reasonably clear, but the rules themselves have been challenged. Uncertainty over the eligibility rules for out-of-region generators may slow in-region development because renewable generation outside the region is more cost effective. Supply-demand conditions may also prove to be a weakness. The RPS rules were not finalized until March 2002, leaving little time for new renewable energy development before the standard kicked-in; compliance in the early years may therefore prove problematic. Over the long-term, renewables demand may continue to outstrip supply despite an otherwise well-designed policy.

MARKET CONTEXT

The availability of long-term contracts from creditworthy parties is a major concern in New England. This is in part due to the design of competitive markets in the region in which no LSE can be certain of their long-term load obligations, and is in part a result of the fact that the utilities are no longer contracting on a long-term basis for their customers. The current credit crunch in the electricity industry has also not helped the situation. Political and regulatory support appears strong, though siting and permitting issues may thwart new renewable development.

GEOHERMAL-SPECIFIC EVALUATION

Geothermal resources are not realistically available in the region, and in fact geothermal is not even eligible under the state's RPS. As a result, no direct or indirect mechanisms exist to support geothermal.

Minnesota

EVALUATION SYNOPSIS

Minnesota's original renewable energy mandate has applied only to Xcel Energy, and has successfully brought on line wind and biomass capacity. An additional 400 MW of wind power is expected by 2006. The policy was established in a regulated market and applies to only a single utility. Legislation in 2003 established an RPS goal for all utilities in the state, though this goal is a "requirement" only for Xcel. Even Xcel's requirement may be waived if undue economic or reliability impacts are expected, while other utilities must demonstrate "good faith efforts." While the implementing regulations for this "goal" have not yet been established, it appears as if it may drive substantial new renewables development in future years, especially to serve Xcel Energy.

OVERALL RESULTS

The original Xcel Energy mandate required 425 MW of wind and 125 MW of biomass by 2002, and the utility largely met its obligations. An additional 400 MW of wind power was required by 2012. A recent settlement on transmission upgrades in the major in-state wind resource area, however, directs that the incremental 400 MW be brought on by 2006. The cost of this original policy has been stable and reasonable, in part due to the low-cost of wind when purchased under long-term contract, and utility costs (including incremental transmission costs to assess the wind resources) are recovered from ratepayers. No results have yet been generated under the goal/requirement legislation passed in 2003.

POLICY DESIGN STRENGTHS

The original Xcel mandate is meeting its purpose: to install new wind and biomass generation. Resource eligibility rules are well defined, and the implicit treatment of out-of-state resources is also relatively clear (in state was preferred in the first round, while out-of-state is more clearly eligible for the next 400 MW). Supply-demand is well balanced, with new resources required to meet the policy. The renewable energy capacity targets have been stable and well known in advance. The PUC established contracting standards, and compliance costs are recovered from ratepayers. Specific non-compliance penalties are not applied, but regulatory oversight has ensured that the targets are met. Though implementing rules have not been developed, strengths of the 2003 renewable goal legislation include: (1) clear resource eligibility rules, (2) targets that will likely ensure significant increases in renewable generation, at least from Xcel and quite possibly from other utilities as well, and (3) possible use of TRCs to facilitate compliance flexibility.

POLICY DESIGN WEAKNESSES

The original Xcel mandate is not broadly applicable, and instead applies to only one utility. The utility has, in the past, tried to sell some of its obligated renewable capacity as a green power product, raising concerns about green product credibility. Weaknesses of the renewable energy goal established in 2003 include: (1) somewhat unclear rules for out-of-state resources, (2) application of "required" renewable purchases only on Xcel Energy, with "good faith efforts" required of all other utilities in the state, and (3) lack of precise clarity about the circumstances in which Xcel might not be required to meet the renewable energy requirement, due to findings of undue economic or reliability impacts. It is also somewhat unclear on whether the 300 MW wind purchase requirement is part of Xcel's 10% requirement or earlier 825 MW requirement, or is to be additional to those requirements. In either case, it appears as if the 300 MW wind requirement is not subject to least-cost review.

MARKET CONTEXT

Xcel has been willing to enter long-term power purchase agreements with renewable generators; though Xcel is now in a weakened financial situation that may lead to contracting difficulties. Political and regulatory support for the policy has remained strong. Adequate resources appear to exist to meet the renewable energy targets, though transmission expansion and augmentation has been and will continue to be needed to access increasing quantities of wind power.

GEOHERMAL-SPECIFIC EVALUATION

Geothermal resources are not realistically available in the state, and in fact geothermal is not even eligible under Xcel's renewable energy obligation, or the 2003 renewable energy goal.

Nevada

EVALUATION SYNOPSIS

Nevada's RPS is among the most aggressive, potentially requiring sizable amounts of new geothermal energy. Because it is applied in a regulated market, it is also a policy that will require a strong and ongoing role for the Nevada PUC. The policy has already resulted in increased geothermal prospecting in the state, and has led to nearly 100 MW of new geothermal contracts. Utility financial problems may create some contracting difficulties, however.

OVERALL RESULTS

Nevada's RPS began in 2003, and the utilities' first solicitation led to 130 MW of wind contracts, 97 MW of geothermal contracts, and 50 MW of solar contracts. With utility fears over wind power integration, geothermal is also poised to do well in future solicitations. The state's utilities will not be in full compliance with the RPS in its early years. Though this may simply be a transitional issue, if some of the initial renewable energy projects are unable to come to fruition, non-compliance may continue. Nevada's RPS requires long-term contracting, ensuring that RPS compliance costs are likely to remain reasonable and stable. The utilities' first solicitation led to renewable energy contracts whose costs are competitive with conventional energy sources (with the exception of solar). The Nevada PUC will review and approve all contracts, allowing the utilities to recover all prudently incurred costs.

POLICY DESIGN STRENGTHS

Nevada's RPS is aggressive, requiring substantial sums of additional renewables, and is also reasonably well designed. IOUs and ESPs are both responsible for meeting RPS over time, with only publicly owned utilities exempt from the requirements. Resource eligibility rules are well defined, though 2003 ushered in new legislation that expanded resource eligibility. The policy's duration is solid (it is to last indefinitely). Because resources must be located in or near the state (with a dedicated transmission line shared with at most only one non-renewable generator), the RPS targets support existing generation while rapidly requiring new generation as well. The treatment of out-of-state generators is well defined and stable, though legal questions may arise. TRCs are allowed, a critical feature given a lack of transmission in the state. Credit banking offers compliance flexibility. Detailed contracting standards exist, along with cost recovery mechanisms.

POLICY DESIGN WEAKNESSES

A good deal of authority is given to the Nevada PUC to oversee the RPS policy. Aggressive standards may strain resource availability in the long-term. In the early years, the policy's rules were established too late in the game to allow the utilities to bring new renewable project on-line quickly enough to meet their early-year targets; this will lead to non-compliance during at least a transition period. Legal concerns about the rigid eligibility requirements for out-of-state generators may arise. The policy's somewhat vague non-compliance penalties may become a concern, as utilities will not be in compliance early on, and the discretion given to the PUC in levying fines could become an issue in the future. Resource eligibility was recently expanded to include certain small hydro and waste heat and pressure applications, which may to a small degree reduce the impacts of the policy on renewables development.

MARKET CONTEXT

The poor credit of the major utilities could prove a transitional problem; apparently, credit issues are already proving problematic for the recently announced contracts. Regulatory and legislative support appears strong today, but such support has been illusory in the past so the long-term stability of the policy remains in doubt. Resource potential appears adequate in the early years, but may be strained as the RPS targets increase over time.

GEOTHERMAL-SPECIFIC EVALUATION

Geothermal is eligible, and if the RPS remains intact, geothermal should see sizable new markets – 97 MW of geothermal contracts are approved so far, a full 60% of the utilities' total renewables procurement in the first solicitation. The RPS does not provide *specific* encouragement of geothermal (as it does for solar, through a set-aside), but the contracting process allows the utilities to consider integration costs and project output profiles when determining which renewables bids to select. In the first solicitation, the utilities placed a hard limit of 150 MW of wind in the state, given integration concerns. If such concerns and contracting processes continue, geothermal will be strongly supported under the RPS in an *indirect* fashion.

New Jersey

EVALUATION SYNOPSIS

New Jersey has a two-tiered RPS that began in 2001. The policy itself is reasonably well designed, but because of a poor supply-demand balance, it is not likely to drive substantial new development for a number of years. A lack of long-term contracting may also slow new development. A Task Force established by the Governor in 2003 recommended strengthened the RPS, and the BPU is expected to seek the implementations of these recommendations in late 2003.

OVERALL RESULTS

Though the New Jersey RPS is not strictly binding today (aggregate eligible supply exceeds aggregate demand), there has been some new renewable energy development (landfill gas and wind) in the PJM and New York. Though this generation was not built specifically to serve the New Jersey RPS, the existence of the policy has provided a backstop market to help justify some of this investment. Accordingly, the policy has indirectly help drive some new renewable energy development. LSEs are in full compliance with their obligations today, with incremental costs of perhaps ~0.4 cents/kWh for Class I renewable generation and ~0.2 cents/kWh for Class II generation. Costs are reasonable and stable, and are passed on to customers.

POLICY DESIGN STRENGTHS

New Jersey's RPS is well designed in several respects. Applicability is broad, with only publicly owned utilities exempt from the requirement. The duration and stability of the standards are good, although the RPS rules remain "interim." Though the legislation itself is vague in its definition of eligible biomass generation under the Class I standard, subsequent decisions by the BPU and DEP have clarified the eligibility rules to a significant extent. Compliance flexibility is adequate so far.

POLICY DESIGN WEAKNESSES

The supply-demand balance is poor in the early years, with more existing renewable energy supply than RPS-driven demand, ensuring that the policy has little effect on new renewable energy development. This may change over time. Unclear rules for geographic eligibility and an ever-expanding PJM grid, however, may conspire to keep existing renewable generation above the RPS requirements for years to come. The RPS standards also do not grow quickly. A strong verification system for the RPS does not yet exist, and credit trading is not formally allowed under the interim RPS rule. A limited TRC system is under consideration, but it may be years before the system is in place; in the mean time, uncertainty is high. Enforcement rules are reasonably vague and are more flexible than some RPS policies. Once the RPS becomes binding and new renewable energy is needed, contracting standards and imprudence issues may arise for basic generation service (BGS) providers, which serve those customers that do not switch to a new electricity provider. Without contracting standards in place, and given the short-term nature of BGS supply, it remains unclear as to whether industry players will be willing to commit to long-term renewable energy contracts. However, short-term purchasing strategies are likely to be more costly in the long run than entering into long-term renewable energy contracts. The New Jersey RPS also appears to apply on a company basis. If the Governor's Task Force recommendations are approved, many of these weaknesses will be alleviated.

MARKET CONTEXT

The availability of long-term contracts from creditworthy parties is not yet an issue, but may become a concern in later years as the New Jersey RPS begins to drive new renewable energy development. Political and regulatory support for the RPS is strong, and the Governor created a Task Force to recommend changes to the RPS that would, if implemented, strengthen the policy. Adequate renewable resources exist in the PJM and New York to meet the New Jersey RPS, but renewable resource availability within New Jersey is inadequate; if New Jersey's rules became more strict for the eligibility of out-of-state generation, then supply could become a problem over time.

GEOTHERMAL-SPECIFIC EVALUATION

Geothermal resources are not readily available in the region, through geothermal is eligible under the New Jersey RPS. No direct or indirect mechanisms exist to support geothermal.

New Mexico

EVALUATION SYNOPSIS

New Mexico's RPS is among the few to be established by regulatory action; it is also among the nation's most newly established RPS, with rules finalized in December 2002 and taking effect in mid-2003. With renewable energy purchase standards that do not begin until 2006, it is too early to assess the effectiveness of the policy. The rule itself, however, is well designed and provides *specific* encouragement of geothermal development relative to wind and small hydropower. Policy stability may be a serious issue, however, with the utilities questioning the authority of the PUC to implement an RPS without legislative direction. Because the policy is applied in a regulated market, it will also require a strong and ongoing role for the New Mexico PUC.

OVERALL RESULTS

No renewable energy development has yet taken place that is a direct result of the RPS. A 204 MW wind power contract was signed before the RPS came into effect, perhaps in part in anticipation of the future policy. The utilities are currently challenging the RPS rule in court, so the likelihood of future compliance is unclear. The policy does require longer-term contracting, so if the RPS does take effect, the costs of the policy are likely to be reasonable and stable. Prudently incurred compliance costs will be recovered from ratepayers.

POLICY DESIGN STRENGTHS

New Mexico's RPS is broadly applicable, with exceptions given to publicly owned utilities and (in the short term) Texas-New Mexico Power Company. Assuming that out-of-state existing renewables are not rededicated to New Mexico to meet that state's RPS, then the New Mexico policy will drive new resource development. Sufficient lead-time has been given to bring those new resources online. Policy duration is strong: the standard increases to 10% by 2011, and remains at that level indefinitely. Resource eligibility rules are clearly defined, as is the eligibility of out-of-state generation (though it is not clear how the "preference" for in-state generation will be provided). TRCs are envisioned as the verification mechanism, and banking provides adequate compliance flexibility. Contracting standards and cost recovery mechanisms are both to be overseen by the PUC.

POLICY DESIGN WEAKNESSES

The mere existence of the RPS remains in doubt, as the utilities are questioning the PUC's authority in the courts and before the legislature; the PUC has already rejected the utilities' arguments. Enforcement mechanisms remain to be developed, though this may not be problematic if the PUC uses its normal regulatory powers to ensure compliance. A good deal of authority is given to the New Mexico PUC to continue to oversee the policy effectively. Whether the costs of the RPS can be passed on to green power customers (company-based application) is somewhat unclear.

MARKET CONTEXT

The policy is applied in a regulated market, and requires long-term contracting. Regulatory support is strong today, but legislative support is unclear. Because the policy was established through regulation, ongoing regulatory uncertainty is possible. The mere existence of the policy remains in doubt until the legislature and the courts respond to the utilities' attacks. Resource potential in the region should be more than adequate to meet the renewable energy targets.

GEOHERMAL-SPECIFIC EVALUATION

No geothermal development has yet occurred because of the RPS. Geothermal is eligible under the RPS, however, and in fact the policy has been designed to specifically encourage renewable resource diversity, including geothermal. In particular, while every MWh of wind and small hydropower will receive one renewable energy credit, geothermal, biomass, LFG, and fuel cells will receive two credits (solar will receive three credits). If the incremental cost of geothermal energy is less than two times that of wind, then geothermal should compete well under this RPS. New Mexico was the first state to develop such explicit support for geothermal energy. The RPS also requires LSEs to provide a diversified renewable resource portfolio, and to consider delivery characteristics when selecting among different renewable energy resources.

Pennsylvania

EVALUATION SYNOPSIS

Pennsylvania has a small RPS that applies to only a tiny segment of the overall market. With limited applicability and eligible renewable energy supply far outstripping the limited RPS-driven demand, the policy has had little to no effect so far, and is unlikely to drive new renewable energy development in the future.

OVERALL RESULTS

Pennsylvania's renewable energy requirement has been completely ineffective, and has led to no new renewable development this far. This is because the majority of customer load is exempt from the RPS. The cost of the policy is negligible, and what costs do exist are passed through to customers via competitive pricing. A cost cap exists were the costs of the policy to become unreasonable.

POLICY DESIGN STRENGTHS

The policy has few notable strengths. Resource eligibility rules are reasonably clear, however, and the policy is applied on a product-specific basis.

POLICY DESIGN WEAKNESSES

Pennsylvania's renewable energy targets were developed within utility restructuring settlements, and the targets apply to a fraction of load served by competitive suppliers of default service. The state has been largely unsuccessful in attracting competitive suppliers of default service, however, with the exception of approximately 50,000 customers served by Green Mountain Energy Company in PECO's service territory. Accordingly, the vast majority of load in the state is exempt from the RPS. The targets themselves are small, and allow existing renewable generation to qualify. Supply and demand are therefore not in balance, and no new renewables have or will come online solely due to this policy. The targets themselves are unclear in their duration, and enforcement actions remain vague. The treatment of out-of-state generators is not specified, and an accounting and tracking system to verify compliance has not been developed.

MARKET CONTEXT

Because the policy is not driving new renewable energy development, the need for long-term contracting is minimized. Political and regulatory support of the policy is adequate; in fact, all parties involved largely ignore the policy. Given the small targets and limited applicability, resources are clearly sufficient.

GEOHERMAL-SPECIFIC EVALUATION

Geothermal resources are not realistically available in the region, though geothermal is eligible under the mandate. No direct or indirect mechanisms exist to support geothermal.

Texas

EVALUATION SYNOPSIS

Texas' RPS is widely acknowledged to be the most successful in the U.S., if not the world. The policy has driven substantial new wind installation in the state. Additional wind development is expected in future years, though at present the amount of new renewable energy supply outstrips the RPS requirements. Utility providers of retail electricity supply have been willing to enter long-term contracts with renewable energy developers, with smaller competitive suppliers purchasing TRCs from those larger companies. The only dark cloud on the horizon is that transmission constraints are limiting wind power expansion, and have driven the price of TRCs up over recent months. While geothermal is eligible under the Texas RPS, and some geothermal resources may be available in the state, wind power is expected to dominate new installation given its 2.5 cents/kWh cost (with the PTC).

OVERALL RESULTS

In 2001, the Texas RPS helped drive 915 MW of new wind installation and create some new development opportunities for landfill gas, far exceeding the initial 400 MW RPS target. Development in 2002 took a breather, but additional wind project installation is expected in 2003. LSEs appear to be fully complying with the RPS so far. LSEs with long-term contracts for wind supply have only had to pay 2.5 cents/kWh for wind generation (electricity and TRCs), while those purchasing TRCs in the short-term market have seen fluctuating costs of 0.4-1.7 cents/kWh (TRCs only). Costs have remained reasonable, though increasing TRC prices from 0.4 to a high of 1.7 cents/kWh has been cause of some concern. The 5 cent/kWh maximum penalty places an overall limit to the cost of the policy. Other transmission-related costs of the RPS are also recovered through rates, and these costs are not negligible. Prudently incurred compliance costs are being passed on to customers through competitive pricing mechanisms.

POLICY DESIGN STRENGTHS

Texas was the first U.S. state to get its design of the RPS "right." Applicability is broad, with only publicly owned utilities that have not opened their markets to competition exempt from the requirement. The targets and eligibility rules were specifically designed to drive new renewables, so the supply-demand balance is strong. Regulatory rules for the RPS were established well before the first target date, allowing adequate time for projects to come online. The duration and stability of the standards are good, with applicable standards growing until 2009, and then remaining constant for an additional 10 years. Resource and geographic eligibility rules are well defined and stable. Enforcement is vigorous, with automatic financial penalties applied to non-compliant LSEs. The TRC system provides for flexible verification, and forward and deficit banking offer flexibility in compliance. No problems with contracting standards and cost recovery have been expressed. The standard is effectively applied on a product basis.

POLICY DESIGN WEAKNESSES

There are few overt weaknesses of this policy. One possible weakness is that while the current treatment of out-of-state generators is reasonably clear (generators must be located in state, or have in a direct intertie with the state), the legality of these restrictions is not clear. With the recent run-up in TRC prices, some have argued that the policy should give LSEs more flexibility in compliance (specifically, greater allowance for deficit banking); the Texas PUC has already made limited changes to the RPS rules to accommodate these concerns.

MARKET CONTEXT

The utility LSEs have been willing to enter long-term contracts with renewable energy developers, in part because wind power is so cost effective in the state. Smaller LSEs have not been willing or able to offer such contracts, preferring instead to purchase TRCs at higher cost from the short-term market. Political and regulatory support has remained very strong (LSEs know that they have to meet the standards), and adequate resource potential certainly exists to meet the renewable energy targets. Transmission constraints, however, are posing challenges to bringing low-cost wind power to market, and are in part responsible for the recent run-up in TRC prices.

GEOHERMAL-SPECIFIC EVALUATION

Geothermal resources are potentially available in the region, and geothermal is eligible under the Texas RPS. With low-cost wind power dominating the market, however, and with no direct encouragement of geothermal, geothermal development is unlikely to be spurred by the Texas policy.

Wisconsin

EVALUATION SYNOPSIS

Wisconsin has a small but well-designed RPS applied in a regulated market setting. With 80 MW of wind installed in Iowa in 2001, and additional in-state installations, no new development will be required under the policy for several years to come. This has led to calls for increasing the level of the RPS.

OVERALL RESULTS

Wisconsin's RPS has helped to create markets for some new renewable generation. An 80 MW wind project in Iowa came on line in 2001 to serve the Wisconsin RPS. An additional 60 MW of in-state wind and landfill gas also serves the RPS, though much of this generating capacity pre-existed the RPS. With a low aggregate standard (2.2%, at its highest), the policy will not itself drive much new renewable development for several more years. The costs of the policy have been reasonable and stable, with long-term contracting eliminating any sizable cost fluctuations. Compliance costs are passed on to end-use customers.

POLICY DESIGN STRENGTHS

Wisconsin's RPS has a number of strengths. Applicability is among the broadest of all state RPS policies, with even munis and coops responsible for meeting the targets (a limited exemption is provided to one utility). The targets and eligibility rules were designed to drive some new renewable energy development (in part because existing generation was allowed to only contribute 0.6% to the RPS requirements). Resource and geographic eligibility rules are well defined and stable. Enforcement is somewhat vague, but in a regulated market, this is generally of limited concern. A limited renewable energy credit system provides adequate verification flexibility, and significant compliance flexibility (including unlimited banking, among other flexibility mechanisms) is also offered. No problems with contracting standards and cost recovery have been expressed.

POLICY DESIGN WEAKNESSES

There are few overt weaknesses of this policy. Perhaps the primary weakness is that the low percentage standard, combined with early over-compliance and unlimited banking, will result in little incremental renewable energy development until perhaps 2009. Both a strengthened percentage target and limits on credit banking have been proposed. The duration of the policy is also vague, with the percentage targets increasing to 2.2% by 2011, but the standard after that date uncertain.

MARKET CONTEXT

The utility LSEs have been willing to enter long-term contracts with renewable energy developers. Political and regulatory support has remained strong, and there are increasing calls to strengthen the policy. Adequate resource potential exists in the state and surrounding region to meet the renewable energy targets.

GEOTHERMAL-SPECIFIC EVALUATION

Geothermal resources are not realistically available in the region, though geothermal is eligible under the Wisconsin RPS. No indirect or direct support mechanisms exist for geothermal.

Appendix F: Resource List and References

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Web Links

Union of Concerned Scientists Renewable Energy Page:

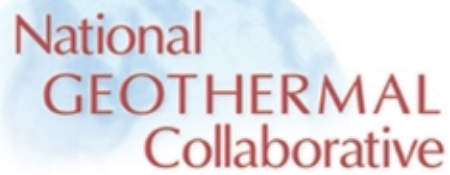
http://www.ucsusa.org/clean_energy/index.cfm?pageID=5

Massachusetts RPS Design White Papers:

<http://www.state.ma.us/doer/programs/renew/rps.htm#papers>

Renewable Energy Policy Project Links to State RPS Regulation and Legislation:

http://www.repp.org/rps_map.html

The logo for the National Geothermal Collaborative features a stylized blue globe in the background. Overlaid on the globe is the text "National" in a dark red serif font, "GEOTHERMAL" in a larger, bold, dark red sans-serif font, and "Collaborative" in a dark red serif font.

National GEOTHERMAL Collaborative



The Renewable Portfolio Standard, (RPS) is an increasingly popular policy tool that can support geothermal or other types of renewable energy. To date, RPSs or RPS-like mandates have been established in thirteen states.

This report evaluates early experience with state RPS policies, and specifically highlights the role of geothermal energy in these policies. Specifically, this report: (1) provides a summary of the status and results of state RPS policies; (2) briefly assesses the advantages and disadvantages of the RPS; (3) critiques the effectiveness of state RPS policies based on a series of objective evaluation criteria; and (4) evaluates approaches to specifically encourage geothermal energy under state RPS policies. The report also includes several appendices that provide detailed summaries of state RPS policies, as well as the results of interviews with twelve (12) relevant stakeholders regarding the RPS. The report concludes by highlighting principles and best practices that we believe would be effective in guiding future RPS design efforts.