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**2008 Long Term Acquisition Plan**

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**APPENDIX H**

**Global Energy's Renewable  
Energy Market Analysis Report**

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## Renewable Energy Credit - Market Analysis of Potential Renewable Energy Sale in WECC

Prepared for:  
BC Hydro

Date Submitted:  
5/15/2008

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**APPENDIX H to BC Hydro's 2008 LTAP**

Renewable Energy Credit - Market Analysis Of Potential Renewable Energy Sale In WECC

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## **1 INTRODUCTION**

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### **1.1 INTRODUCTION**

British Columbia Hydro and Power Authority (BC Hydro) is interested in assessing the potential for green, clean, and low or zero greenhouse gas (GHG) electricity sales in the Western Electricity Coordinating Council (WECC) region over the next 20 years. BC Hydro is particularly interested in analyzing the opportunities or restrictions that it may face for its electricity generation portfolio in WECC markets. This assessment would be prepared to inform BC Hydro's 2008 Long-Term Acquisition Plan.

BC Hydro asked Global Energy Advisors, Inc. (Global Energy) to prepare a report on these matters. The objectives of this report are:

- To obtain an objective view as to what the value of Renewable Energy Certificates (RECs) would be in the future; and
- To obtain an indication of the possibility of British Columbia (B.C.)-based supply being able to access the WECC market.

Assessing the ability of the transmission grid to accommodate physical delivery of renewable power from B.C. to the U.S. is outside the scope of this report. Global Energy was asked to assume that any needed transmission capacity would be available.

The rules and regulations regarding renewable portfolio standards, GHG emissions and related matters are in a state of flux at both the U.S. federal and state levels. For purposes of this report, Global Energy is giving its expert opinion on how those rules and regulations are likely to evolve in the U.S. between now and 2020. In providing this expert opinion, Global Energy provides the basis for making its forecast on these matters.

This report concludes that most WECC state RPS allows out-of-country renewable electricity products, with some states being more restrictive and other states being less restrictive. Mechanisms are already being set up to assure that "tracking" of renewables is done in a way that assures these resources are counted only once. For example, the Western Renewable Energy Generation Information System (WREGIS)<sup>1</sup> is already in existence under the WECC umbrella to accomplish this tracking and the system is designed to track both Canadian and U.S. WECC located renewables.

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<sup>1</sup> WREGIS, a renewable energy registry and tracking system for the Western Interconnection, successfully went online on June 25, 2007. WREGIS is housed in Salt Lake City, UT, and the WREGIS Staff at WECC is currently processing applications for Account Holder registration.

## 1.2 ORGANIZATION OF THE REPORT

The remainder of this report is organized into five sections.

Section 2 contains a discussion of policies today in the WECC region and policies that may emerge in the future that may increase or limit future market opportunities for green, clean or zero-GHG electricity sales, and discusses the products (i.e., RECs or GHG allowances) that can be derived from the B.C. electricity portfolio and may have value in WECC markets, including a discussion of the relationship between these products.

Section 3 provides estimates of demand in the U.S. portion of WECC for green, clean or zero-GHG electricity sales. This section includes Global Energy's calculation of existing GWh from renewables in the WECC and Global Energy's calculation of additional GWh of renewables necessary to meet RPS targets in 2010, 2015 and 2020.

Section 4 provides Global Energy's estimates of the value (\$/MWh) and potential quantity of demand (GWhs) of renewable/clean attributes in WECC markets in 2010, 2015 and 2020 based on the demand for renewables discussed in Section 3. This section will discuss details on the development of the value of these renewable/clean attributes based on:

- a) The likely technologies and quantity of these technologies;
- b) Estimates of the costs of these supplies; and
- c) The value of these supplies in power markets exclusive of the value of any renewable/clean attributes.

Section 5 provides Global Energy's assessment of the range of prices for RECs in the future given the uncertainties that arise in the quantification in Section 4.

## 2 CURRENT AND FUTURE POLICIES

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### 2.1 BC HYDRO PRODUCTS

Any “renewables” that BC Hydro acquires as part of its electricity portfolio may have “renewable energy attributes” that are products that may be marketed in the U.S. portion of WECC. In this report we use the term “renewable energy attributes” to mean the characteristics of electricity supply, such as the energy source and emissions from a generator. These attributes are conveyed with the electricity unless they are “unbundled” from the electricity and recorded in a certificate that may be traded separately from the electricity itself.

**RECs:** RECs are a market instrument created by separating the attributes of renewable electricity generation from the physical electricity produced, thus making RECs a tradeable commodity separate from the actual electrons. RECs can be sold and traded and the owner of the REC can claim to have purchased renewable energy. Typically, one REC equals the renewable attributes of one MWh of electricity from a qualifying renewable project. A certifying agency gives each REC a unique identification number to make sure it does not get double-counted. Double counting occurs when more than one entity claims ownership of a REC or of the REC and its associated power.

RECs may be “bundled” together with their associated electricity that is produced at the renewable electricity generation facility. When both the REC and the electricity associated with that REC are acquired together, it is said that one has acquired a bundled REC. The owner of a REC may decide to “unbundle” the electricity associated with that REC and sell each of the two components separately.

As discussed below in section 2.4, WECC state RPS requirements vary between requiring renewable attributes to remain bundled with the underlying electricity, on the one hand, to allowing unbundled RECs for compliance, on the other. Most WECC states except California currently allow unbundled RECs for compliance purposes. California is expected to permit unbundled RECs for its RPS compliance in the near future. There are also state-specific definitions of renewable energy for RECs eligibility. The following generation technologies typically qualify as producers of RECs: wind, geothermal, low impact hydropower (small run-of-river facilities), biomass, and solar electric. The BC Hydro electricity supply portfolio may include a large quantity of the types of electricity supplies that qualify as “renewable” supplies in U.S. states in the WECC. Small hydro power plants (i.e., hydro projects with less than 30 MW of capacity and which have no storage) and wind power plants will qualify in most of these states as renewable.

**GHG Allowances:** Renewable energy is commonly understood to contribute to improved air quality and reduced GHG emissions. The direct air emissions from a renewable generator, often zero depending on the type of renewable generation, may be called the “primary” renewable energy attributes, and are currently covered by RECs.

“Derived” renewable energy attributes can be defined as the emissions avoided by virtue of renewable energy displacing thermal generation.

It is not yet clear whether renewable generation will be eligible for GHG emission allowances or credits will be granted to renewable generators as part of the Western Climate Initiative’s (WCI)<sup>2</sup> proposed GHG cap-and-trade system. If GHG emission allowances are issued for renewable energy generation, it is thought that credit associated with the low GHG emission will only be able to be counted once and therefore the energy would not be able to be used for both purposes (i.e., cap-and-trade compliance and sales as RECs). If renewable energy is not eligible for GHG emission allowances under the WCI cap-and-trade rules, then clearly its attributes will not include GHG emission allowances.

The remainder of the section 2 is organized as follows. The current status of RPS in all U.S. states is described in section 2.2. To gain insight into the effect of a GHG cap-and-trade system on RPS requirements, in section 2.3 we explore what U.S. states are saying about the goals of their RPS. Finally, section 2.4 sets out the detailed RPS rules for each WECC state as they existed at the time of this report. That section also describes where the rules for each state can be found.

## 2.2 RENEWABLE PORTFOLIO STANDARDS - GENERALLY

Most of the U.S. states located in the WECC region have established RPS requirements for their load serving entities (LSEs). These RPS rules generally require that a specified percentage of energy load in a year be supplied with certain preferred (i.e., renewable) resource types. Each state may have a somewhat different definition of what qualifies as a “renewable resource” for purposes of its RPS.

The number of states taking steps towards establishing requirements of renewable energy use continues to grow. Recently, the states of Oregon, New Hampshire and North Carolina enacted RPS legislation, bringing the total number of states with mandatory RPS requirements to 25 states and the District of Columbia—up from about a dozen states four years ago. Significantly, the state of North Carolina is the first southeast state to require utilities to conform to an RPS target. Other states like Kansas, Vermont, Virginia, and, most recently, Missouri, have adopted voluntary renewable energy procurement goals. Illinois transitioned away from its voluntary targets and adopted a mandatory RPS in August 2007. Finally, the states of Colorado, New Mexico, Delaware, Maryland, and Connecticut have either increased their RPS targets from the original policies or added new resource categories. Other states are evaluating RPS programs, including Michigan and Florida.

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<sup>2</sup> The WCI is a collaboration which was launched in February 2007 by the Governors of Arizona, California, New Mexico, Oregon and Washington to develop regional strategies to address climate change. WCI is identifying, evaluating and implementing collective and cooperative ways to reduce GHGs in the region. Subsequently, Utah, Montana, B.C., Manitoba, and Québec joined the Initiative. Other U.S. and Mexican states and Canadian provinces have joined as observers.

Renewable energy goals are far more aggressive in some states than in most others. California and New York have adopted renewable energy targets of 20 percent by 2010 and 25 percent by 2013, respectively. Maine has the highest percentage requirement among all RPS states, but the 30 percent target is already surpassed by the existing renewable resources. Some states have already increased their targets from their original policies. Recently, Colorado has increased its RPS target from 10 percent by 2015 to 20 percent by 2020.

There was an attempt made in the Congress this past year to pass federal legislation establishing a federal RPS requirement. That effort failed, in part, because it was felt that states already had sufficient standards. However, it is likely that future federal legislation will be proposed—especially if it is perceived that states are not serious in their implementation of the RPS targets.

### 2.3 REASONS FOR ADOPTING RPS AND INTERPLAY WITH GHG CAP-AND-TRADE REGIME

Many RPS standards were originally established as a way of reducing dependence on natural gas fuel supplies that will increasingly need to be imported from areas outside of North America. For example, Colorado's RPS legislation specifically provides that fuel diversity is one of the over-arching reasons for the RPS. Further, renewables were preferred to provide needed power without emitting Oxides of Nitrogen (NO<sub>x</sub>), Oxides of Sulphur (SO<sub>x</sub>) and Particulate Matter (PM<sub>10</sub> and PM<sub>2.5</sub>). See, for example, the RPS legislation of Nevada and California. These reasons continue to be important to policy makers in these states and will make renewables a desirable source of supply even under a possible GHG cap-and-trade program that may be implemented in the WECC.

More recently, the WECC (and the United States and the World in general) has become more concerned about global climate change which has been attributed in part to Carbon Dioxide (CO<sub>2</sub>) emissions that occur when fossil fueled power plants are operated to provide needed power. It is recognized that renewable supplies will address not only earlier concerns about importing fuel and reducing NO<sub>x</sub>, SO<sub>x</sub>, and PM, but will also allow power to be produced without emission of CO<sub>2</sub>.

There is discussion at both the U.S. federal and state level concerning establishing a cap-and-trade program for reducing GHG emissions. For example, the WCI is discussing such a cap-and-trade program for achieving GHG reductions and is expected to put forth a framework for GHG cap-and-trade in August 2008. Global Energy is also aware that the WCI is reviewing studies done by the California Energy Commission (CEC) that show amounts of GHG reductions in each Western state under different penetrations of energy efficiency and renewables.

The CEC studies discussed in the above paragraph were performed by running hourly simulations of the WECC power grid, with hourly loads across WECC being served by economic dispatch of generation available in the region. In its "current conditions extended into the future" case, the CEC studies demonstrate the reality that much load in

WECC is served by natural gas-fired generation. As the CEC increased penetration of renewables in the future in its alternative views of the future, the renewables will run to meet the load, thereby displacing natural gas-fired generation that would otherwise be needed to meet loads. The CEC ran a few sensitivities with high GHG taxes in place. In the cases with high penetrations of renewables, economic dispatch would sometimes displace coal-fired generation rather than natural gas-fired generation because coal generation emits about twice the amount of GHG/kWh than does natural gas-fired generation. The CEC concludes that a good way to reduce GHG is to reduce thermal generation levels by causing higher penetrations of energy efficiency and renewable power supplies.

Global Energy is of the view that any GHG cap-and-trade program will likely not replace RPS programs for the following reasons:

- Renewables are recognized as key supplies in helping the power industry reduce GHG emissions;
- The other aspects of renewables (i.e., that they (a) reduce dependence on natural gas that would need to be imported from outside North America and, (b) reduced emissions of NO<sub>x</sub>, SO<sub>x</sub>, and PM) continue to be important policy goals.

RPS rules in the states are continuously evolving, but the current trend is to increase the “requirement” for more renewables rather than to relax these requirements. The trend toward wanting more renewables continues under possible GHG cap-and-trade programs. It is widely recognized that renewables will be an important method for meeting GHG emission targets even under cap-and-trade programs.

It should be understood that LSEs have been concerned about the impact RPS rules might have on the rates they will need to charge their retail customers. Many existing state RPS rules allow RPS targets to be delayed (or otherwise not met without penalty) if meeting the targets would result in material retail rate impacts. However, U.S. politicians and regulators are aware that the general public appears to be willing to accept some increase in electric rates if that is necessary to reduce dependence on foreign countries for gas supplies, reduce NO<sub>x</sub>, SO<sub>x</sub>, and PM emissions, and to reduce GHG emissions. The American public appears to have the resolve to address these issues, even if rates must be increased somewhat. Politicians and regulators, sensing this public opinion, are proactively working to assure legislative outs related to rate increases are not getting in the way of acquisition of renewables to meet goals.

Concurrent with the discussion of RPS standards is the popular sentiment in the U.S. to do something about global climate change. Various states in WECC have already begun a process of establishing rules to reduce GHG emissions. At the present time, most of these rules are in the form of agreeing to set rules in the future. The details on what those rules will be are being debated today. No later than the year 2012, it is expected that the rules will be established and implementation under way. The U.S. Congress is also seriously considering federal legislation to deal with global climate change. While it is unclear if federal rules will replace state rules, or whether the federal government will conclude that

states are effectively dealing with the issue without federal involvement, it is likely that the federal government will take the lead on this issue and pass federal legislation that is part, or consistent with, of a United Nations effort to deal with this matter.

It is also likely that the global climate change concerns and resulting GHG rules will effectively reinforce the RPS rules and result in even more pressure for LSEs to be involved with resources that have renewable/clean attributes. The analysis we have performed in Section 4 to estimate the value of RECs is based on an assumption that RPS targets will be met in WECC. In the end, it may be the GHG rules forthcoming from global climate change concerns that actually cause this to happen. Clearly higher penetrations of renewables (such as what will be needed to meet RPS requirements) can be a major method for reducing GHGs. Global Energy understands that the WCI workgroups and others working on GHG cap-and-trade rules are fully aware of this fact. Global Energy is of the view that GHG rules will encourage, in one fashion or another, the introduction of additional renewables in accordance with existing, or increased, RPS requirements.

**2.4 RENEWABLE PORTFOLIO LAWS FOR WECC**

Global Energy researched the future RPS requirements for the eleven U.S. states in the WECC. The summary of the WECC RPS by state for the years 2010, 2015 and 2020 is shown in Table 2-1. More comprehensive information on the various RPS targets is included in Appendix A.

**Table 2-1  
U.S. WECC Renewable Portfolio Standards by State<sup>3</sup>**

State	2010	2015	2020
Washington	0	3%	15%
Montana	10%	15%	15%
Oregon	0	15%	20%
Idaho	0	0	0
Wyoming	0	0	0
California	20%	26%	33%
	Must grow at least +1% per Year		
Nevada	12%	20%	20%
Utah	0	0	0
Colorado	5%	15%	20%
Arizona	2.50%	5%	10%
New Mexico	0	15%	15%

Most of these states have some sort of economic criteria that allows utilities to miss these RPS goals without penalty if the cost of meeting the targets will be too high. For example, Montana law states that if rates need to go up to meet these goals, then the goals are not to be met. Such a provision essentially would make the Montana law of no effect at all

<sup>3</sup> While current California law requires only 20 percent RPS by 2010, the governor, the CEC, and the California Public Utilities Commission have called for an acceleration of the RPS to 33 percent by 2020, with at least 1 percent increase per year following the 2010 level of 20 percent. Therefore, for this study we are assuming 26 percent by 2015 and 33 percent by 2020.

since the utility would choose to add the renewables without such a law if they were the lowest cost supplies. The law in California provides that no penalty will be assessed for not meeting the RPS if the utility would otherwise need to pay a price for renewables that (a) is above an administratively determined alternative price (i.e. the Market Price Referent, referred to as the MPR) and (b) there is no other available funds to offset the difference between the price of the renewable and the MPR.

In Global Energy's opinion, these economic criteria have not been communicated to the general public, and a large share of the population is not aware of these economic criteria. The general public is expecting RPS to be met. Further, federal legislators are watching these state activities and are threatening to over-ride state laws on RPS if the states do not meet their goals. Global Energy is of the view there is a political will to cause a higher penetration of new renewable generation supplies, and if certain economic constraints are getting in the way, then there will be a move to modify those economic constraints.

Most U.S. states in WECC appear to be receptive to allowing renewable energy and/or RECs to be supplied from out-of-state and out-of-country provided that for bundled RECs there is an electrical connection between the states and/or foreign countries and provided the renewables/RECs are registered with an acceptable renewable registry and tracking system such as the WREGIS. In some instances, it may be necessary under current rules to demonstrate actual delivery of the output of the renewable plant. In other instances, it may be sufficient just to purchase RECs from these remotely located renewables without any need to deliver the power. In general, most states currently allow unbundled RECs to be used, at least to some extent. Global Energy is of the opinion that states will be more receptive to using unbundled RECs in the future if they find that renewables within their state are not the most attractive in meeting RPS goals. California is already making this finding.

California is the largest potential market. California law allows Publicly Owned Utilities (POUs) in California to make their own determination as to whether or not they will permit the use of unbundled RECs for RPS compliance purposes. California law allows California Investor Owned Utilities (IOUs) to use unbundled RECs only if the California Public Utilities Commission (CPUC) determines this should be allowed. In a draft Order dated April 22, 2008 the CPUC denied a request by Pacific Gas & Electric Company (PG&E) to approve a "innovative" renewable contract for power from wind project located in Klickitat County, Washington because such "innovative" contract appeared to be a contract for unbundled RECs. The draft Order stated that the CPUC was still considering whether it would allow unbundled RECs to be used toward RPS compliance.<sup>4</sup>

The CPUC is considering allowing the use of unbundled RECs (referred to as "tradeable RECs") in CPUC Docket R.06-02-012. The latest activity in this review has involved

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<sup>4</sup> This CPUC draft Order has been designated Draft Resolution E-4170. The CPUC has received extensive comment on this Draft Resolution, including extensive comment that the subject contract was not a contract for unbundled RECs and instead the agreement was permitted by the CEC guidebook that governs RPS delivery requirements for IOUs in California.

comments by the participants. The status of that review is reflected in the following comments made by PG&E on December 5, 2007:

“PG&E is pleased to note that all parties generally support adoption of a tradable REC regime, and disagreements are limited to certain implementation issues.”

The CPUC staff has advised Global Energy that they expect a CPUC proposed decision on whether RECs will be allowed for RPS compliance in the 3rd quarter of this year.

Global Energy is of the view that it is only a matter of time before unbundled RECs are allowed in California. A key milestone in the CPUC's decision that might allow unbundled RECs to be used for IOU RPS goals was met by the establishment of the WREGIS renewable counting and recording keeping system. Such a mechanism would allow IOUs to count the renewable attributes of remotely located resources even if the power itself is not delivered to California. This will make it easier to meet RPS because it may not be necessary to build new transmission all the way to California.

California does permit out-of-country facilities to count toward its RPS targets provided: (i) the facility is interconnected to the WECC transmission system; (ii) the purchasing investor owned utility demonstrates purchase of the generation procured from the out-of-country facility to an in-state hub or in-state location, as specified in the CEC's *Renewables Portfolio Standard Eligibility Draft Committee Guidebook*;<sup>5</sup> (iii) the out-of-country facility will not cause or contribute to any violation of California's environmental quality standard or requirement within California; and (iv) the facility will participate in the CEC's approved RPS tracking and verification system:

The following bullets give an overview of existing law/rules for the WECC states other than California as it is related to (1) using unbundled RECs for purpose of counting toward renewable goals, and (2) allowance of B.C. (and other out-of-country facilities) to count toward RPS targets. For a more definitive understanding for each of these states, please refer to the “links” for these states that are provided in Appendix A to this report.

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<sup>5</sup> Third Edition, December 2007, CEC-300-2007-006-ED3-CTD.

- Oregon - The Oregon *Renewable Act of 2007* provides for different geographic eligibility requirements for different types of RECs. Bundled RECs must physically reside within the U.S. portion of the WECC. However, for unbundled RECs the facility that generates the qualifying electricity can be located within the geographic boundary of the WECC, including B.C. For the three largest utilities, no more than 20 per cent of their compliance in any given year may be met through the use of unbundled RECs. Qualifying resources include wind, certain types of biomass, and up to 50MWa per year of energy generated from a certified low-impact hydroelectric facility.
- The Washington RPS was passed as a voter initiative that added to the Revised Code of Washington. Washington State will allow renewables from B.C. to count toward its RPS if the electricity from the facility is delivered into Washington State on a real-time basis without shaping, storage or integration services. The initiative allows the use of RECs to meet the goals, however based on the real time delivery requirement, it is not clear if B.C.-based unbundled RECs will be allowed to count
- Colorado has no geographic eligibility requirements. Colorado allows the use of unbundled RECs toward meeting RPS goals.
- Montana existing law would suggest that B.C. would not be a good candidate for meeting RPS in Montana. To the extent that Montana located renewables are used to meet Montana RPS goals, this will eliminate these renewables from meeting the goals of other Western states.
- Nevada does not have a “renewable” standard. Instead Nevada has a “portfolio” standard. The portfolio standard is one that can be met either with renewables or energy efficiency. Energy credits are allowed although the law does not refer to them as RECs. Instead they are referred to as Portfolio Energy Credits. Nevada existing law, as supplemented by Nevada Public Utilities Commission regulations, allows the use of unbundled “credits” and appears to have no geographic eligibility requirements.
- Arizona RPS goals have been established by the rulemaking of the Arizona Corporation Commission. The rules do not say if unbundled or “tradable” RECs are allowed or not allowed. The regulations provide as follows:

*“An Affected Utility may transfer Renewable Energy Credits to another party and may acquire Renewable Energy Credits from another party. A Renewable Energy Credit is owned by the owner of the Eligible Renewable Energy Resource from which it was derived unless specifically transferred.”*

In other words, the regulations clearly allow a party to “transfer” its RECs. In other words, RECs can be traded and a transferred (traded) REC counts toward the renewable requirement. These rules have no geographic eligibility requirements.

- New Mexico RPS goals allow the use of unbundled RECs and appear to allow renewables to be located anywhere within WECC.

While small hydro plants and wind plants located in B.C. would appear to qualify for meeting RPS goals in most of these Western U.S. states, the State of Washington’s RPS rules allow only certain U.S.-based hydro plant using fresh water to count towards its RPS

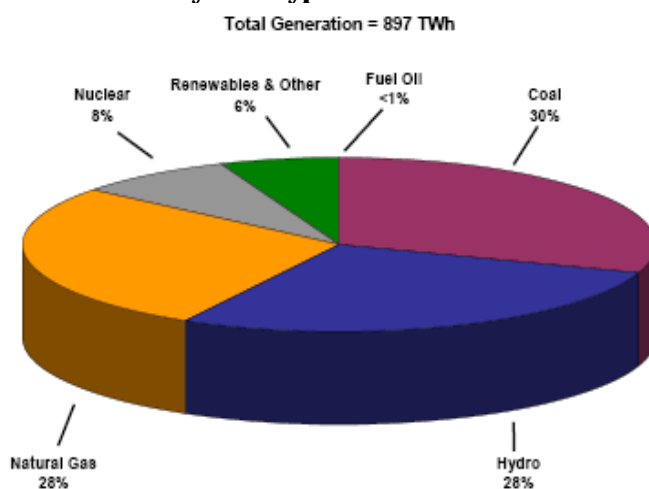
as Washington State wishes to minimize its reliance on hydro resources (falling out of a fear of inflow variances as a function of global climate change) while at the same stimulate the production of in-state wind resources. Interestingly, Washington State will allow large hydro from B.C. to shape “qualifying” resources but not B.C. renewable resources themselves.

### 3 ESTIMATES OF DEMAND FOR GREEN, CLEAN OR ZERO-GHG ELECTRICITY SUPPLIES

#### 3.1 RENEWABLE ENERGY DEMAND FORECAST

Boosted by federal and state initiatives in the form of federal Production Tax Credit (PTC) and the growing adoption of state RPS, there has been significant market penetration of renewable energy technologies since the beginning of this decade. From Figure 3-1 we can see that 6 percent of 2008 generation for WECC is coming from renewable sources. This number is going to go up in future as states adopt RPS requirements.

**Figure 3-1**  
**WECC Generation by Fuel Type 2008**



SOURCE: Global Energy.

For forecasting the WECC renewable energy demand for the years 2010, 2015 and 2020, we used the GED Fall 07 Reference Case database.<sup>6</sup> In modeling the WECC, Global Energy divides the WECC region into 24 market areas. The market areas contain utilities, each with its own loads and resources as applicable. In modeling the load, Global Energy primarily uses the utility load and energy data filed with Federal Energy Regulatory Commission (FERC) in FERC Form 714 filings or contained in their long term plans and forecast.

In calculating the total renewable energy demand, we used the Market Area (also called the transmission area) load data for the years 2010, 2015 and 2020. The transmission area load data was used to calculate the annual Billed Load by subtracting the line losses from annual load. Line losses are typically 7 percent of total load. The RPS by state was applied to annual billed load to forecast the renewable energy demand. The WECC state

<sup>6</sup> Global Energy produces its own independent 25 year view of WECC power markets every 6 months. That independent view includes data on existing power supplies in WECC. That view also includes a forecast of electricity demand in each of 24 different zones in WECC for the next 25 years.

by state calculation of renewable goals is summarized in Table 3-1. This Table includes separate calculations for each of years 2010, 2015, and 2020.

**Table 3-1  
State by State Calculation of Renewable Goals**

2010	US WECC			
	Total GWh Sales Forecast	Renewable Goal %	Target GWh	2008 Existng Renewable GWH
ID	25075	0%	0	1759
MT	11107	10%	1111	530
UT	32078	0%	0	661
CO	55820	5%	2791	3319
NV	43965	12%	5276	1627
CA	290238	20%	58048	26344
AZ	75870	3%	1897	172
NM	23774	0%	0	878
WY	16779	0%	0	809
WA/OR(1)	153805	0%	0	7519
<b>Total</b>	<b>728512</b>		<b>69122</b>	<b>43618</b>

(1) The Existing Renewables for 2008 and total sales for Washington and Oregon are combined together

2015	US WECC			
	Total GWh Sales Forecast	Renewable Goal %	Target GWh	2008 Existng Renewable GWH
ID	27343	0%	0	1759
MT	12582	15%	1887	530
UT	36660	0%	0	661
CO	62707	15%	9406	3319
NV	48463	20%	9693	1627
CA	307463	26%	79940	26344
AZ	87480	5%	4374	172
NM	26910	15%	4036	878
WY	19642	0%	0	809
WA/OR(1,2)	163256	9%	14790	7519
<b>Total</b>	<b>792505</b>		<b>124127</b>	<b>43618</b>

(1) The Existing Renewables for 2008 and total sales for Washington and Oregon are combined together

(2) Average of renewable goal (3% WA and 15% OR)

2020	US WECC			
	Total GWh Sales Forecast	Renewable Goal %	Target GWh	2008 Existng Renewable GWH
ID	29498	0%	0	1759
MT	13979	15%	2097	530
UT	41204	0%	0	661
CO	69031	20%	13806	3319
NV	52764	20%	10553	1627
CA	321679	33%	106154	26344
AZ	98720	10%	9872	172
NM	29751	15%	4463	878
Wy	21941	0%	0	809
WA/OR(1,2)	173226	17.5%	30356	7519
<b>Total</b>	<b>851794</b>		<b>177301</b>	<b>43618</b>

(1) The Existing Renewables for 2008 and total sales for Washington and Oregon are combined together

(2) Average of renewable goal (15% WA and 20% OR)

The target total renewable load and energy forecast for the US portion of WECC for the years 2010, 2015 and 2020 is summarized in Table 3-2.

**Table 3-2  
Target Renewable forecast for WECC**

	2010	2015	2020
Average			
Load	7,891	14,170	20,240 (MW)
Energy	69,122	124,127	177,301 (GWh)

### 3.2 EXPECTED WECC RENEWABLE ENERGY

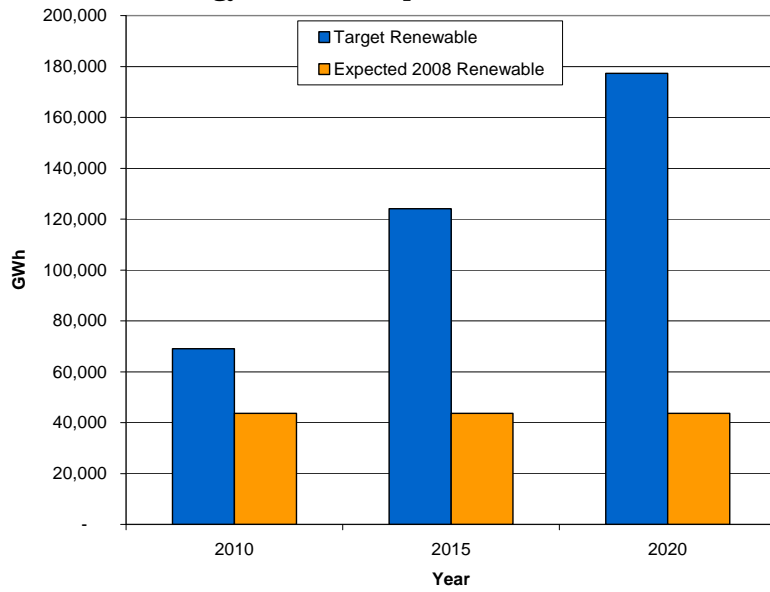
The expected generation from renewable sources/power plants for the year 2008, Table 3-1, was estimated from the Fall 07 WECC Reference case forecast. In forecasting the Power Market outlook, Global Energy considers current and projected new resources and their operational constraints, hourly loads, fuel forecast, transmission limits, losses and Transmission System Operator established operations. Biomass, wind, geothermal, solar, wood, refuse and small hydro (less than 30 MWh) are counted as renewable. The modeling reflects the expected hourly shape of wind and solar resources. The modeling also reflects operating reserve requirements. Global Energy does not increase operating reserve requirements as more renewables are added to the system even though there may be a need for more regulating reserves because, in Global Energy's view, the increase in regulating reserve requirement may be offset by the need for contingency reserves.

Global Energy's understanding of the GWh of renewable generation that will occur in each of the years 2010, 2015, and 2020 is 43,618 GWh/year if no new renewables are brought on line in WECC. These numbers are the same in each year since we are not assuming the construction of new renewables and we are not assuming any existing resources stop producing for purposes of establishing the demand for renewables in the U.S. portion of the WECC.

### 3.3 WECC MARKET POTENTIAL OF RENEWABLE ENERGY

Global Energy estimated the market potential of renewable energy for the years 2010, 2015 and 2020. The renewable energy needed to meet the RPS and the current renewable generation was used to forecast the renewable energy gap or the market potential. The comparison of Target Renewable and Expected Renewable is shown in Figure 3-2.

**Figure 3-2  
Renewable Energy Resource Gap**



## 4 ESTIMATES OF THE VALUE (\$/MWH) AND POTENTIAL QUANTITY OF DEMAND (GWHS) OF RENEWABLE/CLEAN ATTRIBUTES

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### 4.1 LEVELIZED COSTS OF RENEWABLE TECHNOLOGIES

The theory Global Energy uses to predict the price of RECs in the future is to develop a supply curve for renewables and then determine the levels of renewables needed to meet RPS goals. In general, Global Energy concludes that wind will be the marginally needed supply.

To determine the price of the REC, Global Energy first determines the revenue requirement (in \$/MWh) to develop the new wind resource. Tables 4-1, 4-2 and 4-3 below provide certain assumptions about these costs. Global then determines what such a power supply will earn in day-ahead energy markets and what payment it might receive for any contribution it can make toward Resource Adequacy (i.e. capacity) requirements.<sup>7</sup> The total revenue requirement less the energy and capacity revenues leaves a need for more revenues. Global Energy is of the opinion that these additional needed revenues can be provided to wind generators through sales of their RECs (either unbundled sales or bundled sales). Without these additional REC sales, the wind generators can not be financed and renewable goals would not be met. Global Energy assumes that any incremental wind integration costs that arise because of the addition of new resources are reflected in the cost of the renewable.

In this section the levelized costs (revenue requirement) of renewable generation technologies in the U.S. portion of the WECC is discussed. The costs of renewable technologies used in this study came from the CEC's *Cost of Generation Study* dated December 2007. While that study includes the cost of several renewable technologies, Global Energy believes that large quantities of renewables in the U.S. portion of the WECC are likely limited to solar and wind. The demand for renewable energy is driven by the state policies for meeting RPS requirements. The resources are added to meet the load growth and policy requirements in WECC.

In the scenario with new RPS goals, upgrading or constructing new transmission lines to bring renewable power is very critical. In the CEC *Cost of Generation Study* the renewable energy cost is analyzed under different financing options, such as Merchant, IOU and POU. The levelized cost for solar and Wind Class 5 (Class 5 refers to the windiest areas) is summarized below. The solar and Wind Class 5 are reviewed in this analysis because of the large potential volume of such renewables in WECC. As can be seen below, at the present time, the Wind-Class 5 technology is the most economic renewable energy available in the market. Therefore, we limit our analysis of the cost of RECs to an

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<sup>7</sup> In California, "Resource Adequacy" is a mandatory planning and procurement process to ensure adequate resources to serve all customers in real time.

assumption that the RECs would be used to bring in new wind, currently the most economic new renewable supply of significant volume.

In Service Years 2007 (Nominal 2007\$)	Merchant		IOU		POU	
	\$/kW-Yr	\$/MWh	\$/kW-Yr	\$/MWh	\$/kW-Yr	\$/MWh
Solar - Parabolic Trough	497.33	277.30	504.17	281.37	355.71	199.31
Solar - Photovoltaic (Single Axis)	1035.07	704.98	1019.48	695.59	681.74	468.87
Solar - Stirling Dish	855.55	518.89	868.93	527.00	648.77	393.47
Wind - Class 5	245.94	84.24	196.08	67.16	179.19	61.38

SOURCE: CEC, *Cost of Generation Report*, December 2007 (CEC-200-2007-011-SF).

#### 4.2 REVENUE REQUIREMENT FOR CLASS 5 WIND

The levelized revenue requirement for Wind-Class 5 technology was calculated under various financing options and with and without transmission cost. Table 4-1 summarizes the various financing options under which the revenue requirement was calculated. The CEC's standard Cost of Generation Model is used to calculate the revenue requirement. The sensitivity of the PTC on the revenue requirement was done. The levelized revenue requirement with and without PTC is shown in Tables 4-1 and 4-2. The PTC reduces the revenue requirement of the technology by 20 percent. In the analysis a capacity factor of 33-34 percent was used for the Class 5 Wind for converting the revenue requirement from \$/kW/yr to \$/MWh.

For this report, we have excluded the CEC values for Merchant 60 percent equity in the capital structure, instead reporting on the Merchant 40 percent equity assumption since we believe this the more likely expected capital structure if merchant financing is to be performed. We have also excluded the Municipal financing option because we believe it is an overly optimistic assumption on what Municipals will be able to accomplish.

**Table 4-1  
Financing Options**

Name	Merchant Non Gas-Fired	Default IOU
Owner Type	Merchant	IOU
Equity %	40.0%	50.0%
Cost of Equity	15.19%	11.74%
Cost of Debt	6.50%	5.73%

**Table 4-2  
Levelized Revenue Requirement with PTC (No Transmission Cost)**

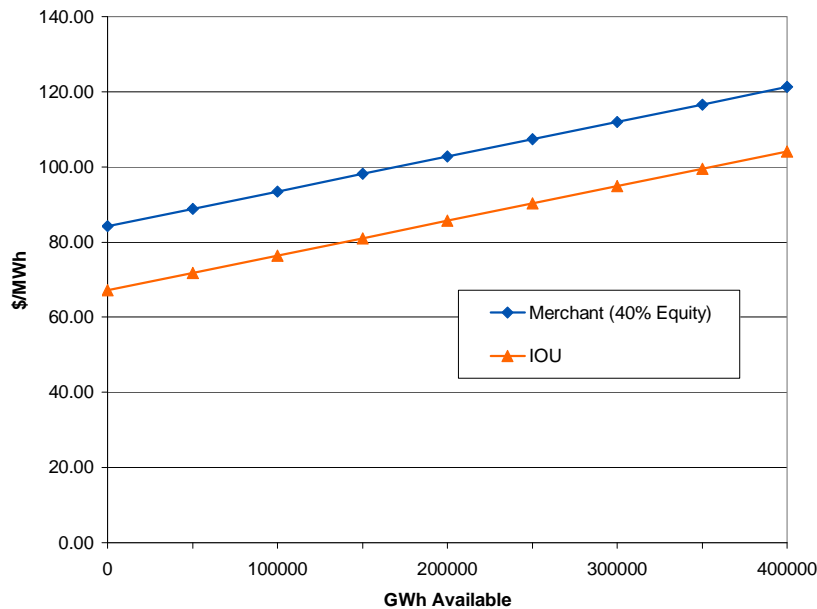
Levelized Cost in (2007 Dollars) with PTC		
Wind - Class 5		
	\$/kW-yr	\$/MWh
Merchant (40% Equity)	246	84
IOU	196	67

**Table 4-3  
Levelized Revenue Requirement without PTC (No Transmission Cost)**

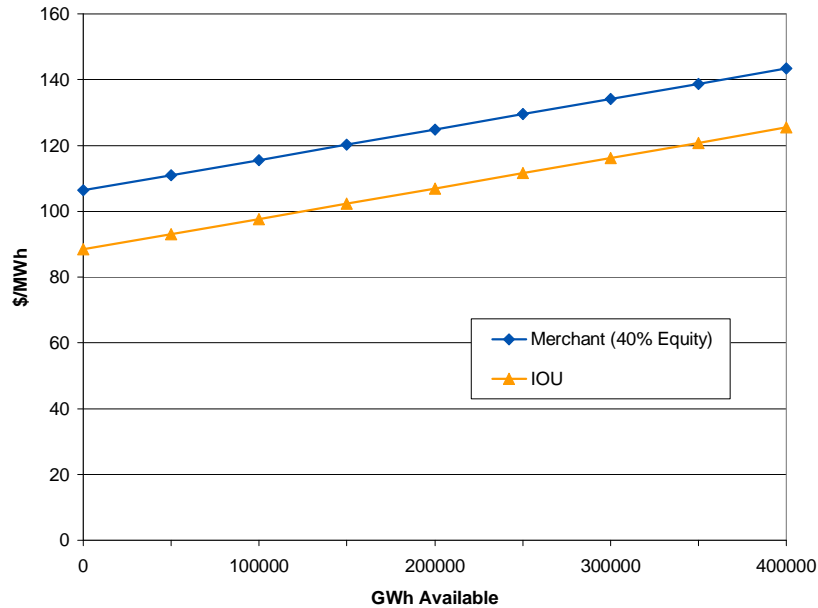
Levelized Cost in (2007 Dollars) without PTC		
Wind - Class 5		
	\$/kW-yr	\$/MWh
Merchant (40% Equity)	310	106
IOU	258	88

The levelized cost of Wind-Class 5 technology, discussed above, does not include the transmission cost. As more and more renewable resources (wind) will be developed to meet the RPS standards, building the transmission infrastructure to deliver the energy will be necessary. As the renewable resource gap increases, the renewable resources will be remotely located or build further away. It will also be necessary to build new/upgrade transmission lines (and incremental ancillary services) to deliver the renewable power to the customers even if generation isn't far from load as many transmission lines are already congested throughout WECC. Recently, Western Regional Transmission Expansion Partnership did an economic study of transmission lines in WECC and reported their findings in a study dated April 2007. From the analysis performed for that study, it can be determined that the cost of transmission (including cost of incremental ancillary services) may be reasonably expected to grow to 28 \$/MWh when the development of wind grows to significant amounts. The supply curve for Wind-Class 5 was generated by incorporating the cost of transmission into the levelized cost. Figures 4-1 and 4-2 show the supply curve with and without PTC for Class 5 Wind.

**Figure 4-1  
Supply Curve for Class 5 Wind (with PTC)**



**Figure 4-2  
Supply Curve for Class 5 Wind (without PTC)**



**4.3 RENEWABLE ENERGY CREDIT METHODOLOGY**

The REC price forecast is a measure of the gap between the revenue requirement and projected revenue earned by a renewable power generating unit. The REC price was forecasted for a wide range of financing options with and without PTC. The capital structure for the various financing options is given in Table 4-1 above. The REC price is forecasted for the U.S. Northwest, Wyoming, Northern California and Southern California regions in the WECC.

The REC price is forecasted for the following capital financing scenario with and without PTC:

- Merchant (40 percent Equity)
- IOU.

Projected REC \$/MWh = Revenue Requirement – Total Revenue

Total Revenue \$/MWh = Energy Revenue + Capacity Payment Revenue

**4.3.1 Revenue Requirement (\$/MWh):**

The revenue requirement for the Class 5 Wind is forecasted for the years 2010, 2015 and 2020. The supply curve (Figure 4-1 and 4-2) is used to project the revenue requirement (\$/MWh) for meeting the renewable energy resource gap.

**4.3.2 Total Revenue (\$/MWh):**

The Total Revenue is the money or profit that a Class 5 Wind plant can make in the power market. The total revenue comes primarily from a) profits from dispatching into spot markets (also called the energy revenues); and b) capacity payments.

**4.3.3 Energy Revenue (\$/MWh)**

The profitability of a Class 5 Wind plant operating in the WECC's U.S. Northwest, Wyoming, Northern California and Southern California market areas were taken from the Global Energy's Fall 07 Power Market forecast. The wind plant profitability numbers were analyzed for 2010, 2015 and 2020.

The Power Market Forecast is from 2007-2032 and is done by using Global Energy's MARKETSYM, an hourly production cost simulation model. The model uses current and projected resources, hourly loads, emissions cost, fuel price forecast, transmission and operational constraints in the simulation.

**4.3.4 Capacity Payments**

Global Energy's assessment of the likely value of capacity in WECC is presented. The capacity price forecast is the price that the bidders are likely to offer for their Resource Adequacy attribute. There is no formal capacity market in WECC. The plant will not get any capacity payment unless and until it signs a Power Purchase Agreement. Global Energy estimated that the capacity price of \$82/kW/yr can be received, but for Resource Adequacy contribution only 20 percent of the nominal capacity is considered.

**4.3.5 REC Price Forecast**

The REC price forecast for the U.S. Northwest (NW), Wyoming (WYCE), Northern (NP15) and Southern (CSCE) California market areas with and without PTC is presented in Table 4-4 and Table 4-5.

**Table 4-4  
REC Forecast for WECC Regions with PTC (2007 \$/MWh)**

<b>Merchant (40% Equity)</b>			
	<b>2010</b>	<b>2015</b>	<b>2020</b>
REC with Capacity Payment and PTC			
NW	35	37	39
WYCE	35	35	38
NP15	30	33	36
CSCE	29	31	35
<b>IOU</b>			
	<b>2010</b>	<b>2015</b>	<b>2020</b>
REC with Capacity Payment and PTC			
NW	18	19	22
WYCE	17	18	21
NP15	13	15	19
CSCE	11	14	18

**Table 4-5  
REC Forecast for WECC Regions without PTC (2007 \$/MWh)**

<b>Merchant (40% Equity)</b>			
<b>REC with Capacity Payment</b>	<b>2010</b>	<b>2015</b>	<b>2020</b>
NW	57	59	62
WYCE	57	57	60
NP15	52	55	58
CSCE	51	53	57
<b>IOU</b>			
<b>REC with Capacity Payment</b>	<b>2010</b>	<b>2015</b>	<b>2020</b>
NW	39	41	44
WYCE	39	39	42
NP15	34	37	41
CSCE	33	35	40

## **5 GLOBAL ENERGY'S ASSESSMENT OF THE RANGE OF PRICES FOR RENEWABLE/CLEAN ATTRIBUTES**

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Section 4, and Tables 4-4 and 4-5 in particular, provide a fairly wide range of the value of RECs in the future. This range is developed by making different assumptions about the continuation of PTC in the future and different assumptions about the cost of money needed to finance Class 5 Wind, which are capital intensive. In developing these tables Global Energy recognizes that PTC may or may not be continued in the future, which has a significant impact on the forecast of REC costs.

The estimates made in Tables 4-4 and 4-5 above do not reflect as much range in financing costs as were reflected in the CEC *Cost of Generation* study. Global Energy has not included a 60% equity case and has not reflected a low cost municipal financing rate. Global Energy is aware that there is some reluctance of municipals to take on wind project ownership risks, which is why we have not included an estimate of REC prices based on municipal financing. Global Energy also believes that merchant wind plants financed with 60% equity will be unlikely.

With that in mind, Global Energy would expect the range of REC (2007\$US/MWh) to be:

<b>Year</b>	<b>2010</b>	<b>2015</b>	<b>2020</b>
High	57	59	62
Low	11	14	18

The High values are taken from Table 4-5; the Low values are taken from Table 4-4.

RECs are being sold for 2008 even though RPS targets generally do not become effective until 2010. Global Energy has heard of prices for RECs ranging from about \$5/MWh to \$15/MWh. Global Energy is of the view that the prices for RECs may experience upward pressure as RECs become more in demand to meet the 2010 goals, and as goals increase, the prices for RECs may also increase.

REC market prices would be expected to be somewhere between the High and Low bands. The actual prices in the future would be influenced by the then current offsetting pressures of the public/political resolve to increase renewable power supplies countered with the resulting utility rate increases. In Global Energy's view, economic safety valves will only come into play if the cost of renewables is materially higher than the cost of alternatives. Given the reality that the cost of all new supplies is experiencing upward pressure, including upward pressure from the cost of natural gas, etc., Global Energy believes the economic safety values are unlikely to materially reduce RPS goals.

**APPENDIX**

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**Renewable Portfolio Laws for the Western Electricity Coordinating Council**

A comprehensive list of the renewable portfolio requirements for the thirteen states and provinces in the WECC and their legislation is list below.

**Washington:**

With the passage of initiative 937 2006, Washington became the second state after Colorado to pass a renewable energy standard by ballot initiative. Initiative 937 calls for electric utilities that serve more than 25,000 customers in the state of Washington to obtain 15% of their electricity from new renewable resources by 2020 *and* to undertake all cost-effective energy conservation. Of Washington's 62 utilities, 17 are considered qualifying utilities, representing about 84% of Washington's load.

Utilities subject to the standard must use eligible renewable resources or acquire equivalent RECs, or a combination of both, to meet the following annual targets:

- At least 3% percent of its load by 1/1/2012, and each year thereafter through 12/31/2015;
- At least 9% of its load by 1/1/2016, and each year thereafter through 12/31/2019; and
- At least 15% of its load by 1/1/2020, and each year thereafter.

Investor-owned utilities subject to the standard are entitled to recover all prudently incurred costs associated with compliance.

*Resource Eligibility* - "Renewable resources" include electricity produced from:

- Water;
- Wind;
- Solar energy;
- Geothermal energy;
- Landfill gas;
- Wave, ocean, or tidal power;
- Gas from sewage treatment facilities;
- Biodiesel fuel (must meet specified standards); and
- Biomass energy based on animal waste or solid organic fuels from wood, forest, or field residues, or dedicated energy crops.

Specifically excluded from the definition are wood pieces that have been treated with chemical preservatives such as creosote, pentachlorophenol, or copper-chrome arsenic; black liquor byproduct from paper production; wood from old growth forests; and municipal solid waste.

Electricity from renewable resources other than fresh water is eligible for compliance if the generation facility begins operation after March 31, 1999. The facility must be located in the U.S. Pacific Northwest or the electricity from the facility must be delivered into Washington State on a real-time basis. Hydroelectric generation projects are eligible if incremental electricity produced as a result of efficiency improvements completed after March 31, 1999 are made to:

- Hydroelectric projects owned by a utility subject to this standard and located in the U.S. Pacific Northwest; or to

- Hydroelectric generation in irrigation pipes and canals located in the U.S. Pacific Northwest, where the additional generation in either case does not result in new water diversions or impoundments.
- Hydro, though, may be used to shape “qualifying” renewable resources.

Distributed generation may be counted as double the facility's electrical output if the utility owns the facility, has contracted for the distributed generation and the associated RECs, or has contracted to purchase only the associated RECs. Eligible renewables from a facility that began operation after December 31, 2005 where the developer used an approved apprenticeship program during facility construction may count 1.2 times its base value.

Utilities subject to the standard must also pursue all available conservation that is cost-effective, reliable, and feasible. Specifically, by January 1, 2010, utilities must (1) identify achievable cost-effective conservation potential through 2019, with reviews and updates every two years for the subsequent 10-years; and (2) establish and meet biennial targets for conservation. High-efficiency cogeneration owned and used by a retail electric customer to meet its own needs may be counted toward conservation targets.

*Non Compliance Penalties* - Although some exemptions apply, a utility's failure to meet the energy conservation or renewable energy targets will result in a \$50/MWh administrative penalty (adjusted annually for inflation) paid to the state of Washington. The funds will be deposited in a special account for the purchase of renewable energy credits or for energy conservation projects at public facilities, local government facilities, community colleges, or state universities.

Source: Directly from DSIRE :

[http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive\\_Code=WA15R&state=WA&CurrentPageID=1&RE=1&EE=1](http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=WA15R&state=WA&CurrentPageID=1&RE=1&EE=1)

Legislation of Initiative 937 can be found at :

<http://www.secstate.wa.gov/elections/initiatives/text/I937.pdf>

**Montana:**

Montana's RPS, enacted in April 2005 as part of the *Montana Renewable Power Production and Rural Economic Development Act*, requires public utilities and competitive electricity suppliers to obtain a percentage of their retail electricity sales from eligible renewable resources according to the following schedule:

- 5% for compliance years 2008-2009 (1/1/08 - 12/31/09)
- 10% for compliance years 2010-2014 (1/1/10 - 12/31/14)
- 15% for compliance year 2015 (1/1/15 - 12/31/15) and for each year thereafter.

*Resource Eligibility* - Eligible renewable resources include wind, solar, geothermal, existing hydroelectric projects (10 megawatts or less), landfill or farm-based methane gas, wastewater-treatment gas, low-emission, nontoxic biomass, and fuel cells where hydrogen is produced with renewable fuels.

*Geographic Eligibility* - Facilities must either (1) be located in Montana or (2) begin operation after January 1, 2005, in another state delivering electricity to Montana.

Utilities and competitive suppliers can meet the standard by entering into long-term purchase contracts for electricity bundled with RECs, by purchasing the RECs separately, or by a combination of both. The law includes cost caps that limit the additional cost utilities must pay for renewable energy and allows cost recovery from ratepayers for contracts pre-approved by the Montana Public Service Commission (PSC). RECs sold through voluntary utility green power programs may not be used for compliance. Before entering into a long-term contract to purchase RECs, with or without associated electricity, a utility must petition the PSC to certify that the RECs were produced by an eligible renewable resource.

For utilities operating in Montana within the geographic boundaries of the WECC, all RECs used to comply with the standard must be tracked and verified through the WREGIS. If WREGIS is not operational, the PSC will approve another tracking system.

*Non Compliance Penalties* - A utility or competitive supplier unable to comply with the RPS during an annual period (there is a three-month grace period) must pay an administrative penalty of \$10/MWh for RECs that the utility failed to procure. Penalty payments may not be recovered in electricity rates. Funds derived from penalties go into the universal low-income energy assistance fund. Alternatively, a utility may petition the PSC for a short-term waiver from full compliance. If a utility or competitive supplier exceeds the standard in any year, it may carry forward the amount by which the standard was exceeded to comply with the standard in either or both of the two subsequent compliance years.

Source: Directly from DSIRE:

[http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive\\_Code=MT11R&state=MT&CurrentPageID=1&RE=1&EE=1](http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=MT11R&state=MT&CurrentPageID=1&RE=1&EE=1)

Legislation (HB 681) : <http://data.opi.mt.gov/bills/2007/billhtml/HB0681.htm>

**Oregon:**

As part of the Oregon *Renewable Energy Act of 2007* (Senate Bill 838), the state of Oregon established a RPS for electric utilities and retail electricity suppliers. Different RPS targets apply depending on a utility's size. Electricity service suppliers must meet the requirements applicable to the electric utilities that serve the territories in which the electricity service supplier sells electricity to retail consumers.

Large utilities—those with 3% or more of the state's load—must ensure that a percentage of the electricity sold to retail customers in-state be derived from eligible renewable energy resources according to the following schedule:

- 5% by 2011
- 15% by 2015
- 20% by 2020
- 25% by 2025.

Smaller utilities are subject to lower standards. Utilities with less than 1.5% of state load must meet a 5% RPS by 2025. Utilities with more than 1.5%, but less than 3% of state load must meet a 10% RPS by 2025. However, utilities that buy into a new coal plant or sign a new contract specifically for new coal power and publicly-owned utilities that annex investor-owned utility territory without consent are subject to the “large utility” standards.

The legislation also established a *goal* that by 2025 at least 8% of Oregon's retail electrical load comes from small-scale renewable energy projects with a capacity of 20 megawatts or less. In fact, the legislation modified Oregon's public purpose charge for renewables to focus on smaller projects of 20 MW or less and extended the sunset date on the public purpose charge through 2025.

*Resource Eligibility* - Eligible renewable resources include electricity generated from solar, wind, hydropower, ocean thermal, wave, and tidal power, geothermal, hydrogen derived from renewable sources, and biomass, including biogas. Incineration facilities using municipal solid waste or chemically-treated wood are not eligible.

*Geographic Eligibility* - Eligible resources must be located within WECC territory or must be designated environmentally preferable by the Bonneville Power Administration (BPA).

To qualify as an eligible renewable resource, electricity must be generated by a facility that becomes operational on or after January 1, 1995. Electricity from facilities operational before January 1, 1995, that is attributable to efficiency or, for non-hydropower facilities, capacity upgrades on or after January 1, 1995 is a qualifying resource. A limited amount of hydropower from facilities operational before 1995 can qualify as an eligible resource under certain conditions.

RPS compliance must be demonstrated through the purchase of RECs, either bundled with, or purchased separately from, electricity contracts. Unbundled RECs can only meet 20% of a large utility's compliance obligation and 50% of a large consumer-owned utility's obligation. RECs procured before March 31st of a given year can be used for a previous year's compliance, and RECs can be banked and carried forward indefinitely for future compliance. Note that bundled RECs must come from a facility in the U.S. portion of the WECC.

RECs cannot be counted toward compliance with both Oregon's RPS and an RPS of another state. However, RECs can be counted toward both Oregon's RPS and a federal RPS should one be enacted.

*Non Compliance Penalties* - There are two mechanisms that serve as cost protections for Oregon consumers -- an alternative compliance payment (ACP) mechanism and an overarching "cost cap" on utility RPS expenditures. In lieu of procuring renewable resources, utilities can pay an administrative civil penalty (ACP), which the Oregon Public Utilities Commission (PUC) will establish by July 1, 2009 for investor-owned utilities and electricity suppliers. The governing body will establish an ACP rate for consumer-owned utilities. Revenue from the ACP will be placed in a holding account and may only be expended for eligible resources. Electric utilities are not required to comply with a renewable portfolio standard during a compliance year to the extent that compliance costs exceed 4% of the utility's annual revenue requirement for the compliance year.

Utilities are also exempt from RPS compliance requirements if the purchase of electricity from eligible sources would:

- Exceed a utility's projected load requirements;
- Would require the utility to substitute eligible renewable electricity for sources other than coal, natural gas or petroleum;
- Would require the utility to substitute eligible renewable electricity from existing large hydropower located on the Columbia River; or
- Would reduce a consumer-owned utility's purchase of the lowest price electricity from the BPA.

Investor-owned utilities are allowed to recover all of their prudent costs associated with RPS compliance in electricity rates.

Investor-owned utilities and electricity service suppliers must submit a compliance report annually to the PUC. Consumer-owned utilities must submit the report to the members or customers of the utility. The PUC can impose penalties against investor-owned utilities or suppliers that fail to comply with the RPS in an amount the PUC determines -- in addition to any alternative compliance payment. Payments will be transmitted to the Oregon Energy Trust to support renewable energy and energy efficiency programs.

In addition to the RPS, utilities are required to offer a voluntary green power program whose subscriptions cannot be counted towards RPS compliance.

Source: Directly from DSIRE:

[http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive\\_Code=OR22R&state=OR&CurrentPageID=1&RE=1&EE=1](http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=OR22R&state=OR&CurrentPageID=1&RE=1&EE=1)

**California:**

California's RPS program requires retail sellers of electricity to increase their sales of eligible renewable-energy resources by at least 1 percent of retail sales per year, so that 20% of their retail sales are served with eligible renewable energy resources by 2010. Governor Schwarzenegger has set a longer-term state goal of 33% by 2020, and currently the CPUC and the CEC are considering ways to achieve that goal.

The CPUC has developed RPS compliance rules for IOUs, electric service providers, small and multi-jurisdictional utilities and community choice aggregators. Publicly-owned utilities are responsible for implementing and enforcing an RPS that recognizes the intent of the Legislature to encourage renewable resources, while taking into consideration the effect of the standard on rates, reliability, and financial resources and the goal of environmental improvement.

The law assigned specific roles to the CPUC and the CEC and directed the agencies to work in collaboration to implement the RPS program.

The CEC's roles are to:

- Certify eligible renewable resources that meet statutory requirements;
- Design and implement a tracking and verification system to ensure that renewable energy output is counted only once for the purpose of the RPS and for verifying retail product claims in California or other states; and
- Allocate and award supplemental energy payments (SEPs) to eligible renewable energy resources to cover above-market costs of renewable energy.

The CEC has adopted three Guidebooks describing its RPS program requirements:

- The Renewables Portfolio Standard Eligibility Guidebook describes the eligibility requirements and process for certifying renewable resources as eligible for California's RPS and SEPs and describes the Energy Commission's implementation of a tracking system to verify compliance with the RPS.
- The New Renewable Facilities Program Guidebook describes how the Energy Commission will allocate and award SEPs to cover the above-market costs of renewable energy.
- The Overall Program Guidebook describes how the Energy Commission's Renewable Energy Program is administered.

To meet California's RPS reporting requirements and the renewable energy tracking needs of 14 states and two Canadian provinces in the WECC, the CEC and the Western Governors' Association have jointly developed the WREGIS, which began operation in June 2007.

The CPUC is charged with:

- Establishing the standard terms and conditions to be used by all IOUs in contracting for eligible renewable energy resources.
- Implementing flexible rules for compliance with annual renewable procurement targets, such as applying excess renewable procurement in one year to a deficit in another year. If a retail seller fails to procure sufficient renewable energy, the CPUC will impose penalties.
- Reviewing and approving each IOU's procurement plan and its process for selecting the least cost bidders of renewable energy that best fit that utility's resource needs. IOUs use these processes to select winning bidders from their solicitations to procure renewable electricity. The CPUC decision conditionally approving the IOUs' 2007 procurement plans is available here.
- Determining MPRs for electricity from non-renewable sources. The MPR establishes a benchmark at or below which approved RPS bid contracts may be considered reasonable. If a contract is executed as a result of a competitive RPS solicitation and priced above the MPR, it may be eligible to receive SEPs from the CEC.

Source: Directly from DSIRE:

[http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive\\_Code=CA25R&state=CA&CurrentPageID=1&RE=1&EE=1](http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=CA25R&state=CA&CurrentPageID=1&RE=1&EE=1)

**Nevada:**

Nevada enacted a RPS as part of its 1997 restructuring legislation. Under the standard, the state's two investor-owned utilities -- Nevada Power and Sierra Pacific Power -- must use eligible renewable energy resources to supply a minimum percentage of the total electricity they sell. In 2001, the legislature revised the minimum amounts to increase by 2% every two years, culminating in a 15% requirement by 2013. In [Assembly Bill \(AB\) 3](#) of the 2005 special session, the portfolio requirement was further revised to increase by 3% every two years, to achieve 20% of retail sales by 2015. The 2005 revisions included a significant change allowing utilities to meet the standard through renewable energy generation (or credits) *and* energy savings from efficiency measures. At least 5% of the standard must be generated, acquired, or saved from solar energy systems.

Under AB 3, efficiency measures eligible for portfolio energy credits include those installed after January 1, 2005, must be implemented at a retail customer's location, and must be partially or fully subsidized by the electric utility to qualify. The measure must also reduce the customer's energy demand (as opposed to shifting demand to off-peak hours). The contribution from energy efficiency measures to meet the portfolio standard is capped at one-quarter of the total standard in any particular year. [AB1 of 2007](#) expanded the definition of efficiency resources to include district heating systems powered by geothermal hot water.

% Renewables/Efficiency --	Date
6% -----	2005 and 2006
9% -----	2007 and 2008
12% -----	2009 and 2010
15% -----	2011 and 2012
18% -----	2013 and 2014
20% -----	2015 and thereafter

*Resource Eligibility* - Beyond solar, qualifying renewable energy resources include biomass, geothermal energy, wind, certain hydropower, and waste tires (using microwave reduction).

The Public Utilities Commission of Nevada (PUCN) has established a program to allow energy providers to buy and sell portfolio energy credits (PECs) in order to meet energy portfolio requirements. One PEC represents a kilowatt-hour of electricity generated by a portfolio energy system, with the exception of photovoltaics, for which 2.4 PECs are credited per one actual kWh of energy produced. An adder of 0.05\* can be added to the 2.4 multiplier for PV if the system is deemed by the PUCN to be a customer-maintained distributed generation system. In addition, the number of kilowatt-hours saved by energy efficiency measures is multiplied by 1.05 to determine the number of PECs. For electricity saved during peak periods as a result of efficiency measures, the credit multiplier is increased to 2.0. PECs are valid for a period of four years.

To help facilitate the renewable projects called for in the renewable energy portfolio standard, the PUCN established the Temporary Renewable Energy Development (TRED) Program. The TRED program is meant to insure prompt payment to renewable energy providers in order to encourage completion of renewable energy projects. The TRED Program establishes: (1) a TRED Charge allowing investor-owned utilities to collect revenue from electricity customers to pay for renewable energy separate from other wholesale power purchased by the electric utilities; and (2) an independent TRED Trust to receive the proceeds from the TRED Charge and remit payment to renewable energy projects that deliver renewable energy to purchasing electric utilities.

*\*This adder was originally 0.15 but was reduced to 0.05 in PUC proceeding (05-7050) later in 2005.*

Source: Directly from DSIRE:

[http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive\\_Code=NVO1R&state=NV&CurrentPageID=1&RE=1&EE=1](http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=NVO1R&state=NV&CurrentPageID=1&RE=1&EE=1)

**Colorado:**

Colorado became the first U.S. state to create a RPS by ballot initiative when voters approved Amendment 37 in November 2004. Colorado's original RPS, which has since been expanded, required utilities serving 40,000 or more customers to generate or purchase 10% of their retail electric sales from renewable-energy resources. The original RPS also implemented a rebate program for customers of investor-owned utilities. The rebate program is still in effect.

In March 2007, the state legislature increased the RPS and extended the requirement to electric cooperatives, among other changes.

Colorado's RPS requires each investor-owned utility to use specific percentages of renewable energy and/or recycled energy according to the following schedule:

- 3% of its retail electricity sales in Colorado for the year 2007;
- 5% of its retail electricity sales in Colorado for the years 2008-2010;
- 10% of its retail electricity sales in Colorado for the years 2011-2014;
- 15% of its retail electricity sales in Colorado for the years 2015-2019; and
- 20% of its retail electricity sales in Colorado for the year 2020 and for each following year.

For investor-owned utilities, at least 4% of the standard must be generated by solar-electric technologies. At least one-half of the solar requirement must be generated by solar-electric systems located on-site at customers' facilities. Eligible energy generated in Colorado is favored; each kilowatt-hour (kWh) of eligible electricity generated in-state receives 125% credit for RPS-compliance purposes. The 2007 amendments directed the Colorado Public Utility Commission (PUC) to revise or clarify its existing RPS rules on or before October 1, 2007. The PUC's rules generally apply to investor-owned utilities.

In addition, Colorado's RPS requires all electric cooperatives and each municipal utility serving more than 40,000 customers to use specific percentages of renewable energy and/or recycled energy according to the following schedule:

- 1% of its retail electricity sales in Colorado for the years 2008-2010;
- 3% of its retail electricity sales in Colorado for the years 2011-2014;
- 6% of its retail electricity sales in Colorado for the years 2015-2019; and
- 10% of its retail electricity sales in Colorado for the year 2020 and each following year.

*Resource Eligibility* - Eligible energy resources include solar-electric energy, wind energy, geothermal-electric energy, biomass facilities that burn nontoxic plants, landfill gas, animal waste, hydropower, recycled energy,\* and fuel cells using hydrogen derived from an eligible energy resource.

*Geographic Eligibility* – There are no geographic restrictions. Tradable renewable energy credits (RECs) may be used to satisfy the standard. Utilities that do not generate the required amount of electricity from renewable energy sources may purchase RECs from utilities that exceed the requirement.

*\* "Recycled energy" is defined as "energy produced by a generation unit with a nameplate capacity of not more than 15 megawatts (MW) that converts the otherwise lost energy from the heat from exhaust stacks or pipes to electricity and that does not combust additional fossil fuel."*

Source: Directly from DSIRE:

[http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive\\_Code=CO24R&state=CO&CurrentPageID=1&RE=1&EE=1](http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=CO24R&state=CO&CurrentPageID=1&RE=1&EE=1)

**Arizona:**

In November 2006, the Arizona Corporation Commission (ACC) adopted final rules to expand the state's Renewable Energy Standard (RES) to 15% by 2025, with 30% of the renewable energy to be derived from distributed energy technologies (~2,000 MW). On June 15, 2007 the Attorney General certified the rule as constitutional, allowing the new rules to go forward. Investor-owned utilities serving retail customers in Arizona, with the exception of distribution companies with more than half of their customers outside Arizona, are subject to the standard.

Utilities subject to the RES must obtain RECs (equal to 1 kWh) from eligible renewable resources to meet 15% of their retail electric load by 2025 and thereafter. Of this percentage, 30% (i.e. 4.5% of total retail sales) must come from distributed renewable (DR) resources by 2012 and thereafter. One-half of the distributed renewable energy requirement must come from residential applications and the remaining one-half from nonresidential, non-utility applications. The compliance schedule is:

- 2006:** 1.25%
- 2007:** 1.50% (5% DR)
- 2008:** 1.75% (10% DR)
- 2009:** 2.00% (15% DR)
- 2010:** 2.50% (20% PV)
- 2011:** 3.00% (25% DR)
- 2012:** 3.50% (30% DR)
- 2013:** 4.00% (30% DR)
- 2014:** 4.50% (30% DR)
- 2015:** 5.00% (30% DR)
- 2016:** 6.00% (30% DR)
- 2017:** 7.00% (30% DR)
- 2018:** 8.00% (30% DR)
- 2019:** 9.00% (30% DR)
- 2020:** 10.00% (30% DR)
- 2021:** 11.00% (30% DR)
- 2022:** 12.00% (30% DR)
- 2023:** 13.00% (30% DR)
- 2024:** 14.00% (30% DR)
- 2025:** 15.00% (30% DR)

*Resource Eligibility* - A utility may use bundled RECs acquired in any year to meet its annual requirement. With the exception of incremental generation from hydropower facilities or hydropower output used to firm intermittent renewables, renewable energy from facilities installed before January 1, 1997 are not eligible. Energy produced by eligible renewable energy systems must be deliverable to the state.

Extra credit multipliers may be earned for early installation of certain technologies, in-state solar installation, and in-state manufactured content. The multipliers are additive,

but cannot exceed 2.0. RECs derived from renewables installed after December 31, 2005 are not eligible for multipliers. If a utility makes an investment in a solar electric manufacturing plant located in state or provides incentives for a plant to locate in the state, the utility can acquire RECs for the main RPS tier equal to the capacity of the panels produced multiplied by 2,190 hours, which approximates a 25% capacity factor. These RECs cannot account for more than 20% of the annual requirement.

*Non Compliance Penalties* - Utilities recover RES costs through a monthly surcharge, which must be approved by the ACC. To date, these surcharges have not been established. Utilities subject to the RES must submit compliance and implementation plans annually to the ACC.

Source: Directly from DSIRE:

[http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive\\_Code=AZ03R&state=AZ&CurrentPageID=1&RE=1&EE=1](http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=AZ03R&state=AZ&CurrentPageID=1&RE=1&EE=1)

**New Mexico:**

In March 2007, New Mexico passed SB 418, which directs investor-owned utilities to generate 20% of total retail sales to New Mexico customers from renewable energy resources by 2020, with interim standards of 10% by 2011 and 15% by 2015. The bill also establishes a standard for rural electric cooperatives of 10% by 2020 (see below). Furthermore, utilities are to set a goal of at least 5% reduction in total retail sales to New Mexico customers, adjusted for load growth, by January 1, 2020.

*Resource Eligibility* - Renewable energy is defined as electric energy generated by low- or zero-emissions generation technology with substantial long-term production potential; solar; wind; geothermal; hydropower facilities brought in service after July 1, 2007; fuel cells that are not fossil fueled; and biomass resources, such as agriculture or animal waste, small diameter timber, salt cedar and other phreatophyte or woody vegetation removed from river basins or watersheds in New Mexico, landfill gas and anaerobically digested waste biomass. Renewable energy does not include electric energy generated by use of fossil fuel or nuclear

*Geographic Eligibility* - Utilities document compliance with the RPS through the use of RECs. A REC represents one kilowatt-hour (kWh) of renewable electricity. RECs used for RPS compliance must be registered by January 1, 2008 with WREGIS. RECs not used for compliance, sold, or otherwise transferred may be carried forward for up to four years. Existing law in New Mexico appears to allow renewables to be located anywhere in WECC.

**RPS for Investor-Owned Utilities**

In August 2007, the PRC issued an [order](#) and rules requiring that investor owned utilities meet the 20% by 2020 target through a "fully diversified renewable energy portfolio" which is defined as a minimum of 20% solar power, 20% wind power, and 10% from either biomass or geothermal energy starting in 2011. Additionally 1.5% must come from distributed renewables by 2011, rising to 3% in 2015. Distributed resources counted toward the other portfolio requirements cannot also be counted for the distributed requirement. Utilities will be excused from the diversification targets should costs of achieving them raise the cost of electricity by more than 2 percent or if the targets cannot be accomplished without impairing system reliability.

PRC Case No. 04-00253-UT established a two-prong "Reasonable Cost Threshold" (RCT). One component is a cap on the price of resources by technology type, while the second is an overall retail customer rate impact threshold. The technology cost caps were set at \$0.049 per kilowatt-hour (kWh) for wind and hydroelectric resources; \$0.06254 per kWh for biomass and geothermal resources; \$0.15 per kWh for solar projects up to 10 kilowatts (kW) in capacity, and \$0.10 per kWh for solar projects greater than 10 kW. The overall retail customer rate impact is capped at one percent (1%) of all customers' aggregated overall annual electric charges for 2006, increasing by one-fifth percent (0.2%) per year until January 1, 2011, at which time it will be two percent (2%). New

Mexico investor-owned utilities must file by September 1, 2007, reports that reflect their positions regarding the RCT and whether the utilities believe the threshold should be changed. The NMPRC then will initiate a proceeding to review the RCT.

The additional cost of the RPS to non-governmental customers who consume more than 10 million kWh per year is also limited so as not to exceed the lower of 1% of that customer's annual electric charges or \$49,000. This procurement limit increases by 0.2% or \$10,000 per year until January 1, 2011, when it remains fixed at the lower of 2% of the customer's annual electric charges or \$99,000. After January 1, 2012, the \$99,000 limit is adjusted for inflation by the amount of the cumulative change in the Consumer Price Index, Urban (CPI-U) between January 1, 2011 and January 1 of the procurement plan year.

*Non Compliance Penalties* - On September 1, 2007 and July 1 of each year thereafter, investor-owned utilities must file a report to the PRC on its procurement and generation of renewable energy during the prior calendar year and submit a procurement plan.

Source: Directly from DSIRE:

[http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive\\_Code=NM05R&state=N&CurrentPageID=1&RE=1&EE=1](http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=NM05R&state=N&CurrentPageID=1&RE=1&EE=1)

**Idaho:**

At this time there is no state wide or state enforced program to encourage the development of new clean renewable resources through a RPS. Lt. Gov. Jim Risch in the summer of 2006 signed onto “25 x 25 “ a mandate to require that 25% of the state’s power be generated by clean renewables by 2025. They are currently drafting a new bill that could include a renewable portfolio standard for the state.

Source: NW Energy Coalition : <http://nwenergy.org/publications/reports/citizens-energy-plan/state-by-state-proposals-idaho>

Source: [http://www.agweekly.com/articles/2007/02/08/news/ag\\_news/news73.txt](http://www.agweekly.com/articles/2007/02/08/news/ag_news/news73.txt)

**Wyoming:**

At this time there is no state wide or state enforced program to encourage the development of new clean renewable resources through a RPS. Rep. Jane Warren, D-Laramie proposed a bill in 2005 that would have created an energy commission temporarily. One of the tasks of this commission would have been to draw up a renewable portfolio standard. However this bill did not get passed

Source:

<http://www.casperstartribune.net/articles/2005/01/09/news/wyoming/bad0e4fe41b9d2c087256f820003dadb.txt>

Source:

<http://www.casperstartribune.net/articles/2007/11/09/news/wyoming/7d5ac83f572d45438725738c000e2de2.txt>

**Utah:**

At this time there is no state wide or state enforced program to encourage the development of new clean renewable resources through a RPS. Currently over 90% of the state’s electricity comes from coal, and the Governor Jon Huntsman has appointed a committee to establish a RPS.

Source: <http://www.kcpw.org/article/4595>

**British Columbia:**

At this time there is no Province wide RPS. Policy Action No. 21 of the 2007 Energy Plan sets a generation target as follows: “ensure clean or renewable electricity generation continues to account for at least 90 per cent of total generation”.

Source: <http://www.sfu.ca/cprost/docs/FinalHonoursReportJan2004.doc>

Source: <http://www.xoj.ca/documents/rps.pdf>

**Alberta:**

At this time there is no Province wide or government enforced program to encourage the development of new clean renewable resources through a RPS. Alberta has a voluntary goal of 3.5% total generation to come from renewable sources by 2008, and is on track to achieve this.

Source: [http://www.ieawind.org/AnnualReports\\_PDF/2005/05%20Canada.indd.pdf](http://www.ieawind.org/AnnualReports_PDF/2005/05%20Canada.indd.pdf)