# The Washington Clean Energy Initiative: Effects of I-937 on Consumers, Jobs and the Economy

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## Executive Summary

In November 2006, the citizens of Washington will have an opportunity to vote on Initiative 937 (I-937), which would establish a renewable energy standard requiring the state's largest electric utilities to supply 15 percent of their electricity sales from eligible renewable resources by 2020. It would also require those electric utilities to pursue all low-cost energy conservation opportunities with their customers and in their communities.

Twenty states and the District of Columbia have enacted performance standards that require electric utilities to increase their use of renewable energy sources. Eight states have enacted energy efficiency resource standards, which promote more efficient generation and use of electricity and natural gas.

The Union of Concerned Scientists analyzed the costs and benefits of the renewable energy and energy efficiency provisions of I-937. Under our expected case, which primarily utilizes cost and performance projections from industry experts, the U.S. Department of Energy and the Northwest Power and Conservation Council, we found that by 2025, I-937 would result in the following economic benefits for Washington:

- 2.9 percent, or $1.13 billion, in savings on consumer electricity bills
- 2,000 new jobs in manufacturing, construction, operation, maintenance, and other industries
- $138 million in additional income and a $148 million increase in gross state product
- $2.9 billion in new capital investment
- $30 million in income to rural landowners from wind power land leases
- $167 million in new property tax revenues or payment in lieu of taxes for local communities[1]

### Energy Demand

I-937 would create a stable market for new renewable energy and energy efficiency in Washington. The renewable energy standard would support nearly 1,300 average megawatts (aMW) of renewable resources by 2025, including wind, landfill gas, bioenergy, and efficiency upgrades at existing hydroelectric facilities. This level of development would produce enough electricity to meet the needs of more than 930,000 average homes.[2] I-937's conservation requirements would support the acquisition of more than 1,000 aMW of cost-effective energy efficiency from 2010 to 2025—freeing up electricity from existing sources that is equivalent to meeting the needs of about 720,000 average homes.

### Consumer Energy Bills

Energy costs are on the rise in Washington as regional utilities pursue new higher cost conventional resources to meet growing power demand. I-937 would reduce energy demand, provide price stability by diversifying the power mix, and deliver long-term savings to energy consumers.

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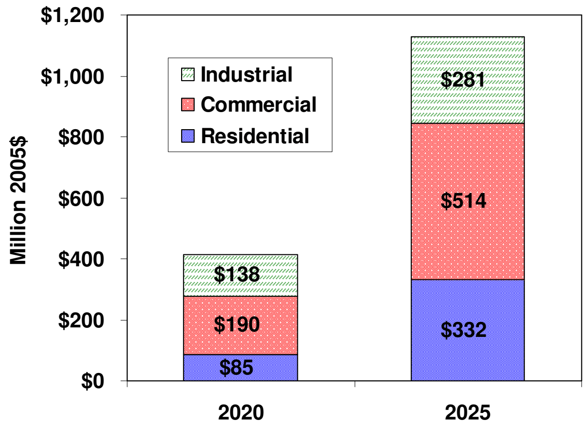
[1] Results are in cumulative net present value 2005$ using a 4 percent real discount rate. Job results are for the year 2025.

[2] Assumes average monthly residential consumption of 1,017 kilowatt-hours (kWh) (EIA, 2005).

By definition, investments in cost-effective conservation will reduce the total cost of meeting power supply needs over time. During the next decade, new renewable resources are projected to be cost competitive with new conventional resources such as coal and natural gas. By 2017, the investments in renewable energy begin to deliver demonstrable savings compared with conventional energy sources.

With the efficiency and renewable energy investments combined, consumers would see *annual* savings on electric bills under I-937 beginning in 2014, with savings reaching 7.2 percent, or $362 million, by 2025. Accumulated electricity savings from the efficiency measures will offset the upfront costs of consumer equipment purchases in just a few years. From 2008 to 2025, *cumulative* savings across all consumer sectors—residential, commercial, and industrial—would total 2.9 percent, or $1.13 billion (Figure ES1).

**Figure ES1. Cumulative Consumer Electricity Bill Savings, by Sector**




During this period, a typical Washington household would save an average of nearly $1.50 on its monthly electricity bill. By 2025, monthly savings would reach nearly $4.00.

## Jobs and Economic Development Benefits

By 2025, 2,000 new jobs in manufacturing, construction, operation, maintenance, and other industries would result from I-937. In fact, the amount of additional renewable energy and energy efficiency required would create 2.6 times more jobs than fossil fuels—a net increase of 1,230 jobs by 2025. It would also generate $138 million in additional income, and $148 million in gross state product in Washington's economy.

## Environmental Benefits

Increasing energy efficiency and renewable energy use will protect the health of Washington's citizens and environment by reducing global warming pollution from coal- and natural gas-fired power plants. By 2025, I-937 would keep about 4.6 million metric tons of heat-trapping carbon dioxide (CO2) emissions from entering the atmosphere each year—equivalent to taking 750,000 cars off the road. It will also reduce harmful air, water, and land impacts from extracting, transporting, and using fossil fuels, as well as preserve ecological resources for future generations.

## Sensitivity Analysis

We examined several sensitivities to determine the effects of I-937 on consumers under more pessimistic conditions. Our first three sensitivities examine each of the following respectively: higher wind power costs through 2025, expiration of the current federal renewable energy production tax credit in 2007, and no federal $CO_2$ emissions limits. Our final sensitivity features an unlikely combination of all the adverse assumptions from our first three sensitivities.

Additional sensitivities that reflect plausible, but more optimistic conditions for the development of clean energy resources—such as renewable energy technology costs that decline more quickly—are also possible, but not considered here.

Even with higher wind costs, no PTC extension, or no federal $CO_2$ emissions limits, I-937 would yield long-term electricity bill savings to consumers. When the adverse conditions of sensitivities 1, 2, and 3 are combined, consumers would pay slightly more, but not as much as they would pay for meeting growing energy needs with higher-priced conventional energy sources. In this case, the minimal costs associated with this most pessimistic sensitivity would be more than offset by the savings from using less fossil fuels. Under all sensitivities, I-937 would still provide other important benefits—such as jobs, new capital investment, property tax revenues, land lease payments for wind power, and $CO_2$ emission reductions.

# Introduction

In November 2006, the citizens of Washington will have an opportunity to vote on Initiative 937 (I-937), the "Clean Energy Initiative." I-937 would establish a renewable energy standard requiring the state's largest electric companies to increase their use of new renewable sources in their electric supply to 15 percent by 2020. Electric utilities would also be required to pursue all low-cost energy conservation opportunities with their customers and in their communities.

The Union of Concerned Scientists (UCS) analyzed the costs and benefits of the renewable energy and energy efficiency provisions in I-937. A number of prior state level analyses—including six completed by UCS—have found that increasing renewable energy would have little, if any effect on ratepayers (Chen et al., 2006). This is due in large part to the cost competitiveness of renewable energy technologies compared with new conventional fossil fuel power facilities.

In addition, the U.S. Department of Energy's Energy Information Administration (EIA), UCS, and others have found that renewable energy standards will reduce natural gas prices by reducing the demand for gas relative to supply (UCS, 2003). Combined with energy efficiency programs, the consumer benefits of a renewable energy standard are even greater (Elliot et al., 2003).

To examine the effect on electricity rates, total resource costs, and consumer electricity bills, this report uses an updated version of a spreadsheet model created by the Tellus Institute and the Institute for Lifecycle Energy Analysis. The original model was used in a 2003 analysis of a similar policy then under consideration by the Washington legislature (Lazarus et al., 2003).

In addition to ratepayer impacts, our analysis examines the effect that I-937 would have on state economic development and emissions of carbon dioxide ($CO_2$)—the heat-trapping gas primarily responsible for global warming. We also run the output of the analysis through the Impact Analysis for Planning model to determine the effect of I-937 on employment and income.

We analyze the range of costs and benefits under an expected case that primarily utilizes projections based on information from industry experts, the Department of Energy's national labs that study renewable energy technologies, and the EIA, as well as data on energy efficiency and avoided cost of power generation from the Northwest Power and Conservation Council's (NPCC) The Fifth Northwest Electric Power and Conservation Plan (referred to in this analysis as the Fifth Power Plan). In addition, we analyze several sensitivities to determine the effects of I-937 on consumers under more adverse and pessimistic conditions.

This report first provides an overview of the renewable energy standard and energy efficiency standard as policy tools, including the experience that other states have had with them to date. We then provide a detailed description of the I-937 design details, and how it compares with other state policies. Next, we present our modeling methods and major assumptions for the analysis followed by detailed results that highlight the effects on consumers, jobs, economic development, and the environment. Finally, we sum up our results and the implications of I-937 for the energy future of Washington.

# Policy Overview

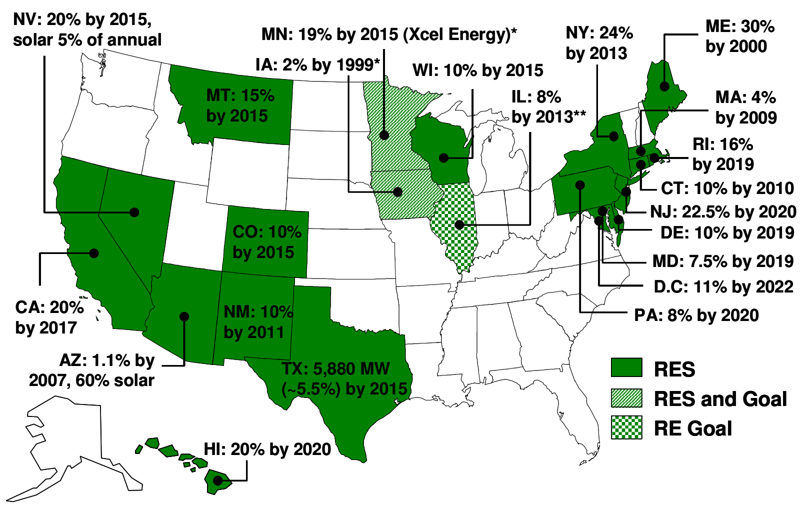
## Renewable Energy Standard

A renewable energy standard—also called a renewable portfolio standard—is a market-based policy mechanism that requires electric utilities to gradually increase the amount of renewable energy resources in their electricity supplies. Though they can vary in design, a renewable energy standard generally establishes annual requirements for each utility covered by the policy to meet a certain percentage of its electricity sales using certain renewable energy resources.

Twenty states and the District of Columbia—representing more than 40 percent of U.S. electricity load—have implemented minimum renewable energy standards (Figure 1).[3] On Election Day 2004, Colorado residents voted on (and passed) the first-ever renewable energy standard ballot initiative requiring the state's utilities to generate 10 percent of their electricity supply from renewable energy sources by 2015. Delaware, Hawaii, Maryland, Montana, New York, Rhode Island, and Washington, DC, have enacted minimum renewable energy standards since the beginning of 2004. And at least nine more states—including Washington—are currently considering one. A number of factors are driving the recent growth of new standards, including the recognition by states that renewable energy can provide greater fuel diversity, a valuable hedge against volatile natural gas prices, significant economic development and job creation, as well as environmental and public health benefits such as reduced $CO_2$ emissions and improved air quality. A second trend is that many states have increased or accelerated their existing standards, including Minnesota, Nevada, New Mexico, Pennsylvania, Texas, Wisconsin, and, most recently, New Jersey.

UCS projects that existing state renewable energy standard laws and regulations will provide support for 31,750 megawatts (MW) of new renewable power by 2017—providing enough clean power to meet the electricity needs of 19.9 million typical homes (Figure 2). By 2017, annual new renewable energy production from all state standard programs will reduce $CO_2$ emissions by more than 75 million metric tons—equivalent to taking 11.2 million cars off the road.

**Figure 1. Renewable Energy Standards**

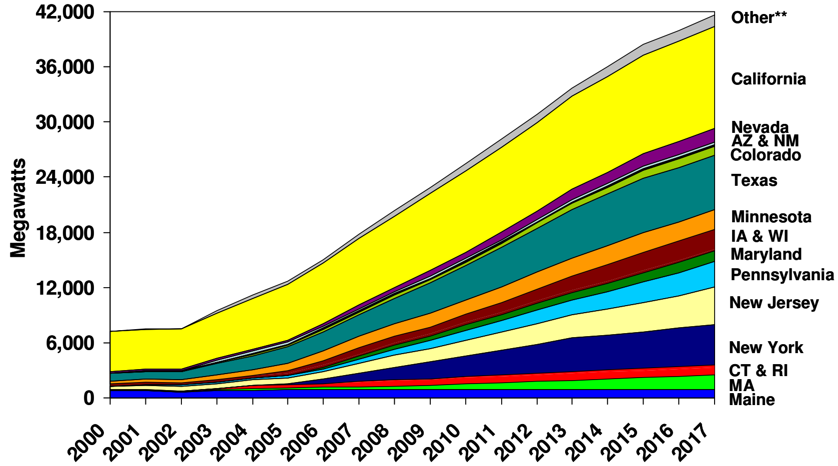



*MN has a requirement for one utility, Xcel Energy, and a 10% by 2015 renewable energy goal for all other utilities. In addition to its requirement, IA has a 1,000 MW (~10%) by 2010 goal.
**Renewable energy goal, with no specific enforcement measures.

[3] For detailed information on state renewable energy policies, visit the UCS website at *http://www.ucsusa.org/clean_energy/renewable_energy/page.cfm?pageID=114*.

A number of studies have found that renewable energy standards are and will continue to be the primary driver of new renewable energy generation in the United States (UCS, 2004b). Nearly half of the total wind capacity installed between 2001 and 2005 has resulted from state renewable energy standard policies (Wiser, 2006). Minnesota's largest utility, Xcel Energy, has acquired about 600 MW of wind and bioenergy power as a direct result of its requirement. Wisconsin utilities have secured enough renewable resources to meet their targets through 2011, and Iowa has met and exceeded its relatively low renewable energy requirement. But the most successful standard so far may belong to Texas.

**Figure 2. Expected Development From State Renewable Energy Standards***




* Projected development assuming states achieve annual targets.
**Includes Delaware, Hawaii, Illinois, Montana, and Washington, DC.

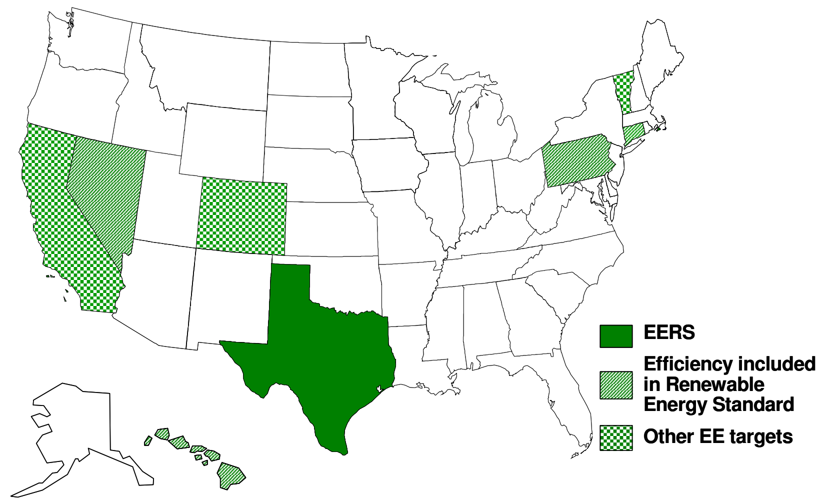
The Texas legislature adopted a renewable energy standard in 1999 that required 2,880 MW of renewable electricity generating capacity (2,000 MW of it being new development) to be installed by 2009. Nearly 1,950 MW of renewable energy have been installed in Texas so far, putting the state on track to meet its original 2009 requirement several years early. As a result, in August 2005, the Texas legislature increased the new capacity requirement to 5,000 MW by 2015. The Texas renewable energy standard has been successful, in part, due to the availability of good renewable energy resources, effective policy design, penalties for non-compliance, and strong political support and regulatory commitment (Wiser et al., 2004; Wiser and Langniss, 2001).

## Energy Efficiency Resource Standard

Eight states have enacted energy efficiency resource standards, which can result in significant reductions in both electricity and natural gas consumption, thereby lowering energy prices and bills, and reducing stress on transmission capacity. The energy efficiency resource standard is emerging as an effective way to help stimulate investment in energy efficient technologies. Like a renewable energy standard, an energy efficiency resource standard is a market-based policy mechanism that requires utilities to meet specific annual electric and gas savings targets. The annual requirements are generally met by making efficiency gains in the use of electricity and natural gas, as well as in the generation and transmission processes (Nadel, 2006).

Currently, energy efficiency resource standards have been adopted in eight states (Figure 3). Texas was the first state to adopt an energy efficiency resource standard as part of electric utility restructuring legislation in 1999. Under this standard, electric utilities in Texas were required to meet energy savings of 10 percent of demand growth by 2003. California's energy efficiency resource standard applies to the state's largest electric utility and natural gas providers, and requires savings that are projected to reduce electricity demand growth by more than half, and natural gas demand growth by more than 40 percent, by 2013 (EPA, 2006).

**Figure 3. Energy Efficiency Resource Standards**




Source: Nadel, 2006.

Connecticut, Hawaii, Nevada, and Pennsylvania have included energy efficient technologies as eligible resources under their renewable energy standards. Connecticut created a separate tier for energy efficiency, load management, and cogeneration that ramps up to four percent of total electric sales by 2010. Pennsylvania allows energy efficiency resources to compete with other alternative—but non-renewable energy—resources under its Tier 2 requirement, which reaches 10 percent of total electric sales by 2020. Both Hawaii and Nevada allow energy efficiency resources to meet up to a certain percentage of their annual renewable energy requirements.

As with the renewable energy standard, Texas has had the most experience and success thus far among the states with an energy efficiency resource standard. In 2004, Texas exceeded its 10 percent load growth reduction requirement, resulting in more than 400 million kilowatt-hours' worth of energy savings—a $76 million benefit to energy consumers (EPA, 2006).

## I-937: The Washington Clean Energy Initiative

### Washington's Clean Energy Resources

Washington and the rest of the Pacific Northwest have significant potential to reduce energy use through efficiency. Energy efficiency programs in the region have produced nearly 3,000 average megawatts (aMW) of savings since 1978 (Eckman, 2005). As Table 1 shows, the NPCC identified nearly 2,800 aMW of cost-effective and realistically achievable conservation potential for the Pacific Northwest from 2004 to 2025 (NPCC, 2005).

In addition, Washington and the Northwest have a strong and diverse supply of renewable energy resources. The state has the technical potential to generate more than enough clean power to meet all of its current electricity needs. Hydropower already accounts for more than two-thirds of the state's electricity mix (CTED, 2006). There are some opportunities for upgrades and efficiency gains at existing facilities, but most of the available hydropower resources in Washington and the Northwest have already been developed, and most remaining sites are generally believed to have unacceptable environmental impacts. In addition to hydropower, Washington and the Northwest possess strong wind, geothermal, bioenergy, and even solar resources. These other renewable energy sources currently account for only 1.3 percent of the state's electric supply.

Wind power has experienced growth in Washington since 2001. Today, nearly 400 MW of wind capacity is currently operating in the state, and an additional 430 MW is under construction. This development has been stimulated in large part by the cost competitiveness of wind power compared with new natural gas and coal power facilities, a federal tax credit for renewable energy production, the utility integrated resource planning (IRP) process, and customer support for clean energy (Bolinger and Wiser, 2005).

**Table 1. Achievable Conservation Potential**

| Efficiency Measure and End Use | Cumulative Savings Potential (aMW in 2025) |
|---|---|
| **Residential** | |
| Compact Fluorescent Lights | 530 |
| Heat Pump Water Heaters | 200 |
| Clothes Washers | 140 |
| Existing Space Conditioning—Shell | 95 |
| Water Heaters | 80 |
| HVAC System Conversions | 70 |
| HVAC System Efficiency Upgrades | 65 |
| New Space Conditioning—Shell | 40 |
| Hot Water Heat Recovery | 20 |
| HVAC System Commissioning | 10 |
| Existing Space Conditioning—Duct Sealing | 10 |
| Dishwashers | 10 |
| Refrigerators | 5 |
| **Commercial** | |
| New & Replacement Lighting | 221 |
| New & Replacement HVAC | 140 |
| Retrofit HVAC | 119 |
| Retrofit Lighting | 117 |
| Retrofit Equipment | 114 |
| Retrofit Infrastructure | 105 |
| New & Replacement Equipment | 84 |
| New & Replacement Shell | 22 |
| New & Replacement Infrastructure | 11 |
| Retrofit Shell | 4 |
| **Other** | |
| Industrial Non-Aluminum | 350 |
| Agriculture - Irrigation | 80 |
| New & Replacement AC/DC Power Converters | 155 |
| **Total** | **2,797** |

Source NPCC, 2005.

## I-937 Design and Comparison with Other State Standards

Below is a description of some of the key features of I-937 and, when pertinent, how they compare with other state standards.

Targets. I-937 requires electric utilities with more than 25,000 customers to generate or acquire renewable energy equal to at least three percent of retail sales by 2012, increasing to nine percent in 2016, 15 percent in 2020, and remaining at 15 percent each year thereafter. Washington would join the 20 states plus the District of Columbia that currently have renewable energy standards (Table 2). In addition, I-937 requires these electric utilities to pursue all available conservation opportunities that are cost-effective, reliable, and feasible based on biennial targets that begin in 2010.

Qualifying Utilities. Seventeen of the state's 62 utilities—including investor-owned, publicly-owned, and rural cooperatives—would initially have to meet the requirements under I-937. These utilities account for nearly 88 percent of the total state electricity sales (Table 3). Over the course of the next two decades, additional utilities may grow large enough to be subject to the I-937 requirements, though we do not evaluate them in this analysis.

Resource Eligibility/Qualifying Facilities. I-937 defines renewable resources as: water; wind; solar energy; geothermal energy; landfill gas; wave, ocean, or tidal power; gas from sewage treatment facilities; certain biodiesel fuel; and biomass energy.[4] To be eligible to meet the renewable energy standard, generation from renewable resources must come from facilities that have commenced operation after March 31, 1999, and are located in the Pacific Northwest or delivered into Washington on a real-time basis. The renewable energy portion of power generated through co-firing of renewable resources with fossil fuels is also eligible. However, renewable energy sold to retail customers through a voluntary contribution program may not be counted toward the renewable energy requirements.

Hydropower eligibility is limited to the incremental generation that results from efficiency improvements (completed after March 1999) at facilities owned by qualifying utilities and located in the Pacific Northwest, or at irrigation pipes and canals in the Pacific Northwest. The additional generation may not result in new water diversions or impoundments. The majority of state renewable energy standards place some kind of restriction (e.g., size limit, sustainability criteria, and incremental generation) on the eligibility of hydroelectric resources.

Conservation is defined under I-937 as "any reduction in electric power consumption resulting from the increases in the efficiency of energy use, production, or distribution." In meeting its conservation targets, a utility may also count high-efficiency cogeneration owned and used by an industrial customer to meet its own needs.

Distributed Generation. Distributed renewable energy generation from facilities up to five MW in size receives additional support under I-937. A qualifying utility may count distributed generation at double its output toward the annual renewable energy requirements. In addition, a renewable energy facility commencing operation after 2005 that uses apprenticeship programs during

**Table 2. State Renewable Energy Standards**

| State | Renewable Requirement (Percent Total Sales) |
|---|---|
| Maine | 30% by 2000 |
| New York | 24% by 2013 |
| New Jersey | 22.5% by 2020 |
| Nevada | 20% by 2015 |
| California | 20% by 2017 |
| Hawaii | 20% by 2020 |
| Minnesota[1] | 19% by 2015 |
| Rhode Island | 16% by 2019 |
| Montana | 15% by 2015 |
| ***Washington (Proposed)*** | ***15% by 2020*** |
| Washington, DC | 11% by 2022 |
| Connecticut | 10% by 2010 |
| New Mexico | 10% by 2011 |
| Colorado | 10% by 2015 |
| Wisconsin | 10% by 2015 |
| Delaware | 10% by 2019 |
| Pennsylvania | 8% by 2020 |
| Maryland | 7.5% by 2019 |
| Texas[2] | ~5.5% by 2015 |
| Massachusetts[3] | 4% by 2009 |
| Iowa[2] | ~2% by 1999 |
| Arizona | 1.1% by 2007 |

[1]Minnesota's standard is for Xcel Energy only, and it includes the utility's 1994 capacity-based and 2003 generation-based requirements.
[2] The Texas and Iowa standards require 5,880 MW and 105 average MW, respectively.
[3] The Massachusetts standard increases by one percent annually after 2009, unless otherwise changed by the Massachusetts Division of Energy Resources.

[4] Qualifying biomass resources include energy crops, wood, forest, or field residues, and animal wastes. They do not include chemically treated wood, black liquor byproduct from paper production, wood from old growth forests, or municipal solid waste.

**Table 3. I-937 Qualifying Electric Utilities**

| Electric Utility | Utility Class | # 2004 Electric Customers | % 2004 State Electric Sales[1] |
|---|---|---|---|
| Avista Corporation | Investor-Owned | 216,737 | 6.7% |
| Inland Power and Light Company | Cooperative | 32,311 | 0.9% |
| PacifiCorp | Investor-Owned | 121,599 | 5.3% |
| Peninsula Light Company | Cooperative | 28,533 | 0.7% |
| Puget Sound Energy, Inc. | Investor-Owned | 990,020 | 25.8% |
| PUD No. 1 of Benton County | Publicly Owned | 43,709 | 2.1% |
| PUD No. 1 of Chelan County | Publicly Owned | 41,441 | 1.8% |
| PUD No. 1 of Clallam County | Publicly Owned | 27,785 | 0.7% |
| PUD No. 1 of Clark County | Publicly Owned | 168,755 | 5.5% |
| PUD No. 1 of Cowlitz County | Publicly Owned | 46,003 | 5.5% |
| PUD No. 1 of Grays Harbor County | Publicly Owned | 36,644 | 1.3% |
| PUD No. 1 of Lewis County | Publicly Owned | 28,486 | 1.0% |
| PUD No. 1 of Snohomish County | Publicly Owned | 295,451 | 8.0% |
| PUD No. 2 of Grant County | Publicly Owned | 41,106 | 3.8% |
| PUD No. 3 of Mason County | Publicly Owned | 29,818 | 0.8% |
| Seattle City of | Publicly Owned | 370,499 | 11.7% |
| Tacoma City of | Publicly Owned | 162,851 | 6.0% |
| | **Total** | **2,957,978** | **87.6%** |

[1] Excludes direct retail electric sales from the Bonneville Power Administration.
Source: EIA, 2005.

construction may count generation at 120 percent its actual output toward the annual requirements. Several other states have included similar provisions in their standards to support distributed generation technologies such as solar photovoltaic and small-scale wind turbines.

Renewable Energy Credit Trading System. To provide greater flexibility in meeting the annual renewable energy requirements, I-937 requires the Washington State Department of Community, Trade, and Economic Development (CTED) to select a renewable energy credit (REC) trading system. A REC trading program is a common compliance mechanism for state renewable energy standards. Under this mechanism, a renewable energy facility earns one REC for each megawatt-hour (MWh) of electricity that is generated in a given year. These RECs can then be bought and sold by utilities with annual renewable energy requirements—much like the Clean Air Act credit-trading system, which enables lower-cost, market-based compliance with air pollution regulations. A REC trading program is either operational or under consideration in 19 of the 21 existing state renewable energy standards.

Cost Cap Provision. A cost cap is included as part of I-937's renewable energy standard to protect electricity customers against higher-than-expected compliance costs. Under I-937, a qualifying utility would be in compliance with the renewable requirements as long as it has met the percentage benchmarks or invested four percent of its total annual revenue on the incremental costs of eligible renewable resources, the cost of RECs, or a combination of both. Of course, a utility may not need to reach this level of investment in order to comply with the requirement. Conversely, it can choose to invest more than this amount, though is under no requirement to do so. Investor-owned utilities are entitled to recover all prudently incurred costs associated with compliance of the renewable energy standard as determined by the Utilities and Transportation Commission. The majority of renewable energy standard policies in other states also place various controls on the cost of compliance, and allow for cost recovery.

Penalties. Qualifying utilities that do not comply with the energy conservation and renewable energy requirements would be subject to penalties. For each MWh of shortfall, a utility would be levied a penalty of fifty dollars (adjusted annually for inflation beginning in 2007). Any penalties collected through this mechanism would be placed in a special fund, which could only be used to purchase RECs or invest in energy conservation projects at public facilities, local government facilities, community colleges, or state universities. Nearly all renewable energy standard policies in other states include similar enforcement mechanisms.

## Methods and Assumptions

This analysis uses a spreadsheet model to estimate the cost and benefits of Washington's I-937 ballot initiative. These impacts are calculated by analyzing the interaction between renewable energy and energy efficiency supply and policy-driven demand in a competitive wholesale market. The Tellus Institute and the Institute for Lifecycle Energy Analysis initially developed the modeling approach on behalf of the NW Energy Coalition for a 2003 report that examined a policy similar to I-937 (Lazarus et al., 2003). We updated the model to reflect current conditions in the electric power industry, and to match the provisions included in I-937. To calculate the macroeconomic impacts (employment, income, and gross state product) of I-937, we used the Impact Analysis for Planning (IMPLAN) model, with data specific to Washington.

It is important to note that the intent of this analysis is to measure relative effects, not absolute effects. Many different factors influence utility rate levels, revenue requirements, and resource costs, and we have attempted to measure only the effects of I-937.

In addition, we make the general assumption that the energy efficiency and renewable resource development that occurs after I-937 takes effect is attributable to the initiative. Therefore, we compare I-937 compliance with a reference case in which no further energy efficiency and renewable resource investments are made after 2009. It is not unreasonable to expect that some amount of energy efficiency and renewable resource development would take place in the absence of additional policy support. However, the level of development under I-937 would be predictable and assured for energy efficiency and for renewable energy, whereas without I-937 the outlook is highly uncertain and hard to predict. The primary focus of our analysis is to examine the overall costs and benefits to consumers of the level of renewable energy and energy efficiency that is required by I-937.

We analyze the range of costs and benefits under an expected case that primarily utilizes renewable energy cost and performance projections based on information from industry experts, the Department of Energy's national labs that study renewable energy technologies, and the EIA, as well as data on energy efficiency and avoided cost of power generation from the NPCC's Fifth Power Plan. In addition, we analyze several sensitivities to determine the effects of I-937 on consumers under more adverse and pessimistic conditions. Below, we first describe the models and key assumptions we used to project the energy and macroeconomic impacts under our expected case. This is followed by a description of the changes we made to key assumptions to derive our sensitivities.

## Modeling Energy Impacts – Assumptions

### *Load Growth*

To project demand growth across all affected utilities, we used the growth rates by sector from the Medium Case of the NPCC's Fifth Power Plan. To project total retail demand, we also assumed that the affected utilities achieve their near-term (2005-2009) cost-effective efficiency targets, calculated as their share of the region's energy efficiency potential established by the NPCC.

### *Energy Efficiency*

Annual Requirements. We used the regional cost-effective conservation target determined by the NPCC in its Fifth Power Plan to allocate the amount of conservation required for each qualifying utility beginning in 2010.[5] For the industrial and irrigated agriculture sectors, as well as for non-lost opportunity resources in the residential and commercial sectors, we allocated the regional targets to the qualifying utilities based on each utility's share of the respective sector's total regional power demand.[6] For residential and commercial lost opportunity resources, which tend to be more available to those utilities with a growing power demand, we allocated the regional targets based on the size of the utility and the total amount of projected load growth from 2010 to 2025. Therefore, a large and growing utility—such as Puget Sound Energy—would receive a higher allocation of the lost opportunity targets. Conversely, a smaller utility experiencing slower growth—such as Gray's Harbor PUD—would receive a lower portion of the allocation.

Costs. To estimate the annual costs of implementing the efficiency measures, we used the NPCC's Fifth Power Plan estimates of levelized, average energy cost savings by sector and type of measure (both lost and non-lost opportunity), and assumed an average measure lifetime of nine years, at which point they are renewed.[7] In addition, most utility-operated efficiency programs have required that consumers bear at least a portion of the cost of the measures installed in their homes and businesses. We therefore assumed that efficiency resources are funded 50 percent by utilities and 50 percent by program participants. This simplified assumption was also used in the 2003 Tellus Institute analysis.

Most investor-owned utilities, which account for about 43 percent of affected retail demand, currently expense their efficiency measure costs in the year they are installed using funds

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[5] The NPCC conservation targets are based on the assumption that 85 percent of the total cost-effective technical potential is achievable.

[6] In Volume 3 of its Fifth Power Plan, the NPCC define a lost-opportunity resource as "a conservation measure that, due to physical or institutional characteristics, will lose its cost-effectiveness unless actions are taken now to develop it or hold it for future use. For example, some efficiency measures can only be implemented cost-effectively when a building is being constructed or undergoing major renovation. If they aren't done then, the opportunity to capture those savings at that cost is lost (NPCC, 2005)." Residential heat pump water heaters are an example of a lost opportunity resource. By contrast, non-lost opportunity measures can be implemented nearly anytime, such as compact fluorescent lighting.

[7] The NPCC's data showing levelized cost of energy saved include program administrative costs.

collected through dedicated efficiency tariffs. The experience with public utilities varies, with some expensing their efficiency programs, and others using financing mechanisms. For simplicity, we assumed that 75 percent of the efficiency program costs are expensed in the first year (effectively representing all investor-owned utilities and half of public utilities), and 25 percent of the costs are financed at a five percent real interest rate for 10 years. This rate is slightly higher than the costs of public debt financing, but lower than what some investor-owned and rural cooperative utilities might require. If the utilities instead choose to pay for a greater portion of these efficiency investments through financing, the utility rates and consumer costs will be lower in the early years following implementation of I-937, and savings will be lower in the later years.

We also assumed that half of consumer costs (e.g., for lower cost and shorter lived equipment such as high efficiency light bulbs and fixtures) would be paid directly upfront, while the other half (e.g., longer-lived, higher-cost equipment) would be financed over five years at a seven percent real interest rate.

***Renewable Energy***

Annual Requirements. We assumed that the qualifying utilities will generate or purchase the minimum amount of renewable energy needed to meet the proposed targets of three percent of retail sales by 2012, nine percent by 2016, and 15 percent by 2020, remaining fixed at 15 percent after 2020. Experience from renewable energy standards in Colorado, Minnesota, New York, Texas, and Wisconsin indicates that utilities may comply well in advance of their benchmark requirements. Therefore, we also assumed that acquisitions will increase in an orderly linear process (i.e., utilities will acquire new resources in equal annual increments between target dates) rather than in the step form included under I-937.

Availability. This analysis assumed that wind, biomass, landfill gas, and geothermal resources would most likely be developed to meet the renewable energy standard, because they are likely to be the most abundant, cost-competitive resources for utility scale development over the next two decades. Like the 2003 Tellus Institute study, our analysis is based on TrueWind wind resource mapping, Washington State University estimates of biomass residue availability, U.S. Environmental Protection Agency data on landfill gas generation opportunities, and information from industry experts on geothermal potential.

We constrained the amount of available wind potential by excluding wind speeds less than 12.5 miles per hour (Class 3), as well as any wind resources located on local, state, or national parks; bodies of water, lands above 5,900 feet; and lands more than 20 miles from existing transmission lines. We further limited available wind resources to 25 percent of the potential for each wind class in Washington, Oregon, and Idaho, and 0.5 percent of the potential in Montana, which is intended to reflect the reality that some sites may be inaccessible due to competing land uses, wildlife issues, or other concerns.[8]

[8] Though Montana possesses considerably more wind resource than Washington, Oregon, and Idaho combined, its development is likely to be contingent on future expansion of transmission capacity. Therefore, we felt it would be more conservative to further limit Montana's wind potential in this analysis. For more information on renewable resource availability and constraints, see Lazarus, M., D. von Hippel, and S. Bernow. 2002. *Clean electricity options for the Pacific Northwest: An assessment of efficiency and renewable potentials through the year 2020*. Boston, MA: Tellus Institute. October.

Opportunities to develop biomass resources are assumed to be limited to co-firing residues at the Centralia and Boardman coal plants. We did not take into account the considerable potential for cost-effective use of biomass resources through development of biomass gasification combined cycle technologies, so that our analysis would not be dependent on the development of future technologies. We also did not consider the potential for anaerobic digesters, small-scale biomass applications, new efficiency upgrades at hydroelectric facilities, solar energy, biodiesel, sewage gas, or ocean resources because they were either not cost-competitive or there was not sufficient data on their costs and resource potential.[9] As a result, our analysis conservatively understates the available renewable resource potential.

Costs. The costs of developing new generation resources have risen significantly in the past several years in the Pacific Northwest and elsewhere. In a recent comparison of power resource costs, Puget Sound Energy—Washington's largest electric utility—revealed that requests for proposals for all new generation resources increased between 36 percent and 92 percent from 2004 to 2006 (PSE, 2006b). Strong global demand for natural gas and oil resources, and political instability in many of the regions that export these resources, have driven prices upward. Natural gas prices have experienced a more a more than 300 percent increase since 1999 (Basheda et al., 2006). Spot prices for coal from the Powder River Basin—which serves as the predominant source for Western coal-fired power plants—have increased 150 percent between March 2003 and March 2006 primarily as a result of shifting demand and transportation problems (Basheda et al., 2006). In turn, capital costs for new power facilities have also increased due in large part to price increases in steel, concrete, and other manufacturing and construction materials, as well as increased labor costs.

In addition to higher material costs, wind costs have been affected by the uncertainty of federal production tax incentives, which has helped produce an expensive boom-bust cycle: manufacturing plant layoffs when the tax credit expires, followed by turbine shortages to meet pent-up demand when it is renewed. Foreign-made turbines have also become more expensive as the value of the U.S. dollar has fallen. The completion of four recently announced wind turbine manufacturing facilities in the United States should help alleviate shortages and provide a hedge against this currency risk.

A recent NPCC review of regional wind power costs concludes that installed capital costs have recently increased to approximately $1,500 per kilowatt (kW) (King, 2006).[10] Other wind industry experts have indicated that near-term increases in capital costs have reached as high as $1,600/kW ($1,557/kW in 2005 dollars) (Pletka and O'Connell, 2006). Although it is uncertain how long these higher costs will last, we felt it was important to capture this trend in our analysis.

In our expected scenario, we maintain capital costs for wind at the more conservative $1,557/kW through 2008, at which point they begin a gradual decline to $1,050/kW by 2025. This assumption falls within the middle of the range of projections that come from the U.S. DOE

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[9] We did include recent eligible efficiency upgrades at hydroelectric facilities in our accounting of existing renewable resource capacity. See Existing Resource Capacity section below for further information.
[10] Reported by the NPCC in 2006 dollars. Our analysis converts all data and results into 2005 dollars.

Office of Power Technology's fiscal year 2007 Government Performance Review Act analysis—which has been widely reviewed by leading wind technology experts—and the EIA's Annual Energy Outlook for 2006. We assumed capacity factors based on EIA projections that range from 32 percent to 40 percent today (Class 4 to Class 6 wind resources, respectively), and increasing to 38 percent to 48 percent by 2025 (EIA, 2006a). We believe that wind costs and performance are likely to reflect this scenario, as the continued expansion of wind power will stimulate new U.S. manufacturing, easing supply constraints, and continued technological improvements will help to drive costs down.

Increasing renewable energy use will reduce the need for new conventional power plants that would have otherwise been built without I-937. As a result, we assumed that renewable energy technologies would get a capacity credit based on EIA projections of the annualized cost of a new natural gas combustion turbine plant. Wind power, which only produces electricity when the wind is blowing, is assumed to get a partial capacity credit based on its effective load carrying capacity (ELCC). ELCC is a standard measure of capacity credit that is based on well-known reliability analysis techniques. Several studies that have applied this approach resulted in a capacity credit that is similar to the capacity factor of the wind project (Milligan and Parsons, 1999). To be conservative, we assumed that a wind project would receive a capacity credit of 20 percent, based on analysis by PacifiCorp for its operating region (DeMeo et al., 2005).

To account for its variability, wind electricity may impose additional costs—referred to as ancillary services—to the electric system. We assumed that these ancillary services cost 0.455 cents per kilowatt-hour (kWh), based on the NPCC's analysis for the Fifth Power Plan. This is a conservative assumption that is at the high end of the range projected by several recent utility studies, considering the level of wind penetration projected in this study (DeMeo et al., 2005).

We assumed that the wheeling, or transmission, costs of $19.46 per kilowatt-year (kW-year) as assumed in the NPCC's recent updated wind power cost assessment.

Although there has been a recent trend towards utility ownership in the Pacific Northwest, we assumed resources would be developed by the private sector, as reflected in an 11 percent real fixed charge rate (EIA, 2006a). If utilities choose to develop the resources themselves rather than purchase from private developers, it is conceivable that those resources could be acquired at a lower cost. In addition, public utilities or their associations, such as Energy Northwest, would be able to reduce costs even further using lower-cost public financing.

Existing Resource Capacity. Generation from renewable resource facilities that commenced operation after March 31, 1999, is eligible to meet the renewable energy standard. Using industry data, we determine that approximately 306 aMW of renewable resource capacity has currently been acquired by qualifying utilities, and is either operating or under development (CTED, 2005, and RNP, 2006). Wind accounts for the majority of existing eligible resources, but landfill gas and recently completed or under development efficiency upgrades at hydroelectric facilities are also included. We assumed that these existing resources count toward the annual renewable energy requirements, and therefore are factored into our cost cap calculations (see below). We do not, however, include them as part of the cost or benefits results as they were not developed or acquired by the qualifying utilities as a result of the I-937 requirements.

Federal Production Tax Credit. The federal government currently provides a production tax credit (PTC) to renewable energy facilities. Last renewed as part of the Energy Policy Act of 2005, the credit is worth 1.8 cents/kWh for the first 10 years of operation for facilities placed in service before January 1, 2008. However, because the PTC is a credit on tax liability rather than a dollar of taxable income, this value does not account for its full tax benefits. To capture the additional tax benefits of the PTC, we assumed that it has a 20-year levelized value of 2.2 cents/kWh (EIA, 2006b). Under our expected scenario, we assumed that the federal PTC is extended through 2012. Currently set to expire at the end of 2007, several bills have been introduced in Congress—with bipartisan support—that would extend the PTC up to 10 years.

Allocation of Wind Energy Development. Based on data from existing wind energy facilities, and conversations with developers, most wind projects in Washington and the Pacific Northwest are being constructed in Class 4 and Class 5 wind regions. Access to transmission lines, as well as fewer competing land uses and other constraints, have made these sites preferable to Class 6 sites at least in the near to mid- future. Therefore, we conservatively assumed that 60 percent of the wind power developed under I-937 would be located at Class 4 sites, 30 percent at Class 5 sites, and 10 percent at Class 6 sites. In addition, we assumed that two-thirds of the wind development would occur in Washington. The availability of strong in-state resources as well as extra credit achieved through use of in-state labor apprenticeship programs and regional transmission constraints contribute to likely development in Washington, particularly in the near-term.

Cost Cap Provision. The cost cap compares the cost of eligible renewable resources or RECs purchased to meet I-937's renewable energy standard with the cost of other new resources. The difference in cost, or incremental cost, between an eligible renewable resource and other available new resources is the amount used to determine if the cost cap threshold is reached. If this incremental cost exceeds four percent of a utility's total annual retail revenue requirement, a utility may acquire fewer eligible renewable resources than would otherwise be required to meet the annual target. The four percent cost cap does not compound from year to year. Details concerning implementation of the cost cap will be determined through the rule-making process.

Though the cost cap will be determined on a utility-by-utility basis, for the purpose of our analysis, we calculate the cost cap cumulatively across all affected utilities. We use a simplified rate model to determine total annual power supply and delivery costs (collectively assumed to be the revenue requirement) with and without I-937. The total revenue requirement for all affected utilities is then multiplied by the four percent cap, which determines the annual threshold on renewable resource expenditures. Next, we assumed the avoided cost of generation (see below) to be the cost of new non-eligible resources, and compared it with the average renewable energy price for that year. The difference between these two figures is then multiplied by the new renewable resource generation required to meet the standard. We also included the incremental cost of generation from any existing (pre-2008) eligible renewable energy facilities using a cost assumption of $46/MWh, and compared it with the avoided cost of generation.[11] If the total incremental expenditures from new and existing renewable resources exceed the cost cap in any year, we reduce the amount of renewable energy development accordingly.

### *Avoided Cost of Generation*

The effect of I-937 on utilities and consumers will depend substantially on the future cost of electricity supplies that efficiency and renewable resources will displace. As discussed above, the cost of all energy sources has increased in the last several years. To account for this increase, we used the NPCC's Fifth Power Plan projections (High Fuel Price Case) for avoided cost of generation for the Eastern Oregon and Washington/Idaho North region. Though described by the NPCC as a high price case, this projection is actually consistent with the EIA's more recent regional projections of delivered natural gas prices (EIA, 2006), and still lower than current prices and what many industry experts project. The effect of using the NPCC's High Fuel Price Case is that avoided generation costs are higher in the near term, but gradually decline as cheaper resources replace natural gas in later years. Though we analyzed annual avoided generation cost data, the levelized cost from 2005 to 2025 is approximately 4.5 cents/kWh under the NPCC High Fuel Price Case compared with 4.1 cents/kWh under their Medium Case. If natural gas and coal experience today's higher prices for a longer period of time than projected by the NPCC and EIA, then the avoided cost of nonrenewable generation will also be more expensive.

For energy efficiency, we also assumed avoided transmission costs of $3/kW-yr and avoided distribution costs of $20/kW-yr, figures developed by the NPCC's Regional Technical Forum, and used in the Fifth Power Plan. As a result, the set of efficiency measures developed under I-937 save an average of 0.54 cents/kWh due to avoided transmission and distribution.

### *National Carbon Dioxide Reduction Policy*

In our expected scenario, we assumed that a national policy to limit $CO_2$ emissions in the electric power sector is adopted and implemented beginning in 2013. In a recent speech, Alan Richardson, CEO of the American Public Power Association, warned that federal heat-trapping gas regulation is coming. He stated that there is "an emerging public consensus and a building political directive that inaction is not a viable strategy." (Coile, 2006) In July 2005, the U.S. Senate adopted a non-binding resolution calling for mandatory reductions in $CO_2$ emissions through an economy-wide cap-and-trade system on heat-trapping emissions. In May 2006, the U.S. House of Representatives Appropriations Committee passed a resolution identical to the Senate's resolution. More than 100 $CO_2$ emission reduction bills have been introduced thus far in the 109th session of Congress (Roy, 2006).

The congressional response is being spurred in part by a growing policy response at the state and regional level. This includes the regional $CO_2$ limits and trading system being established by eight northeastern states and the law enacted in California in September 2006, requiring the state's global warming emissions to be reduced to 1990 levels by 2020. In addition, a growing number of leading energy companies support mandatory $CO_2$ emission limits, including five of America's 10 largest power companies (Freese and Clemmer, 2006).

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[11] Our assumption of $46/MWh for generation from renewable energy facilities commencing operation after March 1999 and before January 2008 is based on the mid-range for the NPCC's estimated levelized cost of new utility-scale wind power in its Fifth Power Plan.

Such regulation will result in higher costs for fossil fuel power generation in the form of added controls or emission allowance permits. We incorporate these higher fossil fuel costs by adjusting our projection for avoided cost of generation in year 2013 and after to include an allowance price for $CO_2$ emissions. In its Fifth Power Plan, the NPCC examined a High $CO_2$ Case with allowance prices based on a Massachusetts Institute of Technology (MIT) study of the McCain-Lieberman Climate Stewardship Act (Paltsey et al., 2003). A recent report by Synapse Energy Economics examined several studies of federal $CO_2$ emission reduction bills, and found that the MIT cost projections are on the high end of the range. For this analysis, we adopted Synapse's more conservative mid-case projection of $5 per short ton of $CO_2$ in 2013, increasing to $30 per short ton of $CO_2$ by 2025, and applied it to the NPCC's Medium Case avoided generation cost projection. The result is an increase in the avoided generation costs of 0.67 cents/kWh beginning in 2013, and gradually increasing to 1.6 cents/kWh by 2025 (Johnston et al., 2006).

#### *Administration and Transaction Costs*

We also include administrative and transaction costs based on estimates by Sustainable Energy Advantage and La Capra Associates of implementing the Massachusetts and California renewable energy standards. These costs are small enough that their effect on electricity prices and total resource costs would be negligible (about 0.005 cents/kWh) when spread over all electricity demand among the affected utilities.

### Modeling Macroeconomic Impacts

We used the IMPLAN model and specific data on Washington's economy to estimate the macroeconomic impacts (employment, income, and gross state product) of I-937. IMPLAN is an input/output (I/O) model that identifies interactions between all sectors of the economy. I/O models can show how expenditures for installing, manufacturing, operating and maintaining renewable energy technologies and related equipment not only directly benefit the industries engaged in these activities, but also indirectly benefit businesses that provide inputs (i.e., goods and services) to these industries. I/O models can also show the benefits of workers re-spending the income earned from these direct and indirect activities and the impact of changes in consumer energy bills.

The macroeconomic analysis was completed by MRG & Associates using a well-established analytical approach and the inputs and results of the energy modeling described above.[12] There were four main steps in completing the macroeconomic analysis. First, we estimated total expenditures for installing, manufacturing, operating, and maintaining renewable energy and energy efficiency technologies that are projected to be developed to meet I-937 and for fossil fuel power plants that would have otherwise been developed without the initiative. Second, the expenditures are broken down and allocated to the industries that would directly supply the equipment, labor, and services for these technologies. Third, these detailed expenditures are multiplied by the estimated local share of equipment, labor, and services that can be supplied by Washington businesses and matched to the appropriate sectors in the IMPLAN model to

[12] The analytical approach used in this analysis is similar to that used by Geller, DeCicco, and Laitner, 1992, *Energy efficiency and job creation* (Washington, DC: American Council for an Energy Efficient Economy).

calculate the direct and indirect macroeconomic impacts in Washington. Finally, we calculated the impacts of changes in consumer electric bills in Washington.

The key assumptions and data sources for the macroeconomic analysis include the following:

- The expenditure breakdown for the construction, operation and maintenance of renewable and conventional power plants was based on data from actual projects collected from a variety of sources, including state and federal agencies, renewable energy developers and utilities. The expenditure breakdown and local share data on wind projects was based on inputs used in the National Renewable Energy Laboratory's Jobs and Economic Development Impacts (JEDI) model.[13]

- We used data from the IMPLAN model to estimate the local share of expenditures for specific industries, with a few exceptions. We assumed that 33 percent of the manufacturing for wind technologies installed in Washington would be produced by in-state businesses. We also do not include any jobs or economic development from Washington manufacturers exporting equipment to other states or countries. If Washington is able to attract renewable energy and energy efficiency technology manufacturers to produce equipment in the state and for export, the jobs and income from I-937 would increase significantly.

## Modeling Sensitivities

We examined several sensitivities to determine the effects of I-937 on consumers under more adverse conditions. Below, we describe the changes in key assumptions that were made to derive each sensitivity. Table 4 compares the key differences between these sensitivities and our expected case.

First, we analyzed a sensitivity with more pessimistic assumptions for wind cost and performance. We assumed that the higher wind capital costs experienced today ($1,557/kW) would remain in effect through 2025 (Pletka and O'Connell, 2006). In addition, we assumed that technology improvements would be slower than under our expected case, resulting in lower wind power capacity factors. Under this sensitivity, capacity factors range from 31 percent to 37 percent today (Class 4 to Class 6 wind resources respectively), and increase to a range of 37 percent to 44 percent by 2025. Second, we examined a sensitivity where the federal PTC is not extended past its current expiration in 2007. Our third sensitivity assumes that no national policy regulating $CO_2$ emissions is implemented through 2025. To reflect the absence of a $CO_2$ policy, we used the NPCC's avoided cost of generation for the Eastern Oregon and Washington/Idaho North region from its High Fuel Price Case under the Fifth Power Plan.

Our final sensitivity features the highly unlikely combination of all the pessimistic assumptions from our first three sensitivities. Under this sensitivity, we used the same wind cost and performance assumptions as described under sensitivity 1, and the same avoided cost of generation assumption as under sensitivity 3. The effect is that wind power costs are higher and decline at a slower rate over time compared with the expected case, while the cost of

[13] For more information about the JEDI model, see *http://www.eere.energy.gov/windpoweringamerica/jedi.html*.

conventional resources declines significantly compared with today. We also compared the total electricity bills from this sensitivity with the total electricity bills from an alternative reference case in order to examine the effect of a future where conventional energy costs are higher—as has been the experience in recent years. To reflect higher conventional energy costs, we made this comparison using the total electricity bills from our expected reference case.

**Table 4. Comparison of Key Assumptions, Expected Case and Sensitivities**

| Assumption | Expected Case | Sensitivity 1 | Sensitivity 2 | Sensitivity 3 | Combination of Sensitivities 1, 2, and 3 |
|---|---|---|---|---|---|
| Wind power costs | \$1,557/kW from 2005–2008, gradually reducing to \$1,050/kW by 2025 | \$1,557/kW from 2005–2025 | Expected Case | Expected Case | \$1,557/kW from 2005–2025 |
| Federal PTC | Extended through 2012 | Expected Case | Expires in 2007 | Expected Case | Expires in 2007 |
| National $CO_2$ regulation | Implemented in 2013 | Expected Case | Expected Case | Not included | Not included |
| Avoided cost of generation | NPCC High Fuel Case through 2012, then NPCC Mid Case plus $CO_2$ price from 2013–2025 | Expected Case | Expected Case | NPCC High Fuel Case from 2008–2025 | NPCC High Fuel Case from 2008–2025 |

These sensitivities represent a more pessimistic perspective, and it is our assessment that energy technology costs and federal policy activities are much more likely to be consistent with the expected case. Of course, other sensitivities that reflect plausible, but more optimistic conditions for the development of clean energy resources are also possible. For example, renewable energy technology costs could decline more quickly and to lower levels than assumed under our expected case and the costs of conventional resources could remain at today's levels or climb even higher. It is also conceivable that the federal PTC could be extended beyond 2012 or that $CO_2$ prices could be higher than what we assumed. These more optimistic sensitivities are not considered in this analysis.

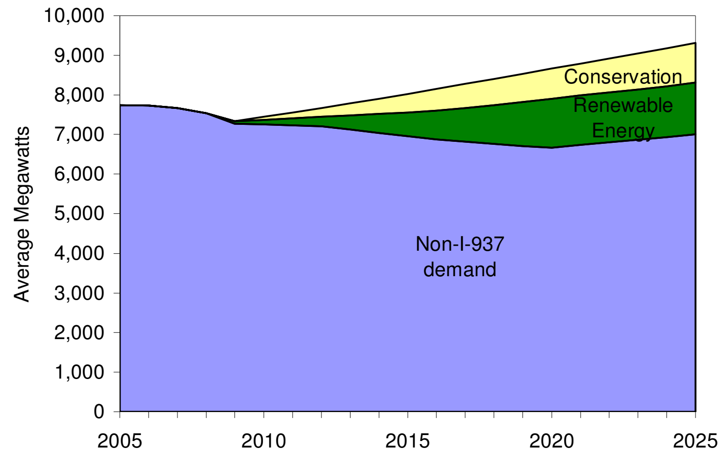
# Results

Below we present the results from our analysis for the scenarios described in our methods and assumptions section. We begin with our expected scenario, and identify the effect of I-937's renewable energy and conservation standards on Washington's energy demand, energy consumers, jobs and economic development, and the environment. We then present the results from our sensitivity analysis, focusing on these same impacts.

## Energy Demand

I-937 would create a stable market for new renewable energy and energy efficiency in Washington. Figure 4 shows the retail electric demand for the 17 utilities affected by the initiative from 2005 to 2025. The renewable energy standard would support nearly 1,300 aMW of renewable resource capacity by 2025. This level of development would produce enough electricity to meet the needs of more than 930,000 average homes.[14] More than 300 aMW of this total is comprised of eligible renewable resource capacity that has already been acquired by qualifying utilities, including wind, landfill gas, and efficiency upgrades at existing hydroelectric facilities (CTED, 2005, and RNP, 2006). The region's strong wind resources would power a majority of the remaining 1,000 aMW of new resources needed to be developed by 2025, with important contributions also coming from landfill gas and bioenergy.

**Figure 4. Effect of I-937 on Retail Electric Demand, Washington 2005 – 2025**




I-937's conservation requirements would support the acquisition of 1,005 aMW of cost-effective energy efficiency from 2010 to 2025. This is enough energy savings to eliminate the need for approximately six typical-size natural gas power plants.[15]

The bulk of the area in Figure 4 represents demand that is not required by I-937. This is demand that can be satisfied by any resources that utilities consider economically viable. The implementation of I-937 results in a decline in the conventional resources needed to meet consumer demand. This decline suggests that qualifying utilities may not need to acquire much in terms of new conventional resources, and in some cases, may have excess supplies that can be sold back to the regional electricity market. Table 5 shows the values of the total demand components at various intervals from 2010 to 2025.

**Table 5. I-937 Renewable Energy and Energy Efficiency Requirements (aMW)**

| | 2010 | 2012 | 2016 | 2020 | 2025 |
|---|---|---|---|---|---|
| Renewable Energy Requirement | 118[1] | 237 | 722 | 1,237 | 1,298 |
| Energy Efficiency Requirement | 73 | 225 | 555 | 761 | 1,005 |

[1] The first year of the renewable energy requirement is not until 2012. We assumed, however, a linear ramp up of the renewable energy requirement beginning in 2009.

## Consumer Energy Bills

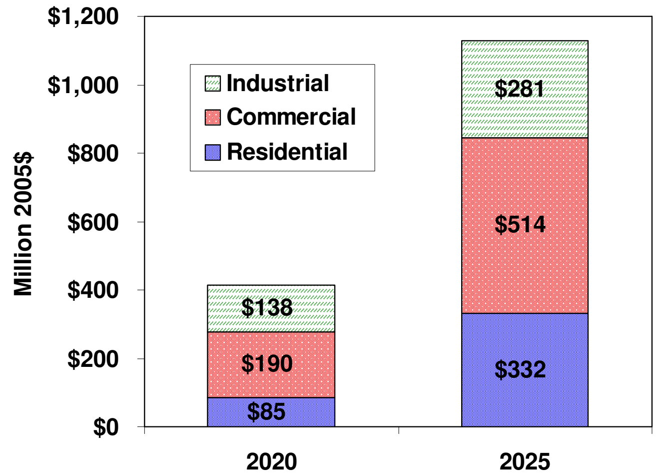
Washington energy consumers currently enjoy some of the lowest electric rates in the nation, due in large part to the significant role that low-cost hydroelectric plays in the power mix. Energy costs are on the rise in Washington, however, as regional utilities pursue new higher cost conventional resources to meet growing power demand. The acquisition of renewable energy and energy efficiency required by I-937 would provide long-term savings to energy consumers.

[14] Assumes average monthly residential consumption of 1,017 kWh, based on 2004 EIA data.
[15] Based on a 305 MW single-unit combined-cycle gas-fired plant, operating at an average capacity of 165 megawatts. Source: NPCC, 2005.

The energy efficiency investments under I-937 are limited to those measures that are cost-effective, thereby guaranteeing that the efficiency gains will reduce the total cost of meeting power supply needs over time. During the next decade, new renewable resources are projected to be cost competitive with new conventional resources such as coal and natural gas. Therefore, both costs and rates would be about the same under the renewable energy standard as they would be if utilities pursued new conventional resources. By 2017, the investments in renewable energy begin to deliver demonstrable savings compared with conventional energy sources.[16]

With the efficiency and renewable energy investments combined, consumers would see *annual* savings on electric bills under I-937 beginning in 2014, with savings reaching 7.2 percent, or $362 million, by 2025. Accumulated electricity savings from the efficiency measures will offset the upfront costs of consumer equipment purchases in just a few years. From 2008 to 2025, *cumulative* savings across all consumer sectors—residential, commercial, and industrial—would total 2.9 percent, or $1.13 billion (Figure 5).[17]

**Figure 5. Cumulative Consumer Electricity Bill Savings, by Sector**




During this period, a typical Washington household would save an average of nearly $1.50 on its monthly electricity bill. By 2025, monthly savings would reach nearly $4.00.[18]

This analysis does not examine the effect that I-937 has on consumer natural gas bills. Several state and federal level analyses have found that the increased use of renewable energy and energy efficiency would create competition with natural gas power plants, leading to reduced gas demand and lower prices (Chen et al., 2006, and Wiser et al., 2005). As a result, homes and businesses that use natural gas for heating would likely see gradually increasing savings on their monthly natural gas bills under I-937. Likewise, large consumers that use natural gas for industrial processes would also see significant benefits from lower natural gas prices. And because natural gas is playing a growing role in the power supply mix for electric utilities in the Pacific Northwest, consumers could see additional savings on electric bills. For example, Colorado's largest utility, Xcel Energy, has announced that it has saved its customers $4.21 million in fuel costs in 2004 and $9.75 million in 2005, by purchasing wind power (Pater, 2006).

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[16] If the cost of conventional generation stays at today's high prices, or increases further, then consumer savings would begin earlier and be greater than reported here.

[17] Cumulative results are in net present value 2005$ using a four percent real discount rate. Though I-937 does not officially begin until 2010, we report cumulative results from 2008 to 2025 in order to capture the effects of early acquisition of renewable energy resources.

[18] Assumes average monthly residential consumption of 1,017 kWh in 2004 (EIA, 2005), and declining to 872 kWh per month by 2025 as a result of the energy efficiency measures.

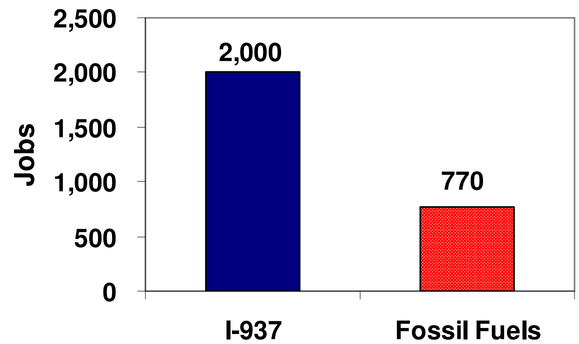
## Jobs and Economic Development Benefits

I-937 would stimulate job creation and economic development in Washington. By 2025, the renewable energy and energy efficiency standards would create 2,000 new jobs in manufacturing, construction, operation, maintenance, and other industries. In fact, the amount of additional renewable energy and energy efficiency needed to meet the requirements would create 2.6 times more jobs than fossil fuels—a net increase of 1,230 jobs by 2025 (Figure 6). It would also generate an additional $138 million in income and $148 million in gross state product in Washington's economy. In addition to new jobs, the implementation of I-937 would help Washington retain its existing jobs in the clean energy industry, estimated in 2004 to number nearly 8,400 and representing more than $500 million in income (Suter, 2005).

Local economies across the state would receive a boost from I-937. By 2025, the initiative would provide Washington:

- $2.9 billion in new capital investment
- $167 million in new property tax revenues or payment in lieu of taxes for local communities
- $30 million in income to rural landowners from wind power land leases[19]

**Figure 6. Job Creation, I-937 vs. Fossil Fuels (2025)**




Renewable energy development has already demonstrated that it can create new high-paying jobs and other economic benefits in Washington. The Hopkins Ridge wind facility, for example, created 22 full-time jobs and averaged 150 jobs over its 10-month construction period. The project's owners contribute more than $1 million in annual tax payments to the local community (PSE, 2006a). The Nine Canyon wind facility—one of the largest public power wind projects (64 MW) in the United States—is contributing nearly $250,000 annually in rent payments to local landowners, and approximately $170,000 annually for local maintenance supply materials and service contracts for road maintenance and power forecasting (Kobus, 2004).

## Environmental Benefits

Increasing energy efficiency and renewable energy use will protect the health of Washington's citizens and environment by reducing global warming pollution from coal- and natural gas-fired power plants. By 2025, I-937 would keep about 4.6 million metric tons of heat-trapping carbon dioxide ($CO_2$) emissions from entering the atmosphere each year— equivalent to taking 750,000 cars off the road. It will also reduce harmful air, water, and land impacts from extracting, transporting, and using fossil fuels, as well as preserve ecological resources for future generations.

## Results from the Sensitivity Analysis

Even under the more pessimistic assumptions examined by our series of sensitivities, I-937 would provide Washington citizens with important economic, environmental, and energy

[19] Results are in cumulative net present value 2005$ using a four percent real discount rate. Job results are for the year 2025.

diversity benefits. Under our first three sensitivities, each of the respective adverse conditions examined would reduce the total consumer electricity bill benefits compared with our expected case. In each case, however, I-937 would still yield long-term savings to consumers (Table 6).

**Table 6. Change in Consumer Electricity Bills, Expected Case and Sensitivities**

| Scenario Description | % Change in Cumulative Consumer Electricity Bills, 2008-2025[1] |
|---|---|
| Expected Case | -2.9 percent |
| Sensitivity 1 – High wind costs | -1.6 percent |
| Sensitivity 2 – Expiration of PTC in 2007 | -2.3 percent |
| Sensitivity 3 – No federal $CO_2$ emission limits | -0.3 percent |
| Combination of Sensitivities 1, 2, and 3 – High wind costs, expiration of PTC in 2007, and no federal $CO_2$ emission limits | 1.0 percent |

[1]Total consumer electric bills for our expected policy case, sensitivity 1, and sensitivity 2 are compared with total consumer electric bills from our expected reference case, which includes the costs of federal $CO_2$ emission limits. Because sensitivity 3 and the combination of sensitivities 1, 2, and 3 do not include federal $CO_2$ emission limits, they are compared with an adjusted reference case that also does not factor in the costs of these limits.

In the unlikely event that all adverse assumptions are combined, consumers would pay slightly more under I-937. However, I-937 would still diversify Washington's electric power mix, create important environmental benefits, and provide a valuable hedge against possible higher future conventional energy costs. For example, when compared with an alternative reference case that meets growing energy needs using higher-priced conventional energy sources, even the minimal costs associated with the combination of all three pessimistic sensitivities (one percent) would be more than offset by the savings that result from less use of fossil fuels. Under this comparison, consumers would actually save about 0.5 percent on their cumulative electricity bills.[20]

Under all sensitivities, I-937 would also still provide significant economic development benefits—such as new capital investment, revenues from taxes and payments in lieu of taxes, and land lease payments for wind power. Under sensitivities 1-3, these benefits would be about the same as under the expected case. Sensitivity 4 would result in slightly lower benefits because the amount of renewable energy development that occurs is less. The higher wind costs and lower avoided generation costs assumptions under sensitivity 4 would invoke the cost cap for renewable resource expenditures from 2018 to 2025. As a result, there is a shortfall of approximately 225 aMW of renewable energy capacity in 2025, when the level of renewable energy in the power supply reaches 13.1 percent. In addition, fewer jobs would be created under all sensitivities, due to less consumer electricity bill savings in the first three sensitivities, and to both slightly higher consumer costs and less renewable energy development in sensitivity 4.

The amount of $CO_2$ emission reductions from power plants would be about the same as in the expected case under sensitivities 1 and 2, and actually higher under sensitivities 3 and 4. Without a national policy regulating $CO_2$ emissions, utilities in the Pacific Northwest are likely to pursue more new coal resources than natural gas. Therefore, under sensitivity 3 and 4, renewable energy largely displaces new coal power facilities instead of natural gas plants—increasing the marginal

[20] To illustrate the effect on the combination of sensitivities 1, 2, and 3 with a future where conventional energy costs are higher, we compared the total electricity bills from this sensitivity with the total electricity bills from our expected reference case. See the Methods and Assumptions – Modeling Sensitivities section for more information.

$CO_2$ emission rate. By 2025, I-937 would reduce about 10.0 MMT of power plant $CO_2$ emissions per year under sensitivity 3, and about 8.9 MMT of power plant $CO_2$ emissions per year under sensitivity 4.

## Conclusion

Our analysis shows that adopting the renewable energy and energy efficiency standards in I-937 would generate significant economic and environmental benefits for Washington. By maximizing cost-effective energy efficiency and diversifying Washington's electricity mix with renewable energy, I-937 would lead to long-term savings on consumer electric bills. It would create jobs and provide important economic development benefits for local communities. It would also reduce harmful air, water, and land impacts from extracting, transporting, and using fossil fuels, as well as preserve ecological resources for future generations.

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