

Executive Summary

Congress has a powerful opportunity for making renewable electricity the standard in the United States as it considers deregulating the electricity industry. Lawmakers from both houses and both parties have introduced proposals specifying that a gradually increasing percentage of the nation's electricity be generated from renewable resources. These proposed renewable portfolio standards (RPS) range from 4 percent in 2010 to 20 percent in 2020. This report examines the costs and benefits of achieving the proposed RPS targets.

The most aggressive of the proposals, offered by Senator James M. Jeffords (R-Vermont), would require a nonhydro renewables target of 20 percent by 2020. Achieving this target would accomplish the following:

- Result in the development of renewable technologies in every region of the country, with the Plains, Western, and Mid-Atlantic states

generating 20 percent or more of their electricity from a diverse mix of renewable technologies.

- Stabilize carbon dioxide (CO₂) emissions from electricity generation at year 2000 levels through 2020 at a cost of \$18 per ton of CO₂ reduced. (See figure ES1)
- Result in average electricity prices falling 13 percent by 2020 instead of 18 percent under a business-as-usual scenario. (See figure ES2)
- Reduce a typical (500 kWh/month) household's expected average electric bill savings of \$5.90 per month between 1998 and 2020 under a business-as-usual scenario by \$1.33. (See figure ES3)
- Lower the projected growth in average natural gas prices by 5% in 2020. As a result, households that heat with natural gas would pay 13 cents less per month on their combined electricity and natural gas bills in 2020 than without an RPS.

Figure ES1. CO₂ Emissions from Electricity Generators

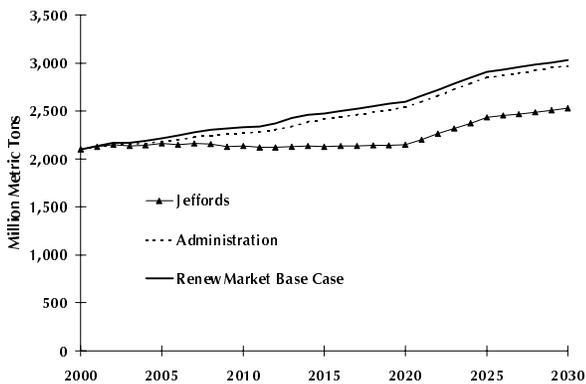


Figure ES2. Average Consumer Electricity Prices

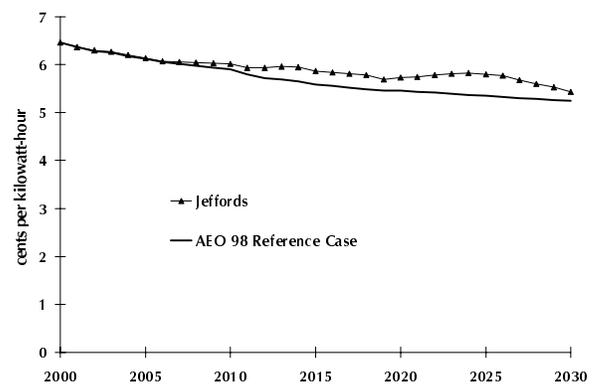
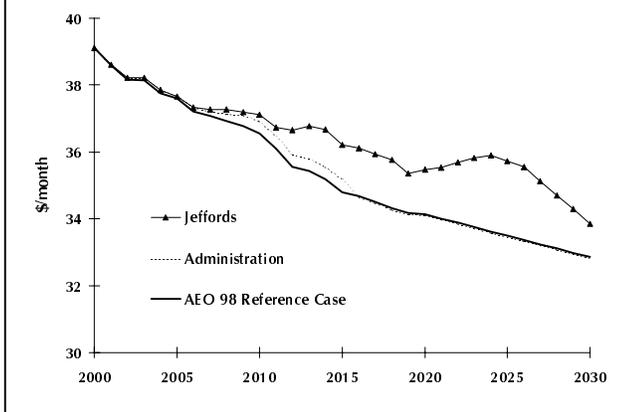


Figure ES3. Average Monthly Electricity Bill for a Typical Nonelectric Heating Household



A proposal offered by the Clinton Administration would increase renewables to 5.5 percent of total generation in 2010. Meeting this target would do the following:

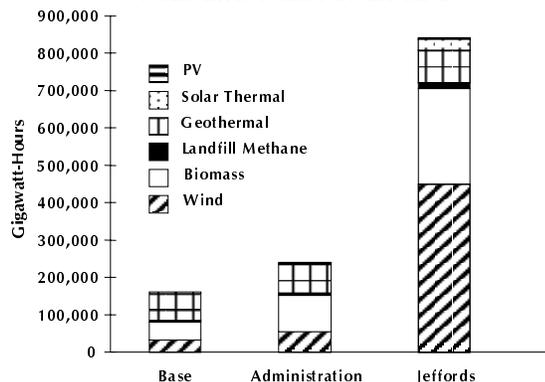
- Result in the development of renewable technologies in most regions of the country, with the Western, New England, Mid-Atlantic and High Plains states generating 5 percent or more of their electricity from non-hydro renewables.
- Reduce CO₂ emissions from electricity generation 2 percent below projected levels at a cost of \$7 per ton of CO₂ reduced.
- Result in average electricity prices falling 15 percent by 2015 instead of 16 percent under a business-as-usual scenario. After the Administration's RPS ends in 2015, electricity prices would be lower than projected levels due to lower gas prices for electricity generators.
- Reduce a typical (500 kilowatt-hours per month) household's expected average electric bill savings of \$5.23 per month between 1998 and 2015 under a business-as-usual scenario by 36 cents.
- Lower the projected growth in average natural gas prices by 1 percent in 2020. As a result, households that heat with natural gas would pay 24 cents less per month on their combined electricity and natural gas bills than without an RPS.

Based on these results, we conclude that a minimum national renewable generation requirement would accomplish the following:

- **Provide considerable environmental benefits.** By displacing fossil fuels, renewables would help the United States reduce heat-trapping gases and other pollutants that harm the environment and human health. An aggressive renewables target that increases about 1 percent each year to 20 percent in 2020 would be needed to eliminate the growth in CO₂ emissions in the electricity sector and reduce coal generation below current levels.
- **Reduce CO₂ emissions at a low cost.** Our analysis clearly shows that renewables can reduce CO₂ emissions at a much lower cost than indicated in some recent studies funded by the fossil fuel and electric power industries, government and non-governmental energy research organizations. These studies predict that reducing CO₂ emissions 7 percent below 1990 levels, as specified in the Kyoto Protocol, will cost between \$60 and \$95 per ton of CO₂ reduced through domestic actions only. Our analysis, which indicates that the United States could achieve a renewables target of 20 percent in 2020 at a cost of \$18 per ton of CO₂ reduced, clearly shows that an RPS is a relatively inexpensive domestic policy for helping the United States meet the Kyoto targets. Furthermore, these cost projections do not take into account the considerable cobenefits society would reap from lowering emissions that cause acid rain, smog, and respiratory problems.
- **Diversify the nation's electricity mix.** Under the RPS proposals, nonhydro renewable resources would provide up to five times more electricity than the projected business-as-usual levels. Biomass, wind, and geothermal would provide the vast majority of the total renewable generation. Solar and landfill methane would also experience significant growth, but provide a relatively small share of total generation (See figure ES4). Greater fuel diversity from a variety of renewable technologies would help insulate the US economy from fossil-fuel price increases and supply shortages. It would also provide an important opportunity for the United States to build a strong domestic renewable energy industry with a large export potential, while creating jobs in high-tech industries and rural economies.



Figure ES4. Breakdown of Total Nonhydro Renewable Generation in 2020 with and without an RPS



- Expand renewable energy development throughout the nation.** Current nonhydro renewable energy generation in the United States is concentrated in California, the Northeast, and the Southeast. As the RPS targets increase, renewable energy development will spread across the United States, and particularly in the Great Plains, Western, and Mid-Atlantic states.
- Have only a modest impact on electricity prices.** Average electricity prices are projected to fall 13 to 17 percent between 1997 and 2020 under the RPS proposals, compared with an 18 percent decline without an RPS. According to the results of national polls, most households would be willing to pay more than \$2 extra per month for renewables, and would thus appear willing to support a renewables target of 20 percent in 2020. Furthermore, the incremental cost of meeting the renewables targets falls over time, as the costs of renewable technologies decline through mass production and improved performance.
- Lower natural gas prices.** By displacing some of the projected growth in natural gas use for generating electricity, renewables would put competitive pressure on fossil-fuel prices, and reduce the projected growth in natural gas prices for all gas consumers. For the over 50 percent of households that heat with natural gas, gas savings completely offset the slightly higher electricity costs over time. Industry, which consumed 40 percent of all the natural gas used in 1996,

would also reap significant savings. Even with an aggressive renewables target of 20 percent in 2020, however, total natural gas generation would still nearly quadruple from 1997 levels.

A number of other studies have shown similar results. For example, an analysis by the Energy Information Administration (EIA) found that achieving a 10 percent penetration of nonhydro renewables in 2010 would result in a 3 percent higher average electricity price compared with no RPS—but the price would still be 17 percent lower in 2020 than it was in 1996. The study also found a 10 percent drop in projected electricity sector carbon emissions and a 8 percent drop in projected total nitrogen oxide emissions in 2020. Furthermore, a close examination of the EIA study revealed major savings for consumers that were not made explicit in the report. First, higher electricity prices are projected to encourage investments in more efficient technologies and reduce the demand for electricity. Second, average natural gas prices are projected to drop 6 percent in 2020, yielding savings for gas consumers. Including these effects reduces the projected cost of the RPS in the EIA study from \$10.5 billion to \$1.8 billion in 2020.*

The results of our analysis provide the following important insights into designing an effective RPS policy:

- To maximize the development of a diverse mix of new renewable technologies, to achieve a greater regional distribution of development, and to produce meaningful environmental improvement, RPS targets should be set near the high end of the range of proposals studied.
- To provide a stable and predictable market for renewable developers, reduce potential price volatility, and eliminate the need for a cost cap, the RPS targets should increase gradually over a long period of time.
- If a cost cap is desired, it should be set just above the expected market price of renewable energy credits. A cap that is set too low can result in a

* Gas savings to consumers and the effect on electricity sales from higher electricity prices under the RPS were not quantified in the EIA report. We calculated these impacts using the detailed results of EIA's analysis generated with the National Energy Modeling System (NEMS) and provided to us by EIA staff.



shortage of renewable generation relative to the target, increase administrative costs, and reduce market efficiencies.

- To encourage the development of new renewable technologies, existing hydropower and municipal solid waste incineration should not be eligible for credits under an RPS. Our analysis indicates that these facilities do not need additional income to continue operating. Including them in the RPS therefore raises its costs unnecessarily, limits the participation of emerging renewable technologies with a greater potential for cost reductions, and produces no environmental benefits.

If anything, the actual cost of the RPS is likely to be less than our analysis indicates. First, if designed properly, an RPS would provide a stable market for renewable technologies, which could lower financing costs. Second, the historical record of forecasting fossil fuel prices shows that most such forecasts have been wrong. With higher fuel prices, renewables would be even more valuable, ensuring that there will be a ready supply of advanced technologies not subject to fossil fuel price escalation. Third, our analysis does not include the benefits renewables provide in reducing the environmental and other societal costs of fossil fuels and nuclear power that are not reflected in energy prices.

Ideally, the RPS would be combined with other renewable energy and energy efficiency policies that

have been enacted in a number of states and proposed at the federal level. For example, renewable energy funds could be used to lower the costs and encourage the development of emerging technologies like photovoltaics, which participate at relatively low levels under an RPS. Requiring electricity providers to disclose their fuel sources and emissions on electricity bills—like nutrition labels—would allow consumers to make an informed decision about purchasing cleaner electricity. Requiring all power plants to meet the same emission standards would put renewables on a more equal footing with fossil fuels. Allowing customers who own renewable technologies to sell any excess electricity generated back to their electricity providers at a fair rate, would encourage the development of small generation, increase the reliability of the electricity system, and reduce the need for costly investments in power lines. Enacting rules that would allow renewable generators equal access to the transmission system would also facilitate the development of renewables under an RPS.

Our analysis clearly shows that creating a minimum national standard for electricity generated from clean renewable resources is an powerful mechanism for capturing some of the public benefits of renewables. As electricity generation becomes increasingly competitive and greater emphasis is placed on short-term prices, an RPS will be especially important for capturing the long-term environmental and economic benefits of renewables.

