RENEWABLE ENERGY AND ELECTRICITY:
DIVERSITY, STABILITY, SECURITY, AND ENVIRONMENTAL STEWARDSHIP

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I. Introduction

The Union of Concerned Scientists (UCS) is a nonprofit organization of more than 60,000 citizens and scientists working for practical environmental solutions. For more than two decades, UCS has combined rigorous analysis with committed advocacy to reduce the environmental impacts and risks of energy production and use. Our clean energy program focuses on encouraging the development of clean and renewable energy resources, such as solar, wind, geothermal and biomass energy, and on improving energy efficiency.

We favor the adoption of policies to increase the use of renewable energy resources in our nation's electricity generation mix. Such policies are needed to meet our future electricity needs, diversify our electricity supply, reduce the vulnerability of our energy system, stabilize electricity prices, and protect the environment. Specifically, we endorse a renewable electricity standard, sometimes also known as a renewable portfolio standard -- a market-based mechanism that requires utilities to gradually increase the portion of electricity produced from renewable resources.

The electricity industry penetrates every sector of the economy and our lives. It keeps our food fresh. It lights up the darkness. It powers the manufacturing process. It runs life-giving medical systems and mind-enriching information systems. It helps warm us in the winter and cools us in the summer.

As important as electricity is to the economy, the tragic events of September 11th have brought renewed attention to how vital and connected our energy system is to national security. The vulnerability of the energy infrastructure to attack has been increasingly recognized as a significant issue, with terrorist threats reported to nuclear power plants and natural gas pipelines, and heightened security implemented at dams, power plants, refineries, liquefied natural gas tankers and terminals, and the electrical grid.

Electricity use also has a significant impact on the environment. Electricity accounts for less than three percent of US economic activity. Yet, it accounts for more than 26 percent of smog-producing nitrogen oxide emissions, one-third of toxic mercury emissions, some 40 percent of climate-changing carbon dioxide emissions, and 64 percent of acid rain-causing sulfur-dioxide emissions.

Unfortunately, there are no quick fixes to make the United States energy independent, ensure price stability, or clean up the air we breathe. However, investments in domestic renewable energy sources, together with continued efficiency improvements, can gradually reduce our dependence on imports and reduce the vulnerability of the US energy system to disruption of supplies or to attack. Investments that increase fuel diversity strengthen the ability of our economy to withstand supply interruptions or price shocks from any one fuel source. Investments in indigenous renewable energy sources keep money circulating and creating jobs in regional economies, and create export opportunities. And of course, investments in clean air benefit everyone that breathes the air.

By investing in renewable energy, our nation promotes a host of important public goods: national security, fuel diversity, price stability, universal and reliable electric service, economic development, and a healthier environment. Most importantly, investing in renewable energy can provide all these benefits *and* reduce electricity costs.

In this testimony, we review the potential for renewable energy and how it can help promote these public goods. We then present the renewable energy standard for electricity as the best policy mechanism for reducing market barriers and stimulating the development of renewable energy resources. Finally, we review three recent studies that show we can significantly improve our efficiency and increase the contribution of renewable energy to our electricity mix, while lowering consumer energy bills.

II. Renewable Energy Potential, Benefits, and Barriers

The United States is blessed by an abundance of renewable energy resources from the sun, wind, and earth. The *technical* potential of good wind areas, covering only 6 percent of the lower 48 state land area, could theoretically supply more than one and a third times the total current national demand for electricity. An area just over one hundred miles by one hundreds miles in Nevada could produce enough electricity from the sun to meet annual national demand. We have large untapped geothermal and biomass (energy crops and plant waste) resources. Of course, there are limits to how much of this potential can be used *economically*, because of competing land uses, competing costs from other energy sources, and limits to the transmission system. The important question is how much it would cost to supply a specific percentage of our electricity from non-hydroelectric renewable energy sources. As this testimony will later show, recent analyses

demonstrate we could affordably generate at least 20 percent of our electricity from non-hydro renewable energy by 2020.

The benefits of renewable energy are as plentiful as the resource itself – environmental improvement, economic development, and increased fuel diversity and national security.

Harnessing renewable energy conserves natural resources for future generations, and reduces the environmental and public health impacts of mining, refining, transporting, burning, and disposing of wastes from fossil fuels, as well as reducing air emissions. Renewable resources also provide insurance against increased costs from stricter environmental regulations in the future.

Renewable energy provides new economic development opportunities, especially in rural areas that are rich in wind and biomass resources. According to the US Department of Energy, generating 5 percent of the country's electricity with wind power by 2020 would add $60 billion in capital investment in rural America, and create 80,000 new jobs. Renewable energy technologies also offer the potential for a very large export market, as many countries around the world are increasing their use of renewable resources.

Renewable energy technologies diversify our energy resource portfolio, reducing exposure to energy supply interruptions and price volatility, which can affect the entire economy. Indeed, Stephen Brown, director of energy economics at the Dallas Federal Reserve Bank, notes that "nine of the 10 last recessions have been preceded by sharply higher energy prices." Two years ago, soaring natural gas prices was one key factor in the California energy crisis that caused rolling blackouts and cost energy consumers billions of dollars. There are now significant indications that

the natural gas price volatility experienced during 2001 was not an isolated event. Just last week, as the composite price of March natural gas on the New York Mercantile Exchange *jumped 65 percent in one day*, the Wall Street Journal reported industry observers as saying that "the U.S. is entering a prolonged period of higher natural-gas prices, and the days of $3 natural gas, which lasted from the mid-1980s until about 2000, may be gone."

There is also a growing recognition that renewable energy and efficiency can enhance energy security. An official banner at the Administration's Renewable Energy Summit in the fall of 2001 read: "Expand Renewable Energy For National Security." James Woolsey, former head of the Central Intelligence Agency, Robert McFarlane, President Reagan's former national security advisor, and Admiral Thomas Moorer, former chair of the Joint Chiefs of Staff, together wrote Congressional leaders in September 2001 urging enactment of minimum standards for renewable fuels and electricity, along with an increase in energy efficiency funding, in order to increase national security.

In spite of these compelling environmental, economic, and security benefits, renewable energy technologies continue to face many market barriers, which unnecessarily keep them from reaching their full potential.

Renewable energy has made great strides in reducing costs, thanks to research and development and growth in domestic and global capacity. The cost for wind and solar electricity has come down by 80-90 percent over the past two decades. However, like all emerging technologies, renewable resources face commercialization barriers. They must compete at a disadvantage against the

entrenched industries. They lack infrastructure, and their costs are high because of a lack of economies of scale.

Renewable energy technologies face distortions in tax and spending policy. Studies have established that federal and state tax and spending policies tend to favor fossil-fuel technologies over renewable energy. A recent study by the Renewable Energy Policy Project showed that between 1943 and 1999, the nuclear industry received over $145 billion in federal subsidies vs. $4.4 billion for solar energy and $1.3 billion for wind energy. Another study by the non-partisan Congressional Joint Committee on Taxation projected that the oil and gas industries would receive an estimated $11 billion in tax incentives for exploration and production activities between 1999 and 2003. In addition to these subsidies, conventional generating technologies enjoy a lower tax burden. Fuel expenditures can be deducted from taxable income, but few renewable technologies benefit from this deduction, since most do not use market-supplied fuels. Income and property taxes are higher for renewable energy, which require large capital investments but have low fuel and operating expenses.

Many of the benefits of renewable resources, such as reduced pollution and greater energy diversity, are not reflected in market prices, thus eliminating much of the incentive for consumers to switch to these technologies. Other important market barriers to renewable resources include: lack of information by customers, institutional barriers, the small size and high transaction costs of many renewable technologies, high financing costs, split incentives among those who make energy decisions and those who bear the costs, and high transmission costs.

Some have called for future support of renewable energy through "green marketing," selling portfolios with a higher renewable energy content (and lower emissions) to customers who are willing to pay more for them. We strongly support green marketing as a means to increase the use of renewable energy and reduce the environmental impacts of energy use. Surveys show that many customers are willing to pay more for renewable energy, and pilot programs have shown promising, but not overwhelming results.

Green marketing is not a substitute for sound public policy, however. There are many barriers to customers switching to green power, not the least of which is inertia. More than fifteen years after deregulation of long-distance telephone service, half of telephone customers still had not switched suppliers, even though they could get much lower prices by doing so. A recent study by the National Renewable Energy Laboratory projects that in an optimistic scenario, green marketing could increase the percentage of renewable energy in our electricity mix from about 2 percent today to only about 3 percent in ten years.

With green electricity, the benefits of any individual customer's choice accrue to everyone, not the individual customer. Green customers gets the same undifferentiated electrons and breathe the same air as their neighbors choosing to buy power from cheap, dirty coal plants, creating a strong incentive for people to be "free riders" rather than pay higher costs for renewable resources. People recognize this public benefits aspect of green power. While they consistently say they are willing to pay more for electricity that is cleaner and includes more renewable energy, they overwhelmingly prefer that everyone pay for these benefits to relying on volunteers. A deliberative poll by Texas utilities found that 79 percent of participants favored everyone paying a small amount to support renewable energy, versus 17 percent favoring relying only on green marketing.

III. The Renewable Energy Standard

A number of complementary policies should be enacted to reduce market barriers to renewable energy development:

- Extending production tax credits of 1.7 cents per kWh and expanding them to cover all clean, renewable resources (excluding hydropower)
- Enacting a federal public benefit fund to match state programs for energy efficiency, renewable energy, research and development, and protecting low-income customers
- Adopting national net metering standards, allowing consumers who generate their own electricity with renewable energy systems to feed surplus electricity back to the grid and spin their meters backward, thus receiving retail prices for their surplus power production
- Increasing spending on renewable energy research and development

The deployment of all these policy solutions will be required to truly level the playing field for renewable energy. However, we believe that a national Renewable Electricity Standard for electricity – also known as a Renewable Portfolio Standard (RPS) is the cornerstone of any comprehensive policy approach to stimulate renewable energy development. A national RPS can diversify our energy supply with clean, domestic resources. It will help improve our national security, stabilize electricity prices, reduce natural gas prices, reduce emissions of carbon dioxide—which are heating up the earth and threaten to destabilize the climate— and other harmful air pollutants, and create jobs—especially in rural areas—and new income for farmers and ranchers.

For these reasons, we believe a national RPS should be included in any electricity bill reported by this Committee.

The RPS is a market-based mechanism that requires utilities to gradually increase the portion of electricity produced from renewable resources such as wind, biomass, geothermal, and solar energy. It is akin to building codes, or efficiency standards for buildings, appliances, or vehicles, and is designed to integrate renewable resources into the marketplace in the most cost-effective fashion.

By using tradable "renewable energy credits" to achieve compliance at the lowest cost, the RPS would function much like the Clean Air Act credit-trading system, which permits lower-cost, market-based compliance with air pollution regulations. Electricity suppliers can generate renewable electricity themselves, purchase renewable electricity and credits from generators, or buy credits in a secondary trading market. This market-based approach creates competition among renewable generators, providing the greatest amount of clean power for the lowest price, and creates an ongoing incentive to drive down costs.

Thirteen states—Arizona, California, Connecticut, Iowa, Maine, Massachusetts, Minnesota, Nevada, New Jersey, New Mexico, Pennsylvania, Texas, and Wisconsin—have enacted minimum renewable energy requirements. But energy production creates national economic and environmental problems that need national solutions. The U.S. Senate recognized this need last year when they passed the first-ever national renewable energy standard with strong bi-partisan support. As part of comprehensive energy legislation (HR 4), the Senate passed a 10 percent by 2020 renewable energy standard that, if signed into law, would have saved consumers money on

their energy bills and resulted in the U.S. increasing its total homegrown renewable power to over 74,000 megawatts (MW). This level of renewable development would produce enough electricity to meet the needs of 53 million typical homes.

The RPS is the surest mechanism for securing the public benefits of renewable energy sources and for reducing their cost to enable them to become more competitive. It is a market mechanism, setting a uniform standard and allowing companies to determine the best way to meet it. The market picks the winning and losing technologies and projects, not administrators. The RPS will reduce renewable energy costs by:

- Providing a revenue stream that will enable manufacturers and developers to obtain project financing at a reasonable cost and make investments in expanding capacity to meet an expanding renewable energy market.
- Allowing economies of scale in manufacturing, installation, operation and maintenance of renewable energy facilities.
- Promoting vigorous competition among renewable energy developers and technologies to meet the standard at the lowest cost.
- Inducing development of renewables in the regions of the country where they are the most cost-effective, while avoiding expensive long-distance transmission, by allowing national renewable energy credit trading.
- Reducing transaction costs, by enabling suppliers to buy credits and avoid having to negotiate many small contracts with individual renewable energy projects.

Some people have asked why hydropower is not eligible to earn renewable energy credits in most RPS proposals. The primary reason for not including hydro is that it is a mature resource and technology. In most cases, it is already highly competitive. It will not benefit appreciably from the cost-reduction mechanisms outlined above, and an RPS that included hydro would produce negligible, if any, increases in hydro generation.

Some people have also expressed concerns about the variable output of renewable sources like solar and wind, and believe that an RPS would affect the reliability of our energy system. However, the electric system is designed to handle unexpected swings in energy supply and demand, such as significant changes in consumer demand or even the failure of a large power plant or transmission line. Solar energy is also generally most plentiful when it is most needed—when air-conditioners are causing high electricity demand. There are several areas in Europe, including parts of Spain, Germany, and Denmark, where wind power already supplies over 20 percent of the electricity with no adverse effects on the reliability of the system. In addition, several important renewable energy sources, such as geothermal, biomass, and landfill gas systems can operate around the clock. Studies by the EIA and the Union of Concerned Scientists show these non-intermittent, dispatchable renewable plants would generate about half of the nation's non-hydro renewable energy under a 10 percent RPS in 2020. Renewable energy can increase the reliability of the overall system, by diversifying our resource base and using supplies that are not vulnerable to periodic shortages or other supply interruptions.

IV. Benefits of a Renewable Portfolio Standard

Three recent studies, one by the U.S. Energy Information Administration (EIA) and two by the Union of Concerned Scientists, show that a 10 percent RPS by 2020 is easily achievable and can

stimulate economic development and increase energy security, while reducing consumer energy bills as well as local and global environmental hazards. Increasing the RPS to 20 percent by 2025 would result in greater diversity, environmental, and economic development benefits compared to the 10 percent standard, and would still provide savings to energy consumers. When combined with energy efficiency measures and additional renewable energy policies, the RPS can significantly lower consumer energy bills.

EIA Analysis: The EIA study was conducted at the request of Senator Frank Murkowski, as the Senate considered inclusion of the RPS as part of comprehensive national energy legislation (S.1766). As part of their analysis, the EIA examined the costs of using the RPS to achieve levels of 10 percent (both with and without the sunset provision in S.1766) and 20 percent renewable electricity supplies by the year 2020.

The EIA scenarios found benefits to consumers from increasing renewable energy use despite including a number of assumptions that are extremely unfavorable to renewable energy. Many of these assumptions were examined and rejected by the Interlaboratory Working Group—made up of experts from the National Renewable Energy Lab, Oak Ridge National Lab, Pacific Northwest Lab, Battelle Memorial Institute, and Lawrence Berkeley National Lab—in their *Scenarios for a Clean Energy Future* (IWG, 2000). In some of the most important such assumptions, EIA

- Used higher cost and worse performance assumptions for most renewable technologies than recent experience or projections by the Electric Power Research Institute and DOE;
- Arbitrarily increased the capital cost of wind, biomass, and geothermal technologies by up to 200 percent in a given region after a fairly small amount of the regional potential

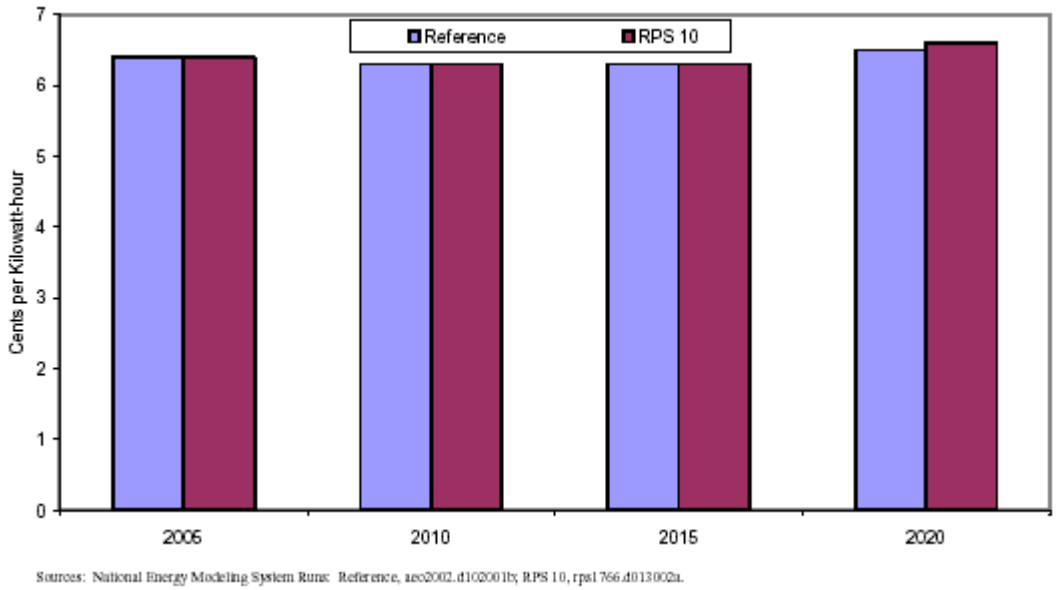
is met; more than 90 percent of the highest value wind resources in the US, for example, are assigned a capital cost multiplier of 200 percent; and

- Limited the penetration of variable output resources like wind and solar power to 15 percent of a region's electricity generation; in parts of Germany, Denmark and Spain, wind power is already providing more than 20 percent of total electricity generation.

These assumptions, and others, led to projections of very high renewable energy prices in high renewable energy penetration scenarios. With the availability and penetration of the lowest cost wind and biomass resources assumed to be sharply limited, higher RPS levels in EIA's version of the model require deploying more expensive renewable resources.

Despite these overly conservative assumptions for renewable energy cost and availability, EIA still found that the 10 percent RPS would have *virtually no impact* on retail electricity prices. Figure 1 shows that, in 2020, electricity prices would be only one-tenth of one cent per kilowatt-hour higher than business as usual under a 10 percent RPS.

Figure 1. Retail Electricity Prices in the Reference and RPS 10 Cases



Energy Information Administration, *Impacts of a 10-Percent Renewable Portfolio Standard,* SR/OIAF/2002-03, February 2002. Figure 5, p. 20

Even these small increases in electricity prices are largely offset, however, by lower natural gas prices. Diversifying the electricity mix with renewable energy helps stabilize electricity prices by easing pressure on natural gas prices and supplies. Under a 10 percent RPS, EIA found that average consumer natural gas prices are 2.2 percent lower than business as usual in 2010, and 1.9 percent lower in 2020. These lower prices would save gas consumers $1.7 billion per year by 2020 (2000 dollars, 8 percent discount rate).

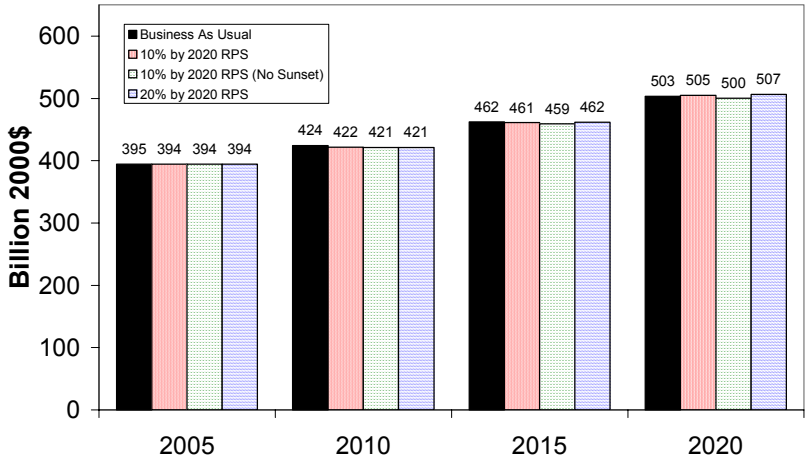
In the key results section of its report, EIA recognizes this benefit of increased renewable energy use by noting that "the retail electricity price impacts of the RPS are projected to be small because the price impact of buying renewable credits and building the required renewable energy is projected to be relatively small when compared with total electricity costs and to be mostly offset by lower gas prices that result from reduced gas use."

However, EIA did not report on the extent to which these lower natural gas prices offset higher electricity costs. By adding total residential, commercial and industrial energy expenditures, it can be seen that total non-transportation energy costs would actually be $2.7 billion *lower* in 2010 and only $1.5 billion or 0.3 percent higher in 2020 under the 10 percent RPS than under business as usual (Figure 2).[1] The net present value *savings* of the RPS scenario would be $6.7 billion compared to the business as usual case (2000 dollars, 8 percent discount rate).

A 10 percent RPS would also help reduce emissions from power plants. Under an RPS, carbon emissions from power plants would be 23 million metric tons or 3 percent lower than business as usual in 2010 and 53 million metric tons or 7 percent lower in 2020, according to EIA.

Figure 2. RPS Cost Comparison

Total Consumer Energy Bills (not including transportation)



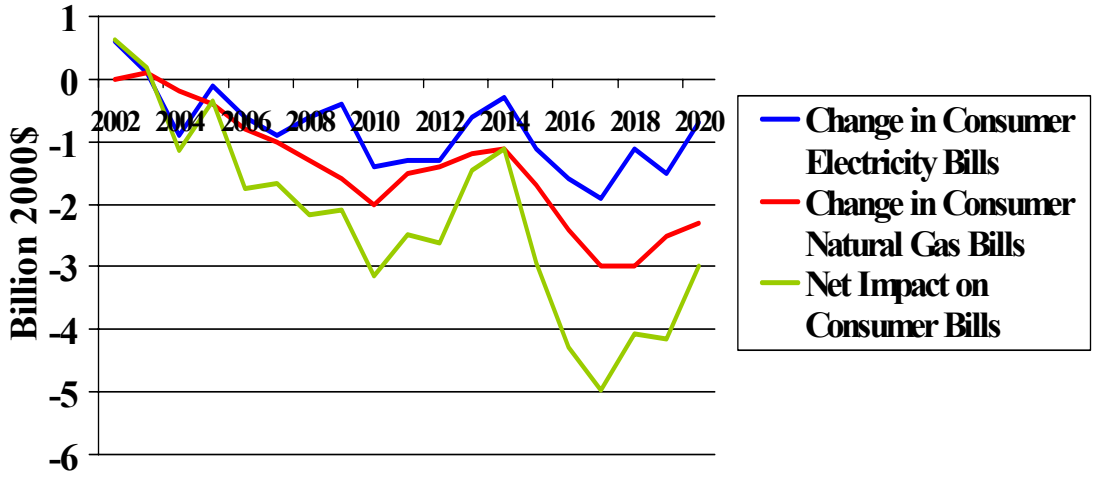
Source: Energy Information Administration, *Impacts of a 10 percent Renewable Portfolio Standard*, SR/OIAF/2002-03. February 2002. National Energy Modeling System Runs: Reference, aeo2002.d102001brps; RPS 10 rps1766.d013002a; RPS 10 No Sunset, 1766ns.d013002a; RPS 20 rps176620.d013102a.

[1] Results obtained through personal communication with Laura Martin at EIA, on March 7, 2002. Tables available upon request.

"No Sunset" Case: The EIA report also examined a 10 percent RPS by 2020 without a key provision included in the original RPS proposed in S.1766 – a 2020 sunset date. EIA found that this sunset provision would cause electric generators to chose an alternative compliance mechanism rather than develop additional renewable energy sources in the later years of the requirement. If the sunset provision was removed from S. 1766 – as was effectively the case in the RPS passed by the Senate – EIA found that there would be a significant impact on the costs and benefits of the RPS.[2] EIA results show that under a 10 percent RPS with no sunset, average retail electricity prices would be unchanged through 2020 compared to business as usual. Average consumer natural gas prices would be 2.3 percent lower than business as usual in 2020. With no change to consumer electricity prices, lower natural gas prices result in savings for consumers on their electricity and natural gas bills throughout the 2002-2020 period (Figure 3). Total non-transportation energy costs would be $3.1 billion lower in 2010 and $3 billion lower in 2020 under the 10 percent RPS than under business as usual (Figure 2). Removing the sunset provision from the 10 percent national standard would also *nearly double total energy consumer savings* to $13.2 billion through 2020.

[2] The sunset does not actually have to be removed, but it must be at least ten years after the date at which the renewable energy ramp-up ends, in order to allow generators that come on-line late in the RPS ramp-up enough time to recover their costs. Otherwise, no renewable energy generation would be added in the last few years of the RPS, and suppliers would instead buy proxy credits from or pay penalties to DOE. The early sunset thus produces less renewable generation and higher costs.

Figure 3. Change in Consumer Energy Bills Under 10% RPS No Sunset



Source: Energy Information Administration, *Impacts of a 10 percent Renewable Portfolio Standard*, SR/OIAF/2002-03. February 2002. National Energy Modeling System Runs: Reference, aeo2002.d102001brps; RPS 10 No Sunset, 1766ns.d013002a.

EIA 20 percent analysis: Results from the EIA analysis also show that increasing the renewable energy standard to 20 percent by 2020 would result in greater diversity and environmental benefits compared to the 10 percent standard, and would still provide savings to energy consumers.

Under a 20 percent RPS, EIA results show *virtually no impact* on retail electricity prices compared to business as usual through 2015. In 2020, electricity prices would be just two-tenths of one cent per kilowatt-hour higher than business as usual.

By diversifying the energy mix even further with a 20 percent RPS, EIA results show an even greater impact on natural gas prices and supplies. Average consumer natural gas prices are 3 percent lower than business as usual in 2010 and 3.6 percent lower in 2020. These lower prices would save gas consumers $3.3 billion per year by 2020.

Similarly to the 10 percent RPS case, EIA results show that lower natural gas prices more than offset the very small increases in electricity prices caused by adding more renewable energy sources to the generation mix. Total consumer energy savings would be $5.7 billion over the next 18 years.

According to EIA, a 20 percent by 2020 RPS would also result in greater carbon emissions savings from power plants. Carbon emissions would be 43 million metric tons or 6 percent lower than business as usual in 2010 and 76 million metric tons or 10 percent lower in 2020.

UCS Analysis: The Union of Concerned Scientists, in *Renewing Where We Live: A National Renewable Energy Standard Will Benefit America's Economy*, investigated the costs and benefits of a 10 percent RPS by 2020 RPS combined with an extension of the Federal renewable energy production tax credit as passed by the Senate in March 2002.

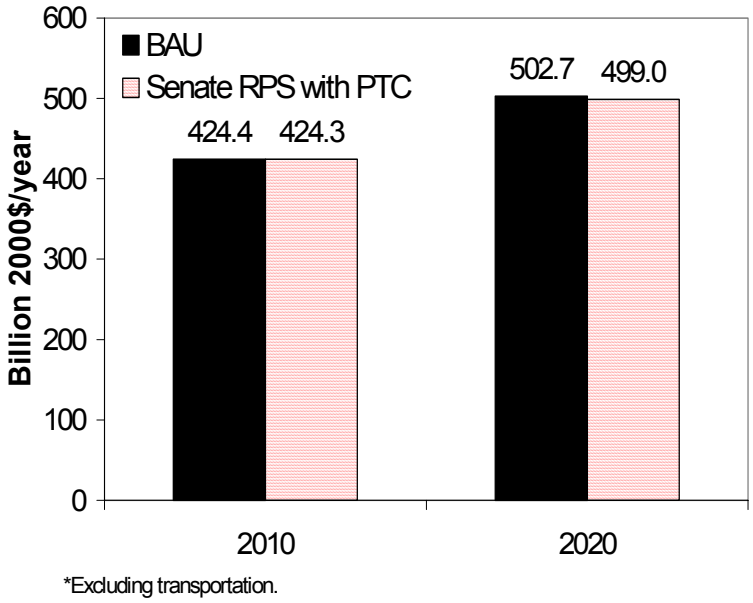
Our analysis used the US Energy Information Administration's NEMS computer model, with scenarios run for UCS by the Tellus Institute. We based our business-as-usual scenario on Annual Energy Outlook 2002 (EIA, 2001), the EIA's long-term forecast of US energy supply, demand, and

prices. The year 2000 is the last year of history in the model, which makes projections through 2020. We modified several NEMS assumptions for renewable energy, generally in line with the IWG Clean Energy Future analysis, in order to model these technologies more accurately.

We found that the national portfolio standard and renewable energy tax credits passed by the Senate would reduce long run energy costs to consumers. Total annual consumer energy bills (not including transportation) would be $100 million lower than business as usual in 2010, and $3.8 billion or 1 percent lower in 2020 (Figure 4). The present value of total consumer savings would be $7.8 billion between 2002 and 2020. If taxpayer costs from the tax credits and increased federal research and development funding for renewable energy are included, total consumer savings would be $2.8 billion.[3] Increased competition from renewable energy leads to lower natural gas prices, which more than offset the slightly higher costs of generating renewable electricity in the United States.

[3] Last year's House and Senate energy bills included renewable energy tax credits worth between $2.6 billion (Congress' estimate) and $5.2 billion (UCS' estimate) over the next 10 years. The bills also included 10 years' worth of subsidies for fossil fuel and nuclear power totaling about $9.1 billion in the Senate bill and $28 billion in the House bill. (Note: these dollar figures are not discounted.)

Figure 4. Total Consumer Energy Bills*



UCS analysis found that under a 10 percent RPS, the United States would increase its total homegrown renewable power to over 74,000 megawatts (MW) by 2020. The majority of this development would be powered by America's strong winds, with significant contributions from biomass and geothermal. This level of renewable development would produce enough electricity to meet the needs of 53 million typical homes.

Renewable energy development resulting from the Senate-passed RPS would bring significant economic benefits to the United States. Through 2020, the national standard would produce

- $17 billion in new capital investment
- $1.2 billion in new property tax revenues for local communities
- $410 million in lease payments to farmers and rural landowners from wind power

UCS also found that the increased use of renewable energy in the United States would reduce air pollution from power plants. Nationally, the renewable energy standard will reduce about 27 million metric tons of carbon emissions a year by 2020. The renewable standard will also reduce harmful water and land impacts from extracting, transporting, and using fossil fuels.

In the future, natural gas is projected to fuel much of the new electricity generation built in the United States without additional policies for renewable energy. This increase in demand for natural gas may lead to natural gas prices that are higher and more volatile than those used in our base case analysis. Based on these assumptions, UCS also examined the effects of a 10 percent RPS on an alternative scenario where wholesale natural gas prices are 35 percent higher by 2020.

UCS found that the more expensive natural gas is, the greater the savings will be from reducing natural gas use through a renewable energy standard. In the scenario that we analyzed, total consumer energy bill savings through 2020 from the renewable standard would more than double to $17.6 billion. Renewable energy generation and related economic development benefits would also increase significantly if gas prices were higher.

In *Clean Energy Blueprint: A Smarter National Energy Policy for Today and the Future*, the Union of Concerned Scientists investigated the costs and benefits of two energy efficiency and renewable energy scenarios, compared to business as usual. We did not examine RPS-only scenarios, as in *Renewing Where We Live* or as EIA did, but looked at a 20 percent RPS in combination with other renewable energy and energy efficiency policies.

We examined a scenario consisting primarily of the policies in the Renewable Energy and Energy Efficiency Investment Act of 2001 (S. 1333), sponsored by Senator Jeffords. In addition to a 20 percent RPS, S. 1333 would have established a federal public benefit fund and net metering. We also assumed that research and development spending on renewable energy and efficiency would increase 60 percent over three years to levels recommended by the President's Committee of Advisors on Science and Technology.

We also investigated the costs and benefits of the RPS with an expanded suite of renewable energy and energy efficiency policies. In addition to the above policies, these included:

- Production tax credits of 1.7 cents per kWh for renewable energy would be extended and expanded to cover all clean, non-hydro renewable resources, helping to level the playing field with fossil fuel and nuclear generation subsidies.
- Combined heat and power: Incentives would be provided and regulatory barriers removed for power plants that produce both electricity and useful heat at high efficiencies.
- Improved efficiency standards: National minimum efficiency standards would be established for a dozen products, generally to the level of good practices today. In addition, existing national standards would be revised to levels that are technically feasible and economically justified.
- Enhanced building codes: States would adopt model building codes established in 1999/2000, as well as new more advanced codes established by 2010.
- Tax incentives would promote efficiency improvements for buildings and equipment beyond minimum standards.

- Industrial energy efficiency measures: Industry would improve its efficiency by 1 to 2 percent per year through voluntary agreements, incentives, or national standards.

Like Renewing Where We Live, this analysis used the US Energy Information Administration's NEMS computer model, with scenarios run for UCS by the Tellus Institute. For this report, we based our business-as-usual scenario on Annual Energy Outlook 2001 (EIA, 2000). The year 1999 is the last year of history in the model, which makes projections through 2020. The efficiency policies were developed by and modeled by the American Council for an Energy Efficient Economy. The calculated energy savings were used to adjust the AEO forecasts. The energy efficiency costs were annualized and added to the results. Once again, we modified several NEMS assumptions for renewable energy, generally in line with the IWG Clean Energy Future analysis, in order to model these technologies more accurately and applied these modifications to both the business-as-usual scenario and the Clean Energy Blueprint.

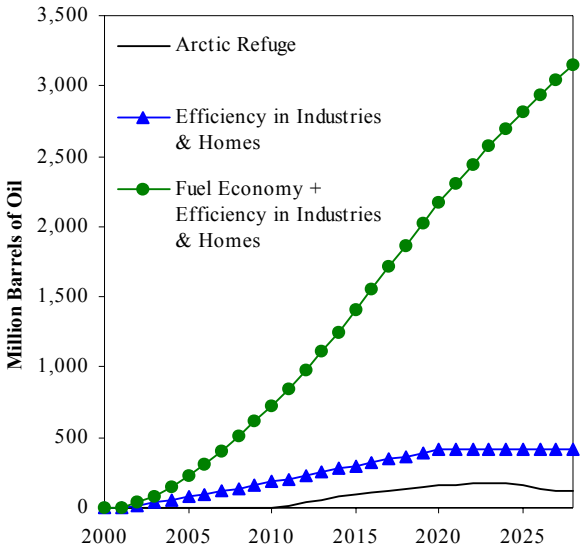
Combined with increased research and development, S. 1333 would save consumers a total of $70 billion between 2002 and 2020, with savings reaching $35 billion per year by 2020. Under a higher-gas-price scenario, cumulative savings would reach $130 billion between 2002 and 2020. In 2020, monthly bills for a typical household would be $34 per month under S. 1333, compared to $38 per month under business as usual and $25 per month under the Clean Energy Blueprint.

Carbon dioxide emissions from power plants would be nearly one-third lower than under business as usual by 2020, while sulfur dioxide emission levels would be 8 percent lower and nitrogen oxide emissions 15 percent lower.

When combined with the energy efficiency and additional renewable energy policies included in the Clean Energy Blueprint, the economic and environmental benefits of the RPS are even greater. Under the Blueprint, total energy use would be 19 percent lower than business as usual by 2020 and only 5 percent higher than 2000 levels, due to increased energy efficiency in homes, offices, and factories. Natural gas use would grow by 8 percent from today's level, but be 31 percent less than business as usual by 2020. Coal-fired electricity generation is 61 percent below business as usual in 2020 and 53 percent lower than today's levels.

Oil use would be reduced by 5 percent, saving over 400 million barrels per year by 2020. More oil would be saved over the next 18 years than is projected to be economically recoverable from the Arctic National Wildlife Refuge over 60 years. The Clean Energy Blueprint did not include oil savings from increased energy efficiency and renewable energy use in the transportation sector. Another recent UCS study, *Drilling in Detroit: Tapping Automaker Ingenuity to Build Safe and Efficient Automobiles*, has shown that fuel economy improvements in cars and light trucks would provide significant oil savings (UCS, 2001). If these savings were combined with the savings from the Clean Energy Blueprint, the United States would save more than 15 times the oil available in the Arctic Refuge at 2001 oil prices (Figure 5) and total oil use would be 9 percent lower in 2010 and 23 percent lower in 2020 than under business as usual. The combined net savings to consumers would increase to over $150 billion per year by 2020 and $645 billion between 2002 and 2020.

Figure 5. Oil Savings from Fuel Economy Standards and Efficiency in Industries and Homes vs. Potential Arctic Refuge Supply

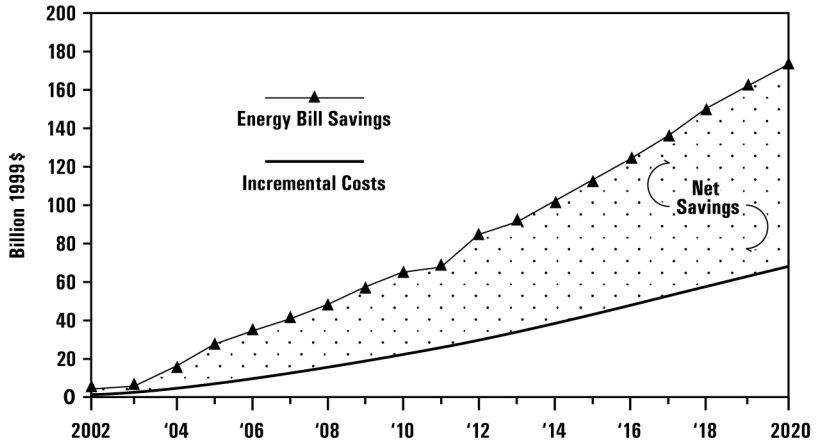


Non-hydro renewable energy sources (wind, biomass, geothermal, and solar) would produce 20 percent of the nation's electricity by 2020. Energy efficiency measures would offset projected growth in electricity use. Combined heat and power plants would meet 39 percent of commercial and industrial electricity needs. Thus, the Clean Energy Blueprint would eliminate the need for 975 of the 1,300 new power plants the administration's *National Energy Policy* says we need by 2020, and retire 180 existing coal plants and 14 nuclear plants, reducing the number of vulnerable energy facilities.

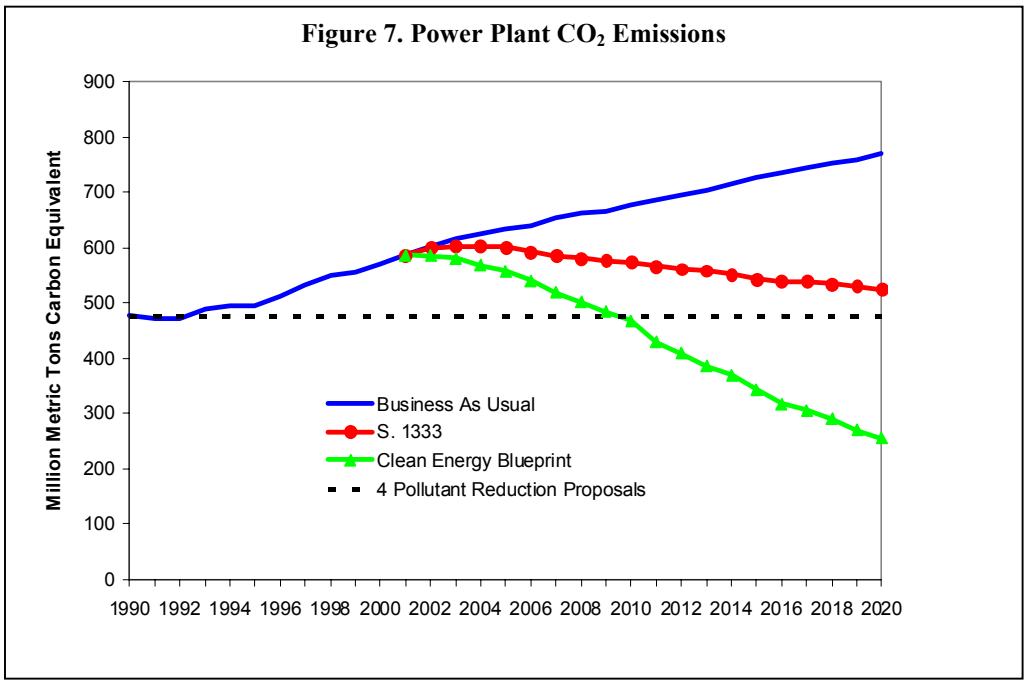
By 2020, because of lower electricity demand and because natural gas is used both to generate electricity and to produce useful heat, overall natural gas generation is 33 percent lower than business as usual in 2020. The Blueprint's efficiency and renewable energy policies reduce natural gas prices by 27 percent by 2020, saving businesses and homes that use natural gas nearly $30 billion per year.

Under the Clean Energy Blueprint, net energy savings would grow to $105 billion per year by 2020, totaling $440 billion between 2002 and 2020 (total savings between 2002 and 2020 are in 1999 dollars using a 5 percent real discount rate.) A typical family would save $350 per year in lower energy bills by 2020 (Figure 6).

Figure 6. Net Savings under the Clean Energy Blueprint



The Clean Energy Blueprint would reduce power plant carbon emissions two-thirds by 2020 compared to business-as-usual projections (Figure 7). Sulfur dioxide emissions, which are the primary cause of acid rain, and nitrogen oxide emissions, a major cause of smog, would both be reduced more than 55 percent.



The Clean Energy Blueprint would reduce the need to drill for natural gas and to build some significant portion of the over 300,000 miles of new pipelines called for in the administration's National Energy Policy. It would also reduce the need to mine, transport, and burn 750 million tons of coal per year by 2020 compared to business-as-usual projections. Moreover, energy efficiency measures and renewable energy facilities can be deployed faster than new fossil and nuclear energy supplies could be developed.

VI. Conclusion

Survey after survey has shown that Americans want cleaner and renewable energy sources, and that they are willing to pay more for them. A survey conducted last year by Mellman Associates found that when presented with arguments for and against a 20 percent RPS requirement, 70 percent of voters support an RPS, while only 21 percent oppose it.

The combination of EIA and UCS studies demonstrate that with appropriate policies, renewable energy technologies can provide Americans with the clean and reliable electricity they desire, while also saving them money, contributing to our nation's energy security and achieving significant reductions in harmful emissions.

The net metering and renewable energy production incentive provisions included in the current draft bill before the committee are laudable and deserving of support. But by themselves, these provisions will not get the job done. A strong, market-friendly renewable energy standard is required to realize the full potential of America's renewable energy resources.

For all of these reasons, we respectfully urge that as the Committee moves forward with its development of national energy legislation, you support inclusion of a renewable portfolio standard. Thank you.