



**25x'25**

**MEETING THE GOAL:  
A PROGRESS REPORT**

**JUNE 2010**



# 25x'25 VISION

By 2025, America's farms, forests and ranches will provide 25 percent of the total energy consumed in the United States, while continuing to produce safe, abundant and affordable food, feed and fiber.

# 25x'25

## MEETING THE GOAL: A PROGRESS REPORT

A Progress Report from  
the 25x'25 National  
Steering Committee

JUNE 2010

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# EXECUTIVE SUMMARY

# 25x'25



In 2004, 25x'25 formed around a bold vision – that 25 percent of our nation's energy would come from renewable resources by the year 2025, while we continued to produce abundant, safe and affordable food, feed and fiber. Just as bold, we set out to achieve our goal by bringing together a broad coalition of stakeholders, from farmers to environmental activists and loggers to lawyers, as well as legislators, regulators and an array of organizations with an interest in a home-grown, clean-energy future for the United States.

Our vision was written into the Energy Independence and Security Act of 2007 by the 109th Congress. Since then, our coalition has grown to include more than 900 organizations and dozens of governors. We have helped shape laws and rules that are changing the energy landscape and creating new opportunities for farmers, ranchers and foresters to help our nation reduce our reliance on imported oil and harness clean energy solutions from the land.

Between 2004 and 2009, renewable energy produced in the U.S. grew by about 23 percent. The clean energy sector set a record in May 2009, when renewable energy contributed 11.5 percent of all energy produced in the U.S., surpassing nuclear power.

We're moving forward steadily, but thousands of barrels of oil gushing from a runaway well in the Gulf of Mexico each day remind the nation that we have a moral obligation as well as an economic one to accelerate the development of alternative energy sources and reduce our dependence on petroleum.

Clean energy generates more than power – it generates jobs. Research by the Pew Charitable Trust determined that clean energy jobs grew 9.1 percent, nearly triple the rate of growth of the total job market, between 1998 and 2007. By the end of that study period, the clean energy sector employed approximately 770,000 workers.

According to the Renewable Fuels Association, the ethanol industry alone helped support nearly 400,000 U.S. jobs and contributed \$53.3 billion to the gross national product in 2009. For every megawatt of wind energy capacity installed, 16 to 19 new jobs are created, according to the American Wind Energy Association. And growing feedstock for biofuels and biogas helps keep America's farms and ranches economically – as well as ecologically – sustainable.

At the same time, our energy infrastructure needs fundamental reform and transformation. The vast rural areas that can harness wind, solar and geothermal energy lack the high-voltage transmission lines and management equipment to bring renewable power to consumers, and existing lines are aging. The Department of Energy (DOE) has determined that 70 percent of the nation's transmission lines and power transformers are 25 years old or older, and few new high-voltage transmission lines have been installed over the past decade. Though electricity sales have jumped 20 percent since 1996, transmission capacity has grown just eight percent – and not necessarily in the areas that will be generating clean energy.

Job creation and the need to improve our infrastructure has helped renewable energy gain a significant level of recent government attention. The American Recovery and Reinvestment Act of 2009 – also called the stimulus package –

included \$37.5 billion for renewable energy and energy efficiency programs. However, the expiration of a critical production tax credit has depressed the production of biodiesel from soybeans and other farm products, and Congress has not yet adopted comprehensive energy and climate legislation that will establish a long-term national energy plan to guide America's transition to a cleaner and more secure energy future.

Policy makers and stakeholders must recognize the critical and immediate need for a comprehensive energy policy and must work together to achieve strategies that not only protect our environment but also insure our energy supplies and enhance our national security.

The 25-percent renewable energy goal is a moving target. Current estimates predict that U.S. energy demand in 2025 will be nine percent higher than today's levels, and those estimates will change as myriad variables – from energy efficiency technologies to the economy – fluctuate in the years to come.

Going forward, energy efficiency will play a key role in moderating the growth of energy demand and continuing to create jobs. The American Recovery and Reinvestment Act included \$16.8 billion for Department of Energy efficiency and renewable energy projects, and energy legislation currently being considered by Congress has the potential to reduce energy demand by over 4 quadrillion BTUs

in 2020 and create approximately 250,000 clean energy jobs. In addition, the reduction in projected greenhouse gas emissions by 2020 under some proposals would be equivalent to taking 49 million cars off the road.

Domestic energy production is a matter not just of economic security, but also national security.

Ninety-seven percent of our transportation system runs on oil, more than half of it imported. Many of the world's oil-producing areas, including the Middle East, East Africa, Russia and Venezuela, are in turmoil, led by regimes supported by petroleum sales. As former CIA Director Jim Woolsey repeatedly reminds us, our continued dependence on foreign oil has us financing both sides in the war against terror. And every day brings us closer to peak oil, the point at which petroleum supplies begin to shrink rather than grow, creating additional imbalances and geopolitical instability.

When we produce clean energy and replace fossil fuels, we also provide high-value services that reduce greenhouse gasses. 25x'25 has consistently emphasized the importance of putting aside the debate surrounding climate change and participating in discussions on society's interest in reducing atmospheric greenhouse gases. America's farms, fields and forests are in a remarkable position to help reduce emissions and sequester, or trap, atmospheric carbon. Conservation tillage practices can reduce

fuel consumption and its associated emissions and sequester millions of tons of atmospheric carbon in cropland soils. Grasslands and forests maintained for bioenergy feedstock production can capture millions more.

Our working lands can also produce the feedstocks for biofuels and biogas, provide the space for wind and solar projects, and harness a broad array of renewable energy resources – all while producing vital crops, providing ecological services such as wildlife habitat, and protecting our nation's water and air from pollution.

The imperative to transition to a new energy future is even more vital now than it was when we set out our vision in 2004. Led by a coalition of diverse stakeholders from across the nation, we continue to forge a path to a cleaner, more secure and economically viable new energy future – one defined by ever-increasing amounts of domestically produced, renewable forms of energy.

It's time for 25x'25 partners to build a bigger, even more effective alliance that can bring about the changes that will produce a new, clean energy future. A re-invigorated alliance can reach across national boundaries and lead a global movement to leverage solutions from the land that improve economies, create jobs, and make our planet a healthier, more sustainable place to live.

Join us as we work to bring the 25x'25 vision to life.



# GETTING TO 25x'25: PROGRESS TOWARD THE GOAL

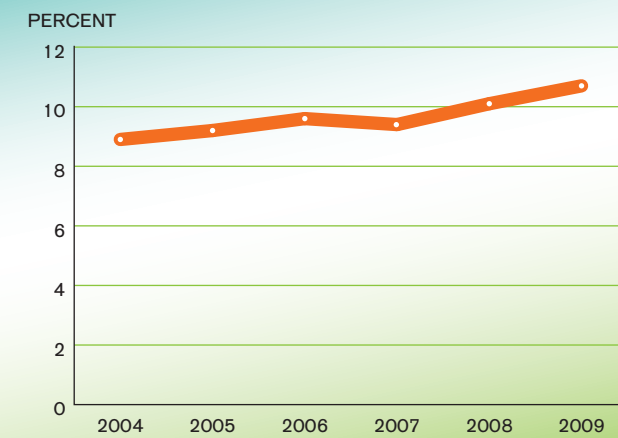
# 25x'25



The renewable energy sector has been the fastest growing domestic energy sector over the last five years. From 2004 to 2009, renewable energy consumption in the U.S. grew about 25 percent. During this time, wind led the pack with a remarkable production increase of over 400 percent. Biomass (33%), solar (41%), and geothermal (7%) energy production have also seen marked growth.<sup>1</sup> Hydroelectric power, one of the largest sources of renewable energy, greatly influences overall renewable energy numbers, and the downturn in renewable energy production between 2006 and 2007 reflects the decline in hydroelectric output, despite large gains in wind and solar (see Figures 1A and 1B).<sup>1</sup>

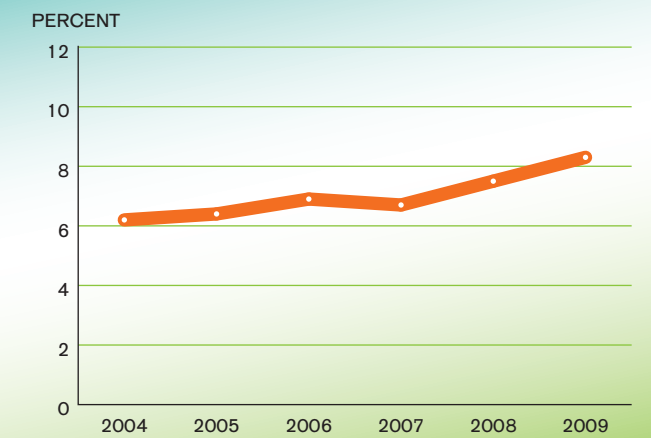
What does this mean for the 25x'25 goal? In 2004, renewables accounted for about 6 percent of total U.S. energy consumption. By 2009, they had grown to about 8.3 percent of all energy consumed in the United States (see Figure 2).<sup>1</sup> During the same period, fossil fuel consumption actually declined about three percent and nuclear increased almost three percent.

**FIGURE 1A**  
U.S. renewable energy production  
as share of total energy production



SOURCE: EIA Monthly Energy Review, April 2009

**FIGURE 1B**  
U.S. renewable energy consumption  
as share of total energy consumption

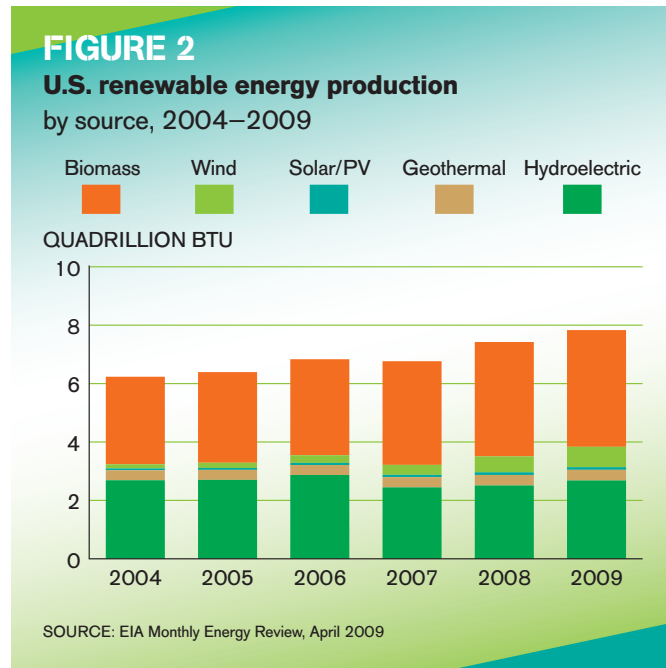


SOURCE: EIA Monthly Energy Review, April 2009

In 2009, renewables contributed 10.7 percent of total U.S. energy production (see Figure 3). While renewable energy production grew 26 percent over the past five years, fossil fuel energy production fell nearly four percent, and nuclear power grew only 3.4 percent.<sup>1</sup>

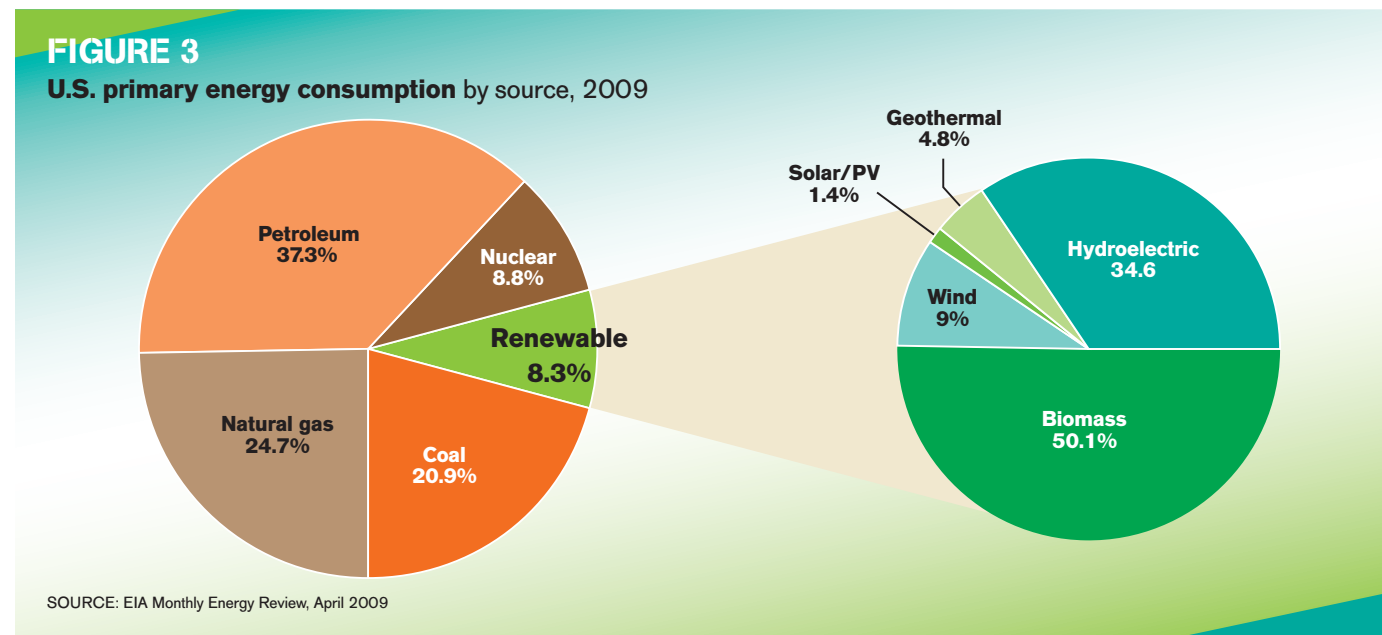
Energy demand is expected to grow between now and 2025, making achieving the goal of 25x'25 a moving target. When 25x'25 began in 2004, demand was expected to grow 30 percent by 2025. Today, partially due to the economic slowdown but mainly to new public policy, energy demand is expected to increase by only nine percent.<sup>1</sup>

Significant progress has been made, but there is more to be done in each renewable energy sector to reach the 25x'25 goal, while improving the economy, the environment and increasing national energy security.



## CONSUMPTION VS. PRODUCTION

The U.S. consumes nearly 30% more energy than it produces, largely due to a reliance on imported oil.



# RENEWABLE ENERGY GENERATION/PRODUCTION

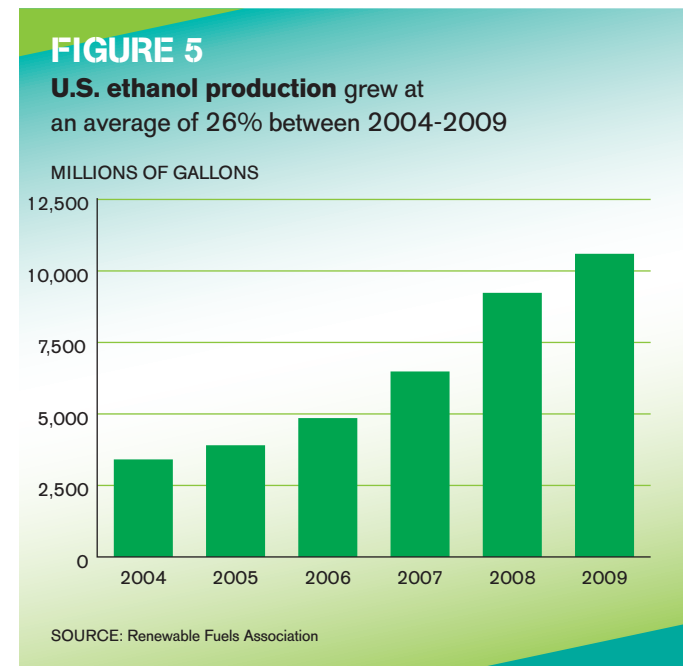
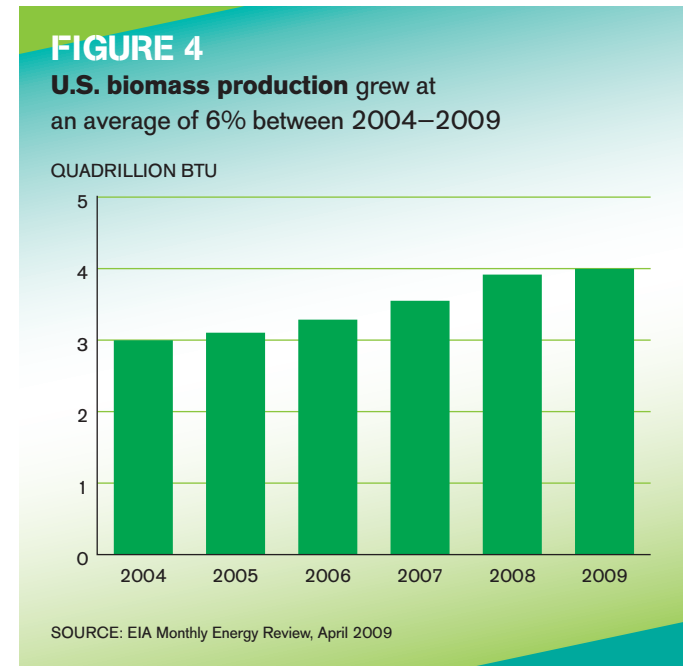
## BIOENERGY

Bioenergy refers to all energy derived from biological materials, including solid (heat, power) and liquid (fuels) applications. Bioenergy can be derived from agricultural feedstocks, residual materials from forestry, agriculture and livestock waste, or dedicated energy crops such as switchgrass, quick growing trees, and algae. Biomass production in the United States increased over 30 percent from 2004 to 2009, with most renewable energy gains made in the ethanol industry (see Figure 4).<sup>1</sup>

## BIOFUELS

Liquid biofuels provide an incredible opportunity for farms, ranches and forests to contribute to America's clean energy future and have been produced in the U.S. for many years. Improvements in production efficiency of first-generation biofuels and advancements in second- and third-generation biofuels have proven the potential of biofuels to significantly enhance U.S. energy security by decreasing our dependence on foreign oil. Moreover, this has been accomplished without putting undue pressure on food prices or land use.

The primary **first-generation biofuels** have been ethanol produced from corn starch and biodiesel. U.S. ethanol production has nearly tripled over the past five years, reaching a record 10.8 billion gallons in 2009 (see Figure 5). The industry aggressively added operating capacity, which increased by 4.1 billion gallons in the last two years alone. These increases are due in large part to the federal ethanol requirements outlined in the Renewable Fuel Standard.<sup>2</sup> The RFS called for 11.1 billion gallons to be blended in 2009, representing about 9 percent of the U.S. gasoline supply. In response to the RFS, there are now almost 200 biorefineries online across the country, and ethanol is blended in 80 percent of the nation's gasoline. Nearly 30 states have produc-





tion sites, but Iowa, Nebraska, Illinois and Minnesota lead the pack.<sup>3</sup> The ethanol industry also benefitted from improved production efficiency and corn yields, which enabled ethanol production to expand without significantly expanding acreage dedicated to ethanol crops.<sup>3</sup>

**Second-generation biofuels** will be produced from the residues or “left-overs” from crops and forests.<sup>4</sup> Cellulosic conversion technologies to use these feedstocks are still under development and promise to provide a more cost-effective method of producing biofuels, helping significantly expand the availability of fuels to satisfy the RFS. The USDA’s Economic Research Service estimates that production capacity from cellulosic ethanol may be 10 million gallons in 2010, with capacity expanding to over 200 million gallons by 2012.<sup>5</sup>

**Third-generation biofuels** require further research and development but show tremendous potential.<sup>4</sup> Also referred to as “drop-in” biofuels, they will be direct replacements for petroleum-based fuels. The DOE estimates that if algae-based fuel replaced all the petroleum fuel in the United States, it would require only 15,000 square miles, slightly larger than Maryland – or less than one-seventh the area devoted to corn production in the United States in 2000.<sup>6</sup>

## BIODIESEL

The biodiesel industry has shown exponential growth for the last few years, peaking in 2008 with almost 700 million gallons of biodiesel produced, but production declined to 545 million gallons in 2009<sup>7</sup> (see Figure 6). Since the expiration of the biodiesel tax credit in December 2009, the industry has crashed, with plants closing, many facilities standing idle and thousands of jobs lost. At press time, the biodiesel tax credit had not been extended.

If the tax credit is renewed, thousands of jobs may come back on line, and expansion in the industry will likely occur. In 2006, there were approximately 85 biodiesel plants in existence but as of September 2008, there were over 176 commercial biodiesel production plants, and 39 plants under construction or expansion<sup>2</sup>, resulting in an annual production capacity of more than 2.69 billion gallons.<sup>8</sup> There are also 679 biodiesel fueling sites in 49 states across the country.<sup>9</sup>

## BIOPOWER

Biomass is a substantial renewable resource generating at least 15 million megawatt hours of electricity annually.<sup>10</sup> Mill wastes, forest residues and prescribed thin-

ning, urban wood and landscape residues, and livestock wastes are the major sources of biomass power. Biopower provides electricity through well-established technologies on and off the grid, with large numbers of biomass electricity-only facilities in the Northeast and California and a large number of biomass combined heat-and-power (CHP) facilities in the forest products industry throughout the U.S. Biopower is also a significant source of thermal heat for residential, commercial and institutional applications in the form of cordwood, pellets or chips, and woody biomass. As oil and other fossil fuel prices rise, woody biomass will, in many cases, become attractive for expanded industrial application and could be used by industries with large thermal energy needs unrelated to the forest products industry.

## BIOGAS

Biogas provides electricity through methane capture and livestock waste digesters. In 2009, biogas recovery systems produced an estimated 374 million kilowatt-hours equivalent of useable energy. The AgSTAR program with the Environmental Protection Agency (EPA) and USDA has helped American farmers and ranchers significantly expand biogas production capacity since 1994. As of April 2010, EPA estimates the U.S. has about 151 operating digester projects at commercial livestock facilities in over 30 states.<sup>11</sup>

## OUTLOOK

The bioenergy market has enormous growth potential both in the U.S. and around the world, but it is constrained by a number of factors. These include uncertainty about the reauthorization of the federal excise tax credits for biodiesel and ethanol, the ethanol “blend wall,” an insufficient number of retail pumps that can dispense varying percentages of biofuel blends, oil price volatility, competing energy technologies and other market barriers.

- As noted earlier, the biodiesel excise tax credit expired on December 31, 2009, and the primary federal ethanol tax incentive (the Volumetric Ethanol Excise Tax Credit) is slated to expire at the end of 2010. Congress has been slow to reauthorize these important incentives. Without these incentives, domestic biofuel production is expected to decline as industry profitability suffers, and the supply required to meet the RFS II mandates is

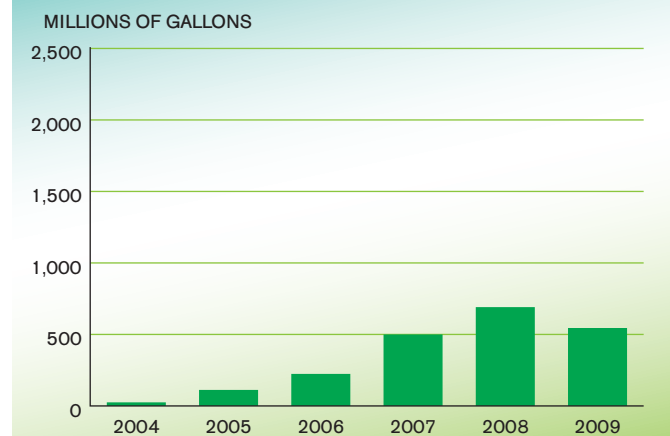
likely to be made up by imports from Brazil and other producers.

- Current EPA regulations limit the amount of ethanol blended with gasoline to ten percent. For a gasoline market of about 135 billion gallons, this implies an ethanol market of 13.5 billion gallons. This is known as the blend wall. Unless EPA approves higher blends, the domestic ethanol market will be saturated, and little or no new investment in capacity will be required. EPA is currently considering a petition which would allow the amount of ethanol blended in the nation’s gasoline supplies to increase from ten to 15 percent.
- Current estimates suggest that there are about eight million flex-fuel vehicles (vehicles designed to burn fuel blended with up to 85 percent ethanol) on the road today. However, the number of pumps that can provide E-85 or other alternative ethanol blends is limited. Legislation has been introduced which would require vehicle manufactures to meet mandated targets for flex-fuel vehicle production. Several states are working to establish low-carbon fuel standards that can further incentivize biofuel production, and others are creating new incentives to accelerate the installation of blender pumps.
- Emerging wood bioenergy industries

will also provide new markets for forest resources, producing net benefits for forest health, local economies and the forest and wood product industries.

Opposition to expanding biofuel production has been based on unsubstantiated concerns that the use of corn

**FIGURE 6**  
U.S. biodiesel production grew at an average of 118% between 2004–2009



SOURCE: National Biodiesel Board, Fuel Fact Sheets, 2009



and other crops for biofuel production would fuel food price inflation, increase emissions of greenhouse gasses and result in adverse indirect land use changes. Recent studies have shown that the 2008 food price spike was due to a general commodity price bubble led by soaring oil prices and was not primarily the result of increased biofuel production.<sup>12</sup> Recent empirical evidence of retail food prices have confirmed that food price inflation has been relatively tame despite significant increases in ethanol production.

Concerns over the impact of ethanol on greenhouse gas (GHG) emissions have been based on outdated studies showing that corn-based ethanol production provides little or no decrease in lifecycle GHG emissions. Increases in ethanol production have not led to significant expansion of croplands under ethanol production since 2003 – average corn yields in the United States have increased from under 130 bushels per acre in 2003 to almost 170 bushels per acre in 2009, a 30 percent increase. Additionally, about a third of each bushel of corn used for ethanol is returned to the feed market in the form of distillers grains, making ethanol only 21 percent of U.S. net corn consumption (feeding, processing, and exports). Combined with yield increases, we now produce enough corn on the same lands to meet the nation's current food, feed and fuel demands. Because of new and more efficient refineries, better crop and soil management, better hybrids, the use of by-products for cattle feed and other factors, corn ethanol produces a fuel that is 48 to 59 percent lower than gasoline when looking at direct-effect lifecycle GHGs.<sup>13</sup> Cellulosic ethanol and biodiesel provide even greater reductions in GHGs, with estimates close to 100 percent, through the displacement of fossil fuels and their low carbon lifecycles.<sup>14</sup>

The University of Illinois at Chicago's Energy Resources Center shows major gains in production efficiencies by America's dry-mill ethanol biorefineries.<sup>15</sup> According to the Renewable Fuels Association, dry-mill facilities represent nearly 90 percent of America's total ethanol production, estimated to be in excess of 12 billion gallons in 2010. Comparing the dry-mill production efficiencies in 2008 to those in 2001, Dr. Steffen Mueller of the University of Illinois at Chicago showed: thermal energy use was less than 26,000 BTU per gallon on average, a reduction of 28 percent compared to 2001 data. Electricity use was reduced by 32 percent compared to 2001 data; ethanol yields per bushel processed improved 5.3 percent since 2001; and total water use was 2.72

gallons per gallon of ethanol produced, down significantly from previous estimates.

The Energy Independence and Security Act of 2007 (EISA) requires transportation fuel sold in the U.S. to contain a minimum of 36 billion gallons of renewable fuels, including advanced cellulosic biofuels and biomass-based diesel, by 2022. To meet this goal, the Department of Energy has announced plans to invest \$786.5 million in Recovery Act funds to accelerate research and development in key areas such as biomass feedstocks, conversion technologies, and integrated biorefinery platforms. Just as with petroleum refineries, future biorefineries will produce multiple fuels and by-products, thus maximizing the value and decreasing the waste derived from the biomass feedstock.

Through continued investment, research and development, first-generation biofuels in development and already online will continue to become more efficient, and second- and third-generation biofuels have the potential to completely transform the industry in the near future.

## WIND

From 2004 to 2009, the electricity generating capacity for wind grew an astonishing 429 percent and now operates with a total capacity of over 35,000 MW, enough to power the equivalent of 9.7 million homes (see Figure 7).<sup>16</sup> Wind has become competitive with traditional fuel sources, and in places like Texas, has been successfully used to hedge against volatile natural gas prices.

2009 was the largest year on record for the U.S. wind industry, with more than 10,000 MW of new installed capacity. New wind accounted for 39 percent of new power installations in 2009 and provided 1.8 percent of U.S. energy production. Domestic manufacturing for wind turbine materials and components is also growing. More than 90 manufacturing facilities opened, expanded or were announced in the past three years, and the total number of online facilities is well over 200. There are now nine turbine manufacturers in the U.S.<sup>16</sup>

## STATES

Texas still leads all states in total installed capacity with over 9000 MW. In 2009 alone, Texas added 2000 MW of

installed capacity. Other states are working to keep pace. In 2008, Iowa surpassed California for second place, and by 2009 14 percent of power in Iowa came from wind. There are now 14 states in the "Gigawatt Club" with more than 1000 MW of capacity installed. Demonstrating the regional opportunities for wind development, the top five states for installed wind capacity are Texas, Iowa, California, Washington and Oregon (see Figure 8). The states with the largest potential resources, however, remain underdeveloped due to transmission constraints.<sup>17</sup>

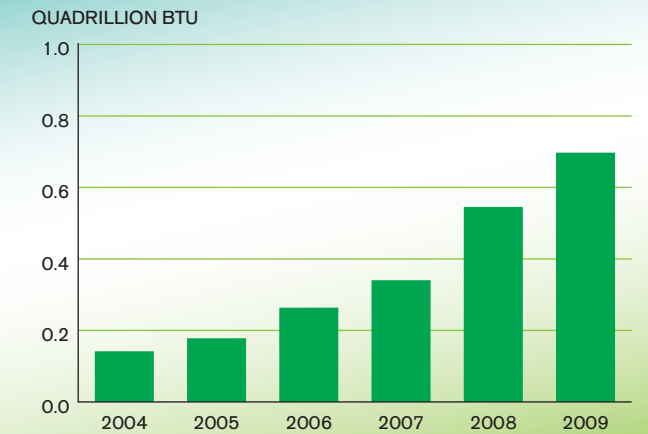
In May 2010, a 25-mile, 420-MW project in Nantucket Sound, designed by Cape Wind, came one step closer to becoming the first offshore wind farm in the U.S. when the project was approved by the Federal Aviation Authority.<sup>18</sup> Delaware, New Jersey and Rhode Island are also in the process of scoping and designing projects. Similarly, the Great Lakes states have a huge opportunity for offshore wind development. The National Renewable Energy Lab has identified more than 1,000 GW of wind potential off the Atlantic coast and more than 900 GW of wind potential off the Pacific Coast. The lab estimates that the high wind potential off the coasts of the lower 48 states exceeds the entire U.S. electricity demand.<sup>19</sup>

## COMMUNITY WIND

Community wind is typically defined as a wind project where the local

community has a tangible financial or other interest in the project. Community wind projects can be large or small but typically involve less than 20 MW of generating capacity. Community wind expands local financial interest and public support and brings more players, places and

**FIGURE 7**  
U.S. wind production grew at an average of 38% between 2004–2009



SOURCE: EIA Monthly Energy Review, April 2009

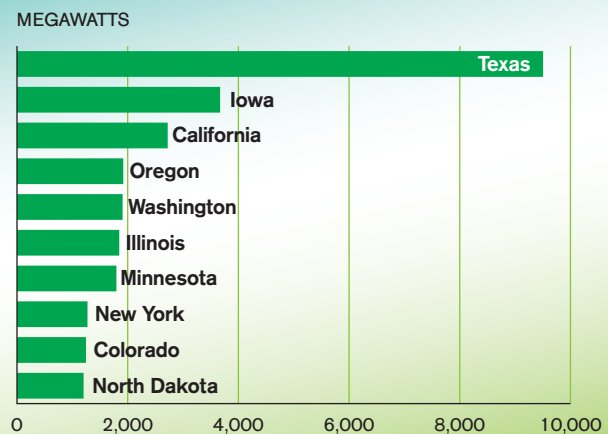
**"This isn't just about energy and the environment, it's also about the economy. Wind represents a huge opportunity as an economic development tool and it could literally save some of these small, agriculture-based communities that have been steadily dying."**

— Dan Juhl, CEO of Minnesota-based Juhl Wind, Inc., quoted in "Winds of Change," Minnesota Business, by David Gee



**FIGURE 8**

**Cumulative installed wind capacity for the top ten states**



SOURCE: American Wind Energy Association, April 2010

wind resources to the table. Community wind is taking off as local communities begin to capture the value of multi-use land planning. In 2009, a 15 percent increase in the small wind market helped the industry reach 100 MW of installed capacity. With continued support from investments and policy, the America Wind Energy Association projects that community wind projects will have 1 GW of installed capacity by 2015.<sup>20</sup>

**OUTLOOK**

Despite the global economic downturn, large wind farms were still coming online in 2009 with help from the Recovery Act. Most of the 5000+ turbines that were brought online in 2008 were 1.5 MW in capacity, but with a variety of models in the 2-MW to 3-MW range now hitting the market, average turbine size could leap in the next few years. Larger turbines help drive down production costs by generating more power per turbine. The Department of Energy has estimated that 9.5 million construction and operations-related jobs could be created from 2007–2030 if the 20 percent wind by 2030 goal is reached<sup>21</sup> (this estimate does not take into account the offsetting effects on employment in other energy sectors).

Internationally, offshore wind farms are becoming more significant as the technology matures. A few countries are vying to develop the world's largest offshore installation. Denmark opened its 209-MW site in

mid-September, and the United Kingdom is planning a 1-GW project called the London Array. Both are dwarfed, however, by a project being planned by Canadian Hydro, which aims to build a 4.4-GW farm located offshore in one of the Great Lakes bordering Ontario.

Despite these improvements, 2010 has had a slow first quarter for new installed capacity, with just over 500 MW coming online and no more than 4000 MW projected for the entire year. Industry experts speculate that this is due to the continuing recession and a lack of a long-term policy platform which will guide and drive private investment in wind development projects.

Moreover, the future of wind power is closely linked to the development of new transmission infrastructure. The U.S. has vast resources of inexpensive wind power in remote areas far from where the electricity is needed. According to the American Wind Energy Association, almost 300,000 MW of wind projects, more than enough to meet 20 percent of our electricity needs, are currently waiting in line to connect to the grid because there is inadequate transmission capacity to carry the electricity they would produce. Concern about inadequate transmission is shared by the solar, geothermal and hydropower industries as well. In California, more than 13,000 MW of large solar power plants are waiting to connect to the grid.

The existing process to plan, site and pay for new transmission, particularly for power lines that cross jurisdictional and state boundaries, is not adequate to address the need to quickly unlock remote renewable resources. Going forward, state and federal regulators and other stakeholders must develop regional planning frameworks that prioritize reliability, cost-effectiveness and clean energy integration. They then must cooperate to site transmission lines as expeditiously and fairly as possible and to spread the costs of new transmission over the broad array of ratepayers who will benefit from new transmission and clean energy.

**SOLAR**

Since 2004, solar energy has grown 41 percent – this includes solar thermal and electricity generation.<sup>1</sup> In 2009, solar electricity passed 2000 MW in production capacity, and solar thermal capacity neared 24,000 MW. Solar industry

revenues climbed 36 percent last year as the industry added over 10,000 new jobs. Increasing energy prices and supporting policies, including the ARRA, have given the industry a boost. Although commercial installations lead in the amount of installed capacity, the residential market continues to dominate in sheer volume of projects completed. Solar energy is unique in the ability to provide individual residential heat and power on and off the grid (see Figure 9).<sup>22</sup>

**PHOTOVOLTAICS (PVS)**

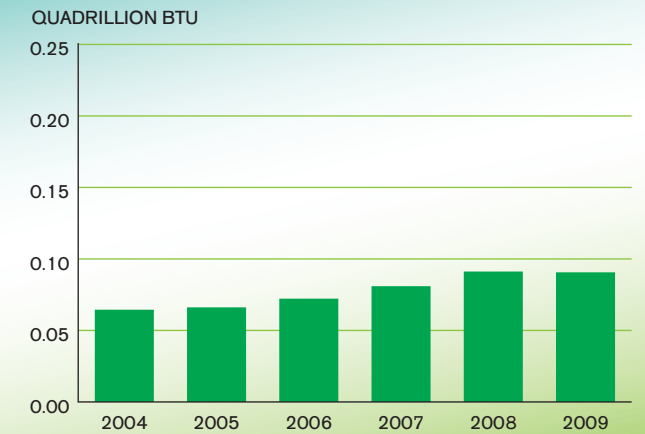
Photovoltaic technologies converting solar radiation into direct current electricity have been around for over 50 years but have seen the most significant increases in grid-tied capacity since 2004. In 2009, 435 MW DC of PV cells were installed, shooting grid-tied capacity past the 1.25 gigawatt mark. There are still significant additions in off-grid applications of PV cells every year, including 40 MW in 2009. Also, PVs in the utility sector tripled from 22 MW in 2008 to 66 MW in 2009.<sup>22</sup>

A 25-MW array in DeSoto County, Florida, and a 21-MW facility from First Solar Electric in California were installed in 2009. The highest growth rate has been for grid-connected systems, especially in the commercial sector. The average size of PV installations

has grown steadily for both residential (4.9 kW) and commercial (110 kW) sites.<sup>22</sup> The largest systems, those over 500 kW, outpaced all other sectors and contributed 43 percent of installed PV capacity in 2008.

**FIGURE 9**

**U.S. solar/photovoltaic production grew at an average of 7% between 2004–2009**



SOURCE: EIA Monthly Energy Review, April 2009





## CONCENTRATING SOLAR POWER

Concentrating Solar Power (CSP, also known as solar thermal electric) systems use mirrors to concentrate solar radiation and heat a fluid to high temperatures. The heat can be used to power a steam turbine and create electricity or it can be used as thermal input to industrial processes. CSP has been in the U.S. since the 1980s but has recently been revived through federal support. Seventy-seven MW have come online since 2006, with three new facilities in 2009. There are now 432 MW of operational CSP plants in commercial production. At least three facilities are planned to come online in 2010, including a 75-MW facility in Martin County, Florida.<sup>22</sup>

## SOLAR THERMAL

Solar thermal systems can be used to heat homes and pools and to cool buildings. Solar thermal systems have been used for over 100 years and were popular in the 1970s before federal support was dropped in the 1980s. Solar Water Heater (SWH) shipments have been steadily increasing for the last ten years, but Solar Pool Heating (SPH) shipments have been declining since 2006.<sup>22</sup>

## STATES

California continues to lead the U.S. photovoltaic market (projects increased 95 percent from 2007 to 2008), and Hawaii is the leader in solar thermal installations.<sup>22</sup> Although solar resources play an important role in solar development, state and federal policies have a much greater impact. The federal ITC and state Renewable Portfolio Standards and incentives are currently the main drivers for development.

## OUTLOOK

Despite its rapid growth, the solar industry did not escape the 2009 economic downturn and is experiencing a leveling out. However, changes in European markets, combined with massive investments in silicon production, cell production, and module manufacturing during the boom years, have led module prices, which typically constitute half of the cost of photovoltaic systems, to drop significantly since the third quarter of 2008.

Industry experts expect better results for 2010. Federal programs, like the extension and expansion of the Investment Tax Credit (ITC), create policy stability that will help companies in the U.S. make longer-term

investment decisions and attract better financing. The American Recovery and Reinvestment Act also allocated \$117.6 million for specific activities within the Solar Energy Technologies Program that will enable solar technologies' cost-competitiveness with conventional sources of energy to improve. The \$2,000 cap on residential solar water heating systems has also been lifted, broadening market opportunities for the solar thermal industry.

Photovoltaic systems are ready for significant expansion. Pacific Gas & Electric is planning to build the 550-MW Topaz Solar Farm and the 250-MW California Valley Solar Ranch that, when completed, will be the two largest PV systems in the world.

Concentrated Solar Power (CSP) is also poised to break out over the next few years as issues of land access and transmission are addressed. The Bureau of Land Management (BLM), which manages much of the public land being considered for solar development, is in the process of conducting a Programmatic Environmental Impact Statement Study (PEIS) for solar installations on its land, and while no new transmission lines have been built yet, the momentum in that direction appears hopeful.

Moving forward, the outlook for the U.S. solar industry will depend on available financing and incentives, regulation (e.g., interconnection standards, net metering, and power purchase agreements), solar resources and retail electricity rates.

# GEO THERMAL

**W**ith a total installed capacity of over 3000 MW from 77 power plants, geothermal production capacity has increased 7 percent since 2004 and the United States currently leads the world in online geothermal energy capacity (see figure 10).<sup>1,23</sup> Geothermal developers are actively developing currently known geothermal resources and seeking new resources for development. Since March 2009, the number of projects in development has risen 26 percent for a total of 152.

## GEO THERMAL ENERGY POTENTIAL

Geothermal energy has the potential to be an excellent source of base load power because it is always "on." Geothermal can thus be used to generate electricity

or provide heat for buildings and industrial processes, including heating greenhouses and homes.

The potential is much greater than is currently being realized. The Western Governors Association Geothermal Task Force projects that 15,000 MW could be developed by 2025, and an even more ambitious study by MIT estimates that 100,000 MW could be available with significant investment in technology and deployment.<sup>25</sup>

## EMERGING TECHNOLOGIES

To facilitate the growing interest in geothermal energy, research is underway at the Department of Energy, in industry, and in academia to develop emerging geothermal technologies on a commercial scale. Geothermal Hydrocarbon Co-production (GHCP) produces electricity from the thermal fluid that flows from several oil and gas wells. Developments are also underway to use the thermal and hydraulic energy available from "geopressured-geothermal resources." The USGS has estimated that in addition to thousands of megawatts of geothermal energy, these resources hold as much as 1,000 TCF of potentially recoverable gas.<sup>23</sup>

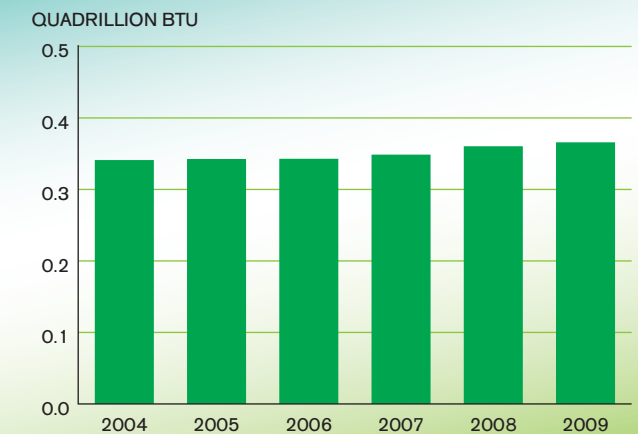
## STATES

Seven geothermal projects, accounting for 176 MW of geothermal

capacity, were brought online in 2009. These included large-scale projects that include two in Nevada by Enel North America totaling 65 MW, Ormat Technologies Inc.'s North Brawley (50 MW) power plant in California and Raser Technologies Inc.'s Thermo No. 1 (10 MW)

FIGURE 10

U.S. geothermal production grew at an average of 1% between 2004–2009



SOURCE: Renewable Fuels Association [http://www.ethanolrfa.org/page/-/objects/pdf/outlook/RFAoutlook2010\\_fin.pdf?nocdn=1](http://www.ethanolrfa.org/page/-/objects/pdf/outlook/RFAoutlook2010_fin.pdf?nocdn=1)





power plant in Utah were also added in 2009. In addition, a number of smaller power units were installed in Oregon, Wyoming and other states.

By April 2010, nine states were using geothermal electric power generation: Alaska, California, Hawaii, Idaho, Nevada, New Mexico, Oregon, Utah and Wyoming. Other states such as Colorado, Louisiana, Mississippi and Texas have projects under development. Southern Methodist University Geothermal Energy Program has estimated that geothermal hydrocarbon co-production (GHCP) operations in the Texas Gulf Plains have the capability of providing 1000 to 5000 MW of power.<sup>26</sup>

## OUTLOOK

Concerns about climate, energy security, and state Renewable Portfolio Standards have led to increased development of U.S. geothermal resources. For example, the Recovery Act has authorized \$350 million to industry, academia, research facilities and national laboratories to expand and accelerate the development, deployment, and use of geothermal energy throughout the United States.<sup>27</sup> The amount of federal funding provided to the geothermal industry through ARRA is unprecedented and provides substantial incentives to encourage the continued development of domestic geothermal resources.

Some key barriers to expanding geothermal energy's contribution to the U.S. energy mix are being addressed, including resource siting and early-stage risk management. The Bureau of Land Management has published a plan for geothermal leasing in the western states to improve resource siting. The most recent geothermal lease sale occurred in July 2009 and resulted in the sale of 255,355 acres of land and revenue of approximately \$9 million.<sup>23</sup> In addition, federal institutions such as the Navy Geothermal Program Office are taking the lead on the earlier stages of exploration and drilling in order to mitigate the high risk of development by private investors.<sup>28</sup>

## HYDRO

Hydropower is a clean domestic energy source that has been around for well over a hundred years – the Austin Dam in Texas, the first dam specifically designed for generating hydropower, was completed in 1893.<sup>29</sup> Although dams enjoyed

a period of extensive growth after World War II, concerns over their ecological, environmental and water impacts have limited the growth of new capacity in the past few decades.

Nevertheless, hydropower is quietly making a comeback in the United States, spurred by a scramble for clean energy and the high costs of fossil fuels. As shown in Figure 11, hydroelectricity generation grew between 2004-2006 and 2007-2009, although it dropped 15 percent between 2006 and 2007 due to changes in watershed patterns where hydroelectric dams are located.<sup>2</sup> The generation capacity of hydropower is projected to grow, as utilities are proposing more than 70 projects that would boost U.S. hydroelectric capacity by at least 11,000 megawatts over the next decade.<sup>30</sup> This would be the nation's biggest hydropower expansion since the 1980s.

## HYDROELECTRIC GENERATION POTENTIAL IN THE UNITED STATES

There is still tremendous untapped hydroelectric generation potential in the United States. In 2007, the Electric Power Research Institute, based on a number of studies from the late 1980s through 2006, issued a conservative estimate that hydropower generation has the potential to increase 23,000 MW by 2025. Of this amount, about 10,000 MW could come from "conventional" hydropower through facility upgrades, new projects and the addition of power units to existing dams. Though America's deep continental shelves complicate the possibility of tidal power along the coastline, advances in offshore generation techniques and efficiency improvements are expected to add an additional 13,000 MW of capacity after 2025.<sup>31</sup>

## EXPANDING HYDROPOWER

Developers are looking at a variety of options to maximize power generation from existing dams, such as installing hydropower on existing dams, replacing existing powerhouses and adding water storage.<sup>30</sup> Converting existing non-power producing dams to produce hydropower presents a huge potential for capacity increase, as only about 2,400 out of about 80,000 dams (three percent) in the United States produce power.<sup>32</sup>

DOE research programs are focusing on enhancing conventional hydropower and developing emerging water power technologies.<sup>33</sup> The goal for conventional hydropower is to demonstrate new equipment and

operational techniques that will optimize water-use efficiency, increase generation up to ten percent and improve environmental performance and mitigation practices. Efforts to support and deploy emerging technologies, such as marine and hydrokinetic devices, offer the potential to capture energy from waves, tide, ocean currents and the natural flow of water in rivers, as well as marine thermal gradients, without building new dams or diversions.<sup>34</sup>

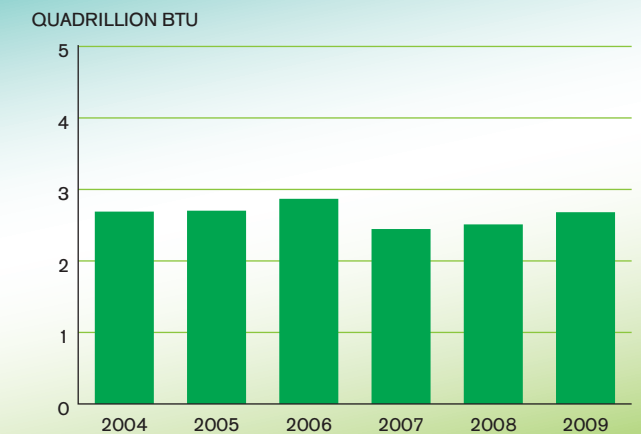
## OUTLOOK

Hydropower is the most reliable source of renewable energy but "It's sort of been relegated to the same position as nuclear," says Douglas Hill, manager of the water energy program for the Idaho National Laboratory. For example, some states allow only small projects to count toward a clean energy mandate to minimize environmental harm. To overcome this barrier and to maximize what is already America's biggest source of renewable energy, the U.S. Department of Energy announced about \$31 million in Recovery Act funding to modernize the existing hydropower infrastructure in the U.S., increase efficiency and reduce environmental impacts.<sup>35</sup> It further awarded \$14.6 million to support development of advanced water

power technologies. Hydropower, perhaps unfairly, is frequently overlooked or taken for granted in the renewable energy debate, but it has a lot to offer in providing America with emissions-free sustainable energy.

**FIGURE 11**

**U.S. hydroelectric production** fluctuated but remained constant between 2004–2009



SOURCE: EIA Monthly Energy Review, April 2009





# ENERGY EFFICIENCY

Energy efficiency is one of the most available forms of renewable energy that can help achieve the goals of 25x'25. Energy efficient technologies, processes and policies will reduce domestic energy demand, avoid greenhouse gas emissions, improve national security by reducing energy dependence and provide a foundation for economic growth by creating jobs and cutting energy waste.

The United States has met 75 percent of its new demand for energy since 1970 by increasing the efficiency of buildings, machinery and appliances. Most of these savings come from making buildings more energy efficient through retrofits and more stringent codes for new buildings. Studies of states like California that have robust efficiency programs show that every dollar invested in efficiency returns \$2 in economic benefits, largely as a result of consumers savings on their utility bills.<sup>36</sup>

Public awareness and good policy have contributed to continued declines in energy use. According to the Energy Information Agency of the Department of Energy, Americans consumed five percent less energy per person in 2008 than when 25x'25 launched in 2004. Over the same period, gross domestic product increased by over nine percent and total energy consumption fell by one percent. That means we are producing more wealth while using less energy.<sup>37</sup>

## STATES

Individual states have taken the lead in energy efficiency implementation. The map in Figure 12 shows the states that have either implemented an Energy Efficiency Resource Standard (EERS) or are in the process of implementing one. An EERS establishes a requirement for utilities (and/or other program administrators) to meet a percentage reduction in energy use from energy efficiency measures. It is therefore complementary to a Renewable Energy Standard (RES), which dictates a certain percentage of energy generation from renewable sources.

## OUTLOOK

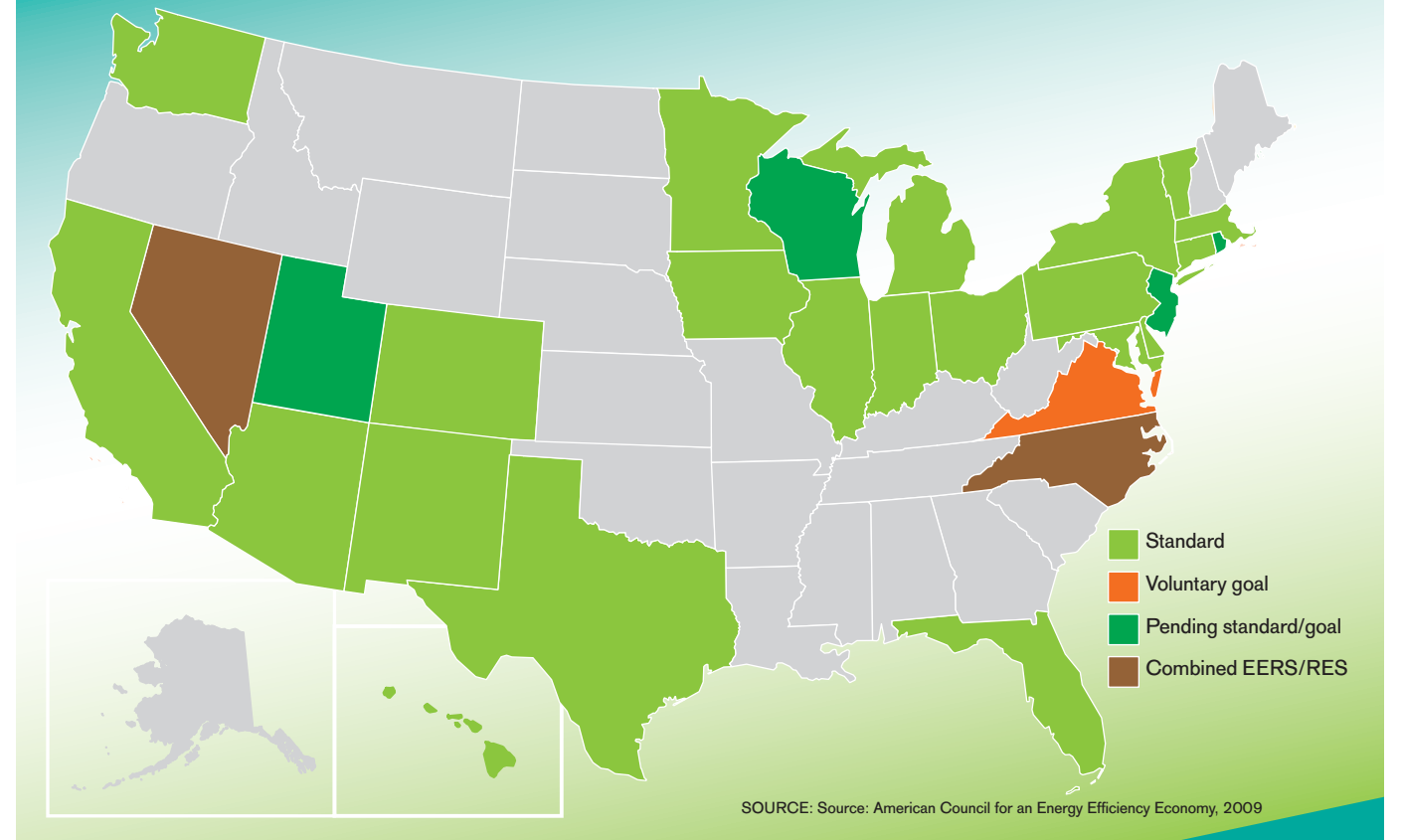
The opportunity for energy efficiency in the U.S. is significant – a study by the McKinsey Global Institute finds that cost-effective investments in existing energy efficiency technology could cap energy demand and greenhouse gas emissions at 2007 levels.<sup>38</sup> Another study by McKinsey and Company estimates that \$520 billion invested in energy efficiency would reduce U.S. non-transportation energy use by almost a quarter by 2020. As a result, the U.S. economy would save more than \$1.2 trillion and avoid the release of greenhouse gases at a level equivalent to replacing 1,000 conventional 500-megawatt coal-fired power plants with renewable energy.<sup>39</sup>

A number of market barriers may prevent the U.S. from achieving the full potential of energy efficiency. These include:

- *High up-front costs* – more efficient technology typically pays for itself and then some, but the difference in the initial cost can discourage purchases.
- *Split incentives* – particularly in buildings, the person paying the energy bill is sometimes not the person who makes the investment decisions.
- *Tight credit markets* – conditions in the capital markets make it difficult for even worthwhile projects to receive the financing they need to get off the ground.
- *Illiquidity/intangibility of efficiency* – markets are just now figuring out how to value investments in energy efficiency.
- *Utility business models that discourage efficiency* – in many states, utilities are a commodity business that earns revenue based on how much energy they sell, with no incentive to reduce energy demand through efficiency.
- *Lack of consumer awareness* – customers of all sizes often do not have the full picture on life-cycle

FIGURE 12

States with energy efficiency policies as of April 2010



savings that accrue from investments in better efficiency.

New federal and state-level policies reflect a growing recognition of the benefits of investing in energy efficiency. Nearly half of all states have set binding energy savings goals for utilities. As a result, utility spending on energy efficiency programs has been on the rise. A recent study estimated that funding by ratepayers for electric and natural gas efficiency programs will increase from \$3.1 billion in 2008 to as much as \$12.4 billion by 2020.<sup>40</sup> Further, a small but increasing number of states have adopted stringent building codes and standards that have the potential to save energy in buildings – a sector that consumes 73 percent of electricity and 40 percent of total energy use in the United States.<sup>41</sup>

The ARRA included a total of \$25 billion in funding for federal, state and local energy efficiency-related initiatives and substantial additional funding for existing programs

to spur jobs from 2009 through 2011. These programs cover a broad array of consumers with a focus on weatherizing residential buildings.<sup>42</sup>

The House of Representatives passed a combined climate and energy bill, the American Clean Energy and Security Act, in June 2009. The bill includes provisions with the potential to advance energy efficiency more than any other single piece of legislation to date and would establish a funding stream based on a cap-and-trade program. In addition, bills which would establish “HomeStar,” “Building Star” and “Rural Star” energy efficiency programs are currently being considered by Congress.

Moving forward, investments in energy efficiency today will have lasting long-term effects on our nation’s energy demand. Continued programmatic and legislative support and federal and private investment will be key to continued progress in energy efficiency in all sectors of the economy.



# 25x'25: A MORE SECURE NATION

A principle objective of the 25x'25 vision is the enhancement of our national security. The alliance holds that renewables are the surest safeguard against price hikes and the instability of supplies that can arise when so much of our fuel emanates from often-hostile nations. The United States currently consumes nearly 20 million barrels of petroleum products per day,<sup>43</sup> and nearly 60 percent of that consumption is met by imports, including crude oil, from hostile and unstable regimes like Venezuela and Nigeria. More than one-fifth of all U.S. oil imports come from Persian Gulf nations, including Iran, which holds the world's third-largest oil reserve.<sup>44</sup>

Multiple uncertainties about our supplies of oil lead to projections of high oil prices by the DOE's Energy Information Administration, which says crude oil spot prices will likely run in the \$84 to \$87 per-barrel range through next year. The EIA also forecasts regular-grade gasoline retail prices averaging nearly \$2.80 per gallon during this summer's driving season, up from \$2.44 per gallon last summer.<sup>45</sup>

At the same time, the cost to secure the uninterrupted flow of oil from the Middle East and other global hot spots has been estimated in the tens of billions of dollars per year and can raise the true cost of oil, which includes military and energy security expenses, to well over \$100 per barrel. That does not take into account the hundreds of thousands of jobs and the billions of dollars in federal and state revenues lost by the diversion of capital resulting from spending hundreds of billions of dollars on foreign oil (approximately \$265 billion on 4.35 billion barrels in 2009). Taken together, the defense costs, economic losses and oil supply distribution costs

add another \$4 to the per-gallon cost of gasoline.<sup>46</sup>

Steps are being taken to address energy security concerns, including new fuel economy standards brokered earlier this year by the Obama administration among automakers, environmentalists and states. The new standards ramp up the fuel economy of the nation's passenger fleet to 35.5 mpg by 2016, four years ahead of the schedule Congress laid out in the Energy Independence and Security Act (EISA) it adopted in 2007.<sup>47</sup>

EISA, which also included the 25x'25 vision as a national goal, addressed energy security concerns by extending and increasing the renewable fuel standard (RFS), a step aimed at reducing the nation's dependence on foreign oil. The revised RFS started with 9 billion gallons in 2008, rising to 36 billion gallons in 2022. Starting in 2016, all of the increase in the RFS target must be met with advanced biofuels, defined as cellulosic ethanol and other biofuels derived from feedstocks other than corn starch – with explicit carve-outs for cellulosic biofuels and biomass-based diesel.

No national sector is more aware of the need for domestically produced energy alternatives than the U.S. military, which consumes 80 percent of the government's energy demand, much of it to insure the flow of oil from overseas. The Department of Defense (DoD) and each branch of the military are pursuing ambitious renewable energy and energy efficiency goals that will save energy, mitigate climate change and reduce costs.<sup>48</sup>

The DoD is working with the Defense Advanced Research Projects Agency and other agencies to stay at the forefront of emerging technologies such as solar,

wind, geothermal and biomass energy for domestic installations. Also, the military is looking to power more vehicles with alternative fuels. Congress has supported the initiative, budgeting \$300 million from the American Recovery and Reinvestment Act of 2009 to fund DoD clean energy innovations in generation, transmission, end use and storage.<sup>49</sup> Meanwhile, the Army, Navy, Air Force, and Marine Corps are leading by example to embrace the strategic and operational imperatives of energy efficiency and the use of alternative energy systems.

Army projects include transformation of its fleet of 70,000 non-tactical vehicles (NTVs), including the current deployment of more than 500 hybrids and the acquisition of 4,000 low-speed electrical vehicles at domestic installations to help cut fossil fuel use.

Projects underway at navy facilities include the commissioning of the USS *Makin Island* as its first electric-drive surface combatant and testing an FA-18 Super Hornet fighter plane engine on camelina-based biofuel – two key steps toward the vision of deploying a “green” carrier strike group using biofuels by 2016 and setting a target of 50 percent of the total energy consumed by the navy, ashore and afloat, coming from alternative energy by 2020.

Air force projects include making 50 percent of its domestic aviation fuel an alternative fuel blend that is greener than conventional petroleum fuel by 2016; the construction of a 14-MW solar power generation plant at Nellis Air Force Base in Nevada to provide more than 25 percent of base energy; and the construction of the Soaring Heights Communities at Davis-Monthan Air Force Base, which will have solar systems expected to produce more than 10 million kilowatt hours of electricity annually – sufficient to provide an estimated 75 percent of the residents' energy use.

Marine corps projects include launching a “10X10 campaign” that aims to reduce energy intensity and water consumption and increase the use of renewable electric energy; working with the army to pioneer tests of energy-efficient foams that can be applied to temporary structures to reduce energy consumption 50 to 75 percent; and construction of the Experimental Forward Operat-

## H.R. 1585

### National Defense Authorization Act for Fiscal Year 2008

Section 2854 requires the Department of Defense to acquire 25 percent of its electricity from renewable energy sources such as wind, solar, geothermal and biomass electrical generators by 2025 and to make incremental progress toward that goal each year. Under current law (the Energy Policy Act of 2005, Public Law 109-58), DoD is required to obtain at least 7.5 percent of its electric power from renewable sources by 2013. To meet the increased requirements of section 2854, the department must acquire another 17.5 percent of its annual electricity consumption – or an additional 5.2 million megawatt hours annually – from renewable sources.

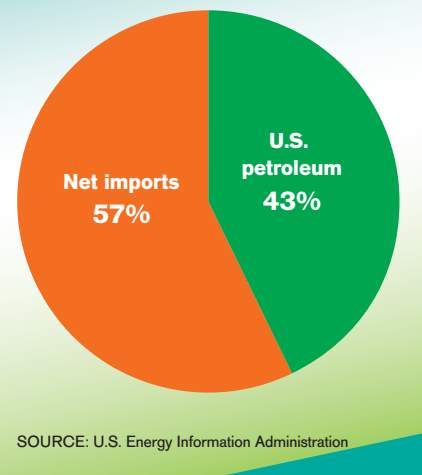
ing Base, a four-phase experiment designed to reduce the water, energy and other logistical needs of a marine base.

Today's military leaders clearly understand that forward-looking approaches to energy and efficiency can save American lives and money as well as reduce emissions. To meet these goals, military researchers are inventing, testing and deploying new technologies and alternative fuels, many of which will find their way into the private sector and to the U.S. consumer.

The military is, in many respects, leading the way and helping to reenergize America's future. The leadership and ingenuity of the military must be mirrored by policy makers and all energy stakeholders. A strong, comprehensive policy framework that invests in energy innovation and helps deploy low-cost, low-carbon energy sources will help strengthen our nation's security, economy and environment.

FIGURE 13

Net imports and domestic petroleum as shares of U.S. demand, 2008





# 25x'25: AN IMPROVED ENVIRONMENT

Producing 25 percent of America's energy from renewable sources will yield significant national security and economic benefits. It will also produce significant environmental improvements in the form of reduced fossil fuel emissions; better soil, water and air quality; and expanded wildlife habitat. The agriculture and forestry sectors in the United States have a unique opportunity to benefit from the clean energy services they can provide, but they also have an obligation to ensure that these services are sustainable. To be a long-term solution for America, renewable energy production must conserve, enhance and protect natural resources and be economically viable, socially acceptable and environmentally sound.

## SOIL HEALTH, WATER QUALITY AND WILDLIFE HABITAT

Recognizing the increased environmental pressure that could result from expanded bioenergy production, in 2007, Congress reauthorized portions of the 2002 farm bill that reward farmers for good conservation practices. The Food, Conservation and Energy Act of 2008 (2008 farm bill) emphasized conservation and restructured or streamlined many of the existing conservation programs under the previous bill. The 25x'25 alliance strongly supports these critical technical and financial assistance programs and the important role they play in helping farmers, ranchers and foresters produce food, feed, fiber and fuel, along with highly valuable ecosystem services.

Thanks to progress in production systems and practices, the environmental footprint of agriculture and forestry in the United States is improving especially in the areas of soil and water quality. Between 2004 and 2008, 53 million acres had new conservation measures applied to improve soil quality, increasing soil fertility and decreasing erosion.<sup>50</sup>

During the same period, agricultural producers applied additional conservation measures to reduce

fertilizer impacts on surface and groundwater water quality. The Natural Resources Conservation Service (NRCS) estimates that these practices reduce potential nitrogen delivery from agricultural operations by 375,000 tons and phosphorous by 61,000 tons. Additionally, farmers and ranchers conserved five million acre-feet of water using management practices implemented with NRCS assistance. With help from public and private sector conservation partners, farmers, ranchers and non-industrial private forest landowners have applied management techniques that will maintain or improve long-term vegetative conditions on 111 million acres of land and applied conservation practices on 3.8 million acres, increasing biodiversity and improving wildlife habitat particularly for at-risk or declining species.<sup>50</sup>

## AIR QUALITY, GREENHOUSE GAS REDUCTIONS AND AVOIDED EMISSIONS

These conservation practices and others provide many co-benefits in addition to the protection and conservation of natural resources. As shown in Table 1, they also help improve air quality by sequestering carbon in soils and reducing greenhouse gas emissions, and, they help farmers reduce costs and save energy.

According to the Conservation Technology Information Center (CTIC), 38 percent of cropland in the United States is maintained using conservation or no-till practices, providing tremendous benefits to the environment and reducing input and labor costs for farmers.<sup>51</sup> It is estimated that switching from conventional tillage practices to no-till agriculture can save farmers 3.5 gallons of fuel per acre – reducing carbon dioxide emissions. Also, substituting manure for commercial fertilizer can reduce fertilizer costs as much as \$85 per acre for a 1,000 acre farm, due in part to the cost of natural gas needed to create nitrogen fertilizer.<sup>52</sup> Nutrient management practices such as using precision

**TABLE 1**  
Sources of important agricultural and forestry “reduction” opportunities

EMISSIONS REDUCTIONS	
<b>Agricultural methane (CH<sub>4</sub>) emissions reductions</b>	<ul style="list-style-type: none"> <li>Manure management</li> <li>Enteric fermentation</li> </ul>
<b>Agricultural nitrous oxide (N<sub>2</sub>O) emissions reductions</b>	<ul style="list-style-type: none"> <li>Fertilizer practices</li> <li>Manure management</li> </ul>
BIOLOGICAL SEQUESTRATION FLUXES	
<b>Agricultural CO<sub>2</sub> in soils</b>	<ul style="list-style-type: none"> <li>Tillage, crop rotations, cover crops, grazing practices</li> </ul>
<b>Forestry CO<sub>2</sub> in forests and wood products</b>	<ul style="list-style-type: none"> <li>Afforestation, reforestation, deforestation, avoided deforestation, forest management, wood products</li> </ul>
AVOIDED FOSSIL FUEL EMISSIONS	
<b>Emissions avoided through substitution for fossil fuel combustion</b>	<ul style="list-style-type: none"> <li>Liquid transportation biofuels (ethanol, biodiesel, other renewable fuels)</li> <li>Thermal biopower/bioheat (biogas, wood, grasses, other cellulose)</li> <li>Renewable electrical power (biogas, wood, grasses, other cellulose)</li> </ul>
<b>Emissions avoided through efficiency improvements</b>	<ul style="list-style-type: none"> <li>Agricultural and forestry operations efficiency for fuels and electricity</li> </ul>

application equipment also lead to reductions in nitrous oxide emissions – nitrous oxide is a GHG 300 times more potent than carbon dioxide.<sup>53</sup> In addition, many next-generation bioenergy crops such as perennial grasses are well suited for conservation agriculture. Not only will these feedstocks directly sequester carbon dioxide, their increased use in alternative transportation fuel production will lead to reductions in the use of imported petroleum-based fuels, providing further significant GHG reductions.

The AgStar program run jointly by EPA and USDA provides livestock farmers with financial and technical assistance to install biodigesters on farms that capture greenhouse gas emissions from methane (direct emission reductions) and provide a cleaner source of energy with natural gas (avoided emissions). According to EPA, anaerobic digesters reduced emissions by over a million metric tons of carbon dioxide equivalents in both 2008 and 2009 through avoided emissions and direct emission reductions.<sup>54</sup>

## OUTLOOK

Increases in the production and use of renewable energy sources will continue to displace the use of fossil fuels and bring us closer to a secure homegrown renewable energy future for America. By reducing our need for fossil fuels, we also reduce potential damage to the environment through greenhouse gas emissions, pollution and future oil spills that would damage our habitats, livelihoods and economy.<sup>50</sup>

USDA has established ambitious targets for expanding conservation support services during the period 2010 to 2015. Its goal is to assist farmers with adopting energy-conserving farming practices and implementing environmentally sustainable systems for the production of renewable energy resources. Measures are also being taken to help farmers install practices that sequester carbon in soils, vegetation and forests and adopt conservation practices that mitigate or adapt to the impacts of climate change.<sup>50</sup>

We face many challenges in decreasing our impact on the environment, but there are many synergies between the opportunities we have to grow America's food, feed, fiber and fuel, and protect and conserve our natural resources.





# 25x'25: AN ECONOMIC ENGINE

America is in a race for global leadership of the new energy future. “The nation that leads the clean energy economy will be the nation that leads the global economy,” President Obama told Congress and the country in his State of the Union message earlier this year. While the United States is moving forward, the president pointed out that China, India and Germany, among others, are also striving for first place in the race to a global clean energy economy.

While virtually all sectors of the economy have suffered from the global recession, renewable energy sectors in particular saw a lengthy downturn in investment in 2008 and 2009 because of the pressure that the recession put on credit and other factors. However, a variety of reports have documented the fact that pursuit of the 25x'25 goal and increased reliance on renewable energy are producing a wide range of economic benefits that will help the United States bounce back and achieve global leadership in the pursuit of a new, clean energy economy.

There have been numerous, resource-specific studies issued in recent years that illustrate the economic benefits of land-based renewable resources. A study commissioned in February, 2010 by the Renewable Fuels Association, “Contribution of the Ethanol Industry to the Economy of the United States,” by John M. Urbanchuk, former director of LECCG LLC and currently a technical director at ENTRIX, showed that in 2009, the U.S. ethanol industry helped support nearly 400,000 jobs in all sectors of the U.S. economy. The industry also contributed \$53.3 billion to the gross domestic product, including \$8.4 billion in federal tax revenues (after subsidies, that results in a surplus of \$3.4 billion for the federal treasury). Biofuels also have added \$16 billion to household income and displaced the need for 364 million barrels of oil, all while reducing farm program payments because of increased demand and better prices for corn.<sup>55</sup> Ethanol use has reduced the price of gasoline by as much as 20 to 35 cents per gallon, according to the DOE, saving the average American household \$150 to \$300 per year. Iowa

State University researchers found that ethanol use may take as much as 40 cents off the price of a gallon of gas.<sup>56</sup>

According to an American Wind Energy Association fact sheet, “Wind Energy and Economic Development: Building Sustainable Jobs and Communities,” for every megawatt (MW) of wind capacity installed, about 60 person-years of employment and 15 to 19 jobs were created directly and indirectly. AWEA says the American wind industry now employs approximately 85,000 people.<sup>57</sup>

According to data compiled from government and industry sources by the Sustainable Energy Coalition, green manufacturing now accounts for between 200,000 and 240,000 jobs and green services jobs are much higher, totaling between 1.4 million and 1.8 million. That includes 46,000 U.S. workers employed by the U.S. solar industry, which also supports an additional 33,000 jobs in other sectors. The U.S. hydropower industry currently employs approximately 300,000 people; the direct, indirect and induced employment created by new geothermal projects is estimated to be 29,750 permanent jobs.

At a symposium held recently to mark the 30th anniversary of the American Council for an Energy-Efficient Economy (ACEEE), analysts agreed that America’s economy has tripled in size since 1970 and three-quarters of the energy needed to fuel that growth has come from energy efficiency advances. However, despite the enormous strides achieved in the last four decades, the U.S. economy remains only about 13 percent energy efficient (compared with 20 percent in Japan and some European countries), an unacceptably high level of inefficiency, according to analysts participating in the symposium.

Looking at the overall picture, “The Clean Energy Economy: Repowering Jobs, Businesses and Investments Across America,” a research study by The Pew Charitable Trusts, shows that despite the lack of a comprehensive, long-term national energy policy, the emerging U.S. clean energy economy increased jobs between 1998 and 2007 at a faster rate than overall job growth. According to the Pew research, by 2007 more than 68,000 clean

energy businesses across all 50 states and the District of Columbia accounted for about 770,000 jobs. Given the recent downturn in the economy, that number of jobs may seem small, representing a half a percent of all U.S. jobs. Still, Pew’s research shows that between 1998 and 2007, clean energy economy jobs – a mix of white- and blue-collar positions from scientists and engineers to electricians, machinists and teachers – grew by 9.1 percent, while total jobs grew by only 3.7 percent. It is likely that job growth in the clean energy economy declined during the downturn in 2008; however, the strength and innovation of the sector not only kept the slide to a minimum but is expected to be the basis for a resurgence in clean energy jobs.<sup>58</sup>

The jobs that are, and will continue to be, prevalent in the growing clean energy economy include wind industry positions such as environmental engineers, iron and steel workers, millwrights, sheet metal workers, machinists, electrical equipment assemblers, construction equipment operators, industrial truck drivers, industrial production managers, and first-line production supervisors.

Solar industry jobs created in recent years and expected to multiply include electrical engineers, electricians, industrial machinery mechanics, welders, metal fabricators, electrical equipment assemblers, construction equipment operators, installation helpers, laborers and construction managers. Biofuel industry jobs past, present and future include chemical engineers, chemists, chemical equipment operators, chemical technicians, mixing and blending machine operators, agricultural workers, industrial truck drivers, farm product purchasers, agricultural and forestry supervisors and agricultural inspectors.

As pointed out by a report from the Political Economy Research Institute at the University of Massachusetts, Amherst, and the Center for American Progress, new job and economic activity is continuing to be generated with the growth of the green economy.<sup>59</sup> Whether it’s installing solar panels or researching new ways to build efficient biofuel engines, the vast majority of green jobs are in the same areas of employment that people already work in today and are found in every state of the country. Wind farm construction, cited by the research as an example, creates jobs for sheet metal workers, machinists and truck drivers, among others. Increasing the energy efficiency of buildings through retrofitting requires roofers, insulators and building inspectors.

The clean energy economy is dawning in the United States and remains a critical component of the nation’s

future. With investments from both the government and private sectors continuing to grow, and with the adoption of a stable, long-term national energy policy by forward-looking policy makers, the nation will continue to find innovative ways to provide sustainably produced energy and spur economic renewal, promoting tremendous growth in the clean energy economy.





# THE PATH FORWARD: GETTING TO 25x'25

# 25x'25



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ince the formation of 25x'25, we have seen remarkable changes and significant progress in our push toward a renewable energy future.

But we still have a long way to go to achieve our vision, and America's need for renewable energy is even more urgent than it was in 2004. The economic and national security of a clean, home-grown source of energy is more important now than ever, as are the environmental improvements that can be derived from a greater reliance on renewable forms of energy.

The members of 25x'25 remain focused on our national goal: 25 percent of America's energy from renewable sources by the year 2025. We continue to work with government officials and stakeholders at every level to promote the creation – and funding – of policies and programs that will allow us to achieve that goal. And we are reaching out to engage the American public, telling the renewable energy story, explaining the urgency, describing the possibilities and sharing our vision.

The bottom line is that significant progress has been made, but there is more to be done and major challenges to overcome. To get to a 25x'25 energy future we must increase production of all forms of renewable energy. We must create the necessary infrastructure to deliver renewable energy to markets. We must expand existing and create new markets and make energy efficiency a high-value energy resource rather than an added cost. And as the oil well blow-out in the Gulf of Mexico reminds us, in producing energy we also must protect the environment and use our natural resources wisely.



## CHALLENGES TO OVERCOME

Today one of the biggest challenges our nation faces is its outdated and limited energy infrastructure. Transmission lines, the backbone of the U.S. electric grid that carries power from where it's generated to where it's used, are in need of modernization and expansion to facilitate a clean energy future. The Department of Energy has found that 70 percent of the nation's transmission lines are 25 years or older, 70 percent of power transformers are 25 years or older, and 60 percent of circuit breakers are more than 30 years old. Yet only a few high-voltage transmission lines have gone up over the past 10 years. While electricity sales have gone up 20 percent since 1996, transmission capacity to carry that power has increased just 8 percent.

In the biofuels arena, America desperately needs an expanded network of pipelines, rail lines, ports and other shipping facilities to ensure that home-grown transportation fuels get from rural areas where they are largely produced to urban and suburban consumers. Efforts must also be increased to find cost-effective mechanisms and systems for getting renewable energy feedstocks to energy production facilities. New incentives are needed to expand the availability of pumps to dispense the variety of biofuel blends that will soon enter the marketplace. Equally important, we need to dramatically increase the number of flex-fuel vehicles available to the driving public.

A new, renewable energy future cannot be achieved without significant public and private investment. Financial markets that had hotly pursued renewable energy and energy efficiency technologies turned cool in the global economic downturn of 2008, from which the world is only now beginning to recover. Government efforts to shore up renewable energy development, including the American Recovery and Reinvestment Act, provided a boost to clean energy markets. However, the path to recovery is not without impediments, and caution continues to inhibit growth. Public investment is a valuable tool in sustaining momentum in the renewable energy market, but in the face of growing deficits, is a limited resource. It is crucial that private investment find its way back to the levels experienced before the recession and spark the growth necessary to achieve a new energy future.

That growth in investment can only come with a focused and sustained commitment to a new energy future. Consumers need to know that renewable energy is a viable and valuable alternative to current energy consumption patterns. Biofuels, wind energy and virtu-

ally every other source of renewable, sustainable energy in this country have drawn criticism from a variety of sectors and interest groups. Much of the negativity, not surprisingly, has come from traditional energy interests seeking to maintain the status quo. However, opposition is also coming from those who seem to be seeking "perfect" solutions to our climate and energy problems. In doing so, they often dismiss the near-term options that are pathways to ever more efficient and viable long-term solutions to the growing threats to our national security, our environment and our economy that result from our dependence on traditional energy sources. It is critical that renewable energy stakeholders work to overcome this resistance and build a broader base of support for the innovative and viable alternatives that renewable energy technologies can offer.

## A NEW POLICY FRAMEWORK

This year has seen a series of environmental catastrophes, diplomatic confrontations and price hikes at the gas pump, all stemming from our over-reliance on fossil fuels. Policy makers and stakeholders must understand that there is a critical and immediate need for a comprehensive energy policy and must work together to bring about a strategy that not only protects our environment, but insures our energy supplies and enhances our national security. The United States has been held hostage for decades by our ever-growing addiction to oil. A new, wide-ranging policy that incorporates the energy and climate solutions available from the land is needed to help break the country free of its dependence on oil and the unstable regimes that supply it. To reclaim our freedom and insure a cleaner, safer energy future, Washington must adopt policies that embrace renewable resources, efficient technology, sustainable fuels and American jobs.

It's time for 25x'25 partners to multiply their efforts and build a bigger, even more effective alliance that can bring about the changes necessary to achieve a new, clean energy future. A reinvigorated alliance can reach across national boundaries and lead a global movement to leverage solutions from the land that improve economies, create jobs for the world marketplace and make our planet a healthier place to live.

With insight, dialogue and a growing network of partners, we are confident we can help our nation move forward and enjoy a cleaner, more secure future fueled in significant part by home-grown renewable energy. **Join us in bringing the 25x'25 vision to life.**

# 25x'25 RECOMMENDATIONS FOR A CLEAN AND SECURE U.S. ENERGY FUTURE

1. Ensure that the enabling policies that are adopted will result in the successful achievement of the 25 percent renewable energy by 2025 national goal.
2. Create markets for renewable energy and carbon using mechanisms that value the role of agriculture and forestry in producing clean energy and reducing and sequestering greenhouse gas emissions.
3. Expand and extend federal loans and loan guarantees for renewable energy production and energy efficiency projects.
4. Pass long-term (six to eight years minimum) renewable energy and energy efficiency financial incentives including investment and production tax credits.
5. Provide incentives for utilities to aggressively pursue cost-effective energy efficiency.
6. Expand and fund federal soil and water conservation programs to ensure the sustainable production of food, feed, fiber and fuel.
7. Create incentives to accelerate the production and deployment of flex-fuel and plug-in hybrid electric vehicles.
8. Modernize and improve access to the grid, build new transmission lines and remove siting impediments to facilitate the delivery of renewable electricity to markets and to improve transmission efficiency and reliability.
9. Create and expand pipelines, rail lines, ports, pumps and other infrastructure needed to deliver renewable fuels and feedstocks to market.
10. Increase federal research, development and deployment funding to accelerate the commercial deployment of next-generation biofuels, solar power, wind energy, geothermal energy, hydropower, energy efficiency tools, carbon capture and storage and other renewable energy technologies.



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# ABOUT 25x'25

25x'25 is a diverse alliance of agricultural, forestry, environmental, conservation and other organizations and businesses that are working collaboratively to advance the goal of securing 25 percent of the nation's energy needs from renewable sources by the year 2025. 25x'25 is led by a national steering committee composed of volunteer leaders. The 25x'25 goal has been endorsed by nearly 1,000 partners, 31 governors, 15 state legislatures and the U.S. Congress through The Energy Independence and Security Act of 2007.

25x'25 is a special project of the Energy Future Coalition, a broad-based non-partisan public policy initiative that seeks to bring about change in U.S. energy policy to address overarching challenges related to the production and use of energy. The Energy Future Coalition is organized as a project of the Better World Fund, which acts as its fiscal agent. The Better World Fund is a tax-exempt organization under section 501(c)(3) of the Internal Revenue Code and shares a common Board of Directors with the United Nations Foundation.

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For more information, please go to the 25x'25 Website at [www.25x25.org](http://www.25x25.org).

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