Testimony
of:
Michael T. Eckhart, President
American Council On Renewable Energy

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This is the testimony of Michael Thomas Eckhart, President of the American Council On Renewable Energy (ACORE), a 501(c)(3) nonprofit organization founded in 2001 and based in Washington, DC.

INTRODUCITON TO ACORE

ACORE has grown rapidly and presently has over 400 organizational members including technology suppliers; energy marketing companies; utility companies; end users, colleges and universities; law firms, consulting firms and other professional services firms; financial firms such as investors, lenders, and insurance; nonprofit groups and environmental organizations; trade associations (including all of the national trade associations in renewable energy); and government agencies at the federal, state and local levels.

ACORE's mission is to bring together all of the organizations necessary to make renewable energy successful in our country. Our focus is to bring renewable energy into the mainstream of our American economy and lifestyle. As a founding philosophy that distinguishes ACORE, we are "for renewable energy" without being against anything.

ACORE convenes the renewable energy community in three major conferences each year – a trade show in Las Vegas, a high-level finance conference in New York City, and a national policy forum here in Washington, DC.

In the most recent national policy conference on November 30, 2006, entitled "Phase II of Renewable Energy in America: Market Forecasts and Policy Requirements" we were honored to have 18 major agencies, associations, and nonprofit organizations give their outlook on renewable energy in America, now published in a report of the same title, which I enter into the record. The organizations included the following:

Nonprofit and Academic Institutions:

- American Council on Renewable Energy
- American Solar Energy Society
- Apollo Alliance
- Energy Future Coalition
- The Renewable and Appropriate Energy Laboratory, University of California at Berkeley
- Worldwatch Institute

Trade Associations:

- American Wind Energy Association
- Biomass Coordinating Council
- Geothermal Energy Association
- National Hydropower Association
- National Biodiesel Board
- Ocean Energy Council
- Renewable Fuels Association
- Solar Energy Industries Association
- U.S. Combined Heat & Power Association

Government Agencies and Research Institutes:

- U.S. Department of Energy
- Electric Power Research Institute
- Energy Information Administration
- National Renewable Energy Laboratory
- Western Governors' Association

ACORE then asked the participating organizations to form a working group, to develop a consensus outlook. This work was conducted from mid-December to mid-February 2007, and is currently being published.

ACORE is pleased to present the text of the to-be-published *2007 Consensus Outlook on Renewable Energy in America* as part of my testimony today, in the following sections. The non-profit organizations, academic organizations, and trade associations endorse this consensus outlook – this is the first time in the industry's 30-year history that a consensus has been reached. The government agencies and research institutes acknowledge that their outlooks were included but of necessity cannot and do not endorse the report.

MEETING AMERICA'S ENERGY NEEDS

Renewable energy could contribute dramatically to meeting America's energy needs, providing up to 550 gigawatts (GW) of new electricity generating capacity by 2025. That amount is equal to roughly half of total U.S. generating capacity today, and – according to projections from the U.S. Energy Information Administration (EIA) – represents substantially more than the additional electric power generating capacity needed by 2025. Moreover, with only a 3% share of the U.S. transportation fuels market, there is room for the biofuels industry to grow significantly. The Department of Energy's Advanced Energy Initiative calls for replacing 30% of our current gasoline consumption with biofuels by 2030.

Renewable energy can meet the immediate needs of the U.S. while helping us achieve our economic, security, and environmental goals. America needs to scale up renewable energy use now for the following reasons.

- **America needs secure energy supplies**. The U.S. imports almost 60% of its oil and is faced with an aging electric grid dependent on centralized power production. In addition,

EIA predicts that imports of liquefied natural gas will increase seven-fold over 2005 levels by 2030. Renewable energy sources are domestic resources, and can include distributed and smaller-scale generation, providing significant security advantages for the entire portfolio of power and fuel supply.

- **America needs to address climate change.** Scientists have shown the connection between climate change and extreme weather patterns, species extinction, desertification, and ecological damage. They are warning us that the time to act is now. Along with energy efficiency, renewable energy can be one of the major solutions to climate change, and can begin to make a difference immediately.

- **America needs a cleaner environment.** Renewable energy will allow the U.S. economy to continue growing while meeting environmental caps and other standards. More renewable energy will mean less pollution, improved public health, protected natural systems, and lower consumption of scarce water resources than the conventional energy path.

- **America needs large-scale, economic energy supplies.** Renewable energy can make a substantial contribution, supplying on the order of 25% of our energy needs by 2025, given the right policies and conditions.

- **America needs energy at predictable costs.** Volatility in oil and natural gas markets creates disruptions to the economy. Renewable energy can offer long-term, fixed price supplies and the certainty of future costs.

- **America needs to grow industry and create jobs.** Pursuing a renewable energy strategy could create $700 billion of economic activity and 5 million jobs by 2025 – good jobs in the high-tech, engineering, construction, installation, agricultural and service sectors that can boost economies in both rural and manufacturing areas.[1] The world market is also hungry for clean energy technologies. The U.S. should take advantage of the opportunity to develop new export potential while building the 21st Century's sustainable economy.

- **America needs to be competitive in the global marketplace.** The U.S. has some of the largest renewable resources of any country in the world. Many renewable technologies were developed in the U.S., but lost essential support. Now, our inconsistent policies threaten to sacrifice tremendous opportunities for economic development and export. If America wishes to lead in the development of today's most promising energy sources, our country must provide the essential policy environment for private sector investment and growth of renewable energy in our domestic market.

HOW RENEWABLE ENERGY CAN MEET AMERICA'S NEEDS

To meet America's energy needs we must consider how energy is consumed in our economy. There are four broad energy-use sectors: industrial, commercial, residential, and transportation. The major applications are electricity production, heating, and transportation fuels. Here is how renewable energy serves these needs.

- **An energy source for America's electric utilities –** The estimates presented in this report suggest a potential for more than 550 GW of new renewable electricity generation

capacity by the year 2025, which is substantially more than the new capacity needed by that date. This capacity will come from all of the renewable technologies: wind, geothermal, solar, water, and biomass power.

- **Distributed applications –** Increasingly, end users of all kinds are generating their own electricity and managing their thermal energy uses with an eye towards greater energy efficiency. Many methods – such as Industrial Efficiency, Green Buildings, Climate-Neutral Campuses, and Zero-Energy Homes – include a combination of efficiency and renewable energy. Examples of distributed applications of renewable energy include: building-mounted solar PV; solar heating and cooling; geothermal energy used in a home or greenhouse; biomass or wind energy on a ranch or farm; combined heat and power at an industrial facility using biomass fuels; and recycled energy at power generation sites.

- **Transportation fuels –** Analyses conducted for the Energy Future Coalition have supported the feasibility of having biofuels supply 25% of our transportation energy needs by 2025. The package of available transportation fuels includes ethanol, biobutanol, biodiesel, bio-based diesel fuels, and a variety of other bio-based transportation fuels. These fuels can be used to power aircraft and watercraft as well as trucks and automobiles.

- **Production of electricity and hydrogen for transportation –** In addition to biofuels, there is substantial potential for renewable energy sources to meet transportation needs through hydrogen production and adoption of transportation technologies using renewable electricity, such as plug-in hybrids, electric vehicles, and mass transit.

Public Policy to Meet America's Needs

America needs coordinated, sustained federal and state policies that expand renewable energy markets, promote and deploy new technology, and appropriately provide opportunities to encourage renewable energy use in each of the market sectors and applications mentioned above. Other countries, such as Germany, Spain, and Japan, have succeeded in building successful renewable energy industries by directing their incentive programs to the end-use markets while continuing support for research and development of new and improved technologies. The U.S. can do the same, if we establish similar long-term, market-oriented policies to "pull through" the new technologies.

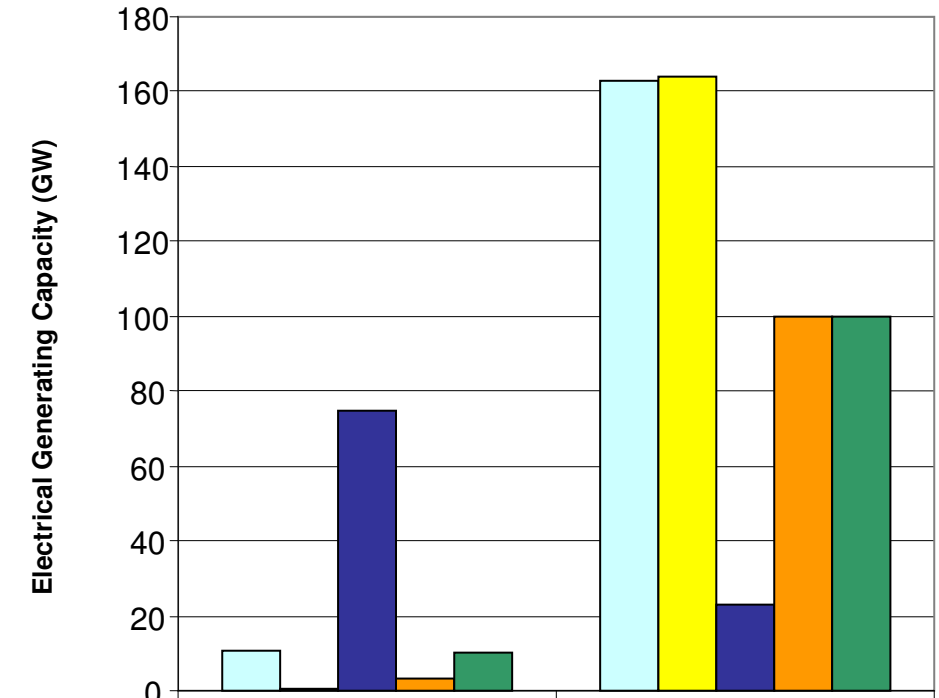
OUTLOOK ON EACH RENEWABLE ENERGY TECHNOLOGY

During the successful "Phase I" period of renewable energy development that occurred from about 1975 to 2000, the focus was solely on research, development and demonstration (RD&D) of the many new technologies. Now, as the U.S. shifts into Phase II strategies for putting the technologies into use at scale, we face new challenges. Research and demonstration should be expanded, but at the same time, there is an increasing need to focus on deployment and market incentives. Expanding renewable energy will require support for the full range of renewable technologies, recognizing their many differences as well as their common foundation as sustainable technologies.

Up to 550 GW of new renewable power capacity could be available by 2025, assuming development of biomass, geothermal, hydro, solar, and wind projects as envisioned by the

industry groups that participated in ACORE's National Policy Conference "Renewable Energy in America: Phase II Market Forecasts and Policy Requirements" in November 2006. (See Figure 1, below.)

Figure 1
New Renewable Power Capacity (2006-2025)



	Current (2006)	New Renewable Capacity (by 2025)
Wind	10.5	163
Solar	0.52	164
Hydro	75.0	23
Geothermal	3.1	100
Biomass	10.0	100

The following offers a summary outlook on each key renewable energy technology.

Wind Power

Wind power is providing increasing capacity to electricity markets around the world. The American Wind Energy Association (AWEA) concludes that it is feasible and affordable to increase wind capacity to supply 20% of this nation's electricity by 2030. AWEA envisions that active "community wind" projects as well as small distributed wind applications will supplement large utility-scale projects. Offshore wind is expected to begin as early as 2010, and to increase thereafter.

This outlook foresees 340 GW of new wind capacity by 2030. Using an average growth rate, this would result in 163 GW of new wind capacity by the year 2025.[2]

Achieving this level of wind power will require new transmission capacity to transmit power from areas with wind resources to regional power markets where the demand exists. Continued research and development also will be needed to achieve improved efficiencies and economies of scale in wind turbine technology to serve lower-wind regions and offshore locations.

Solar Heat and Power

Solar energy is an abundant renewable resource across America, and can become a significant source of new generating capacity in a relatively short timeframe. The rapid scale-up of solar energy markets has been demonstrated in Japan, Germany, Spain, and other countries.

The outlook for solar energy in the U.S. envisions 110 GW of new solar power capacity by 2016, resulting from a 67% compound annual growth rate. After a rapid growth through 2015, the solar market is foreseen to stabilize with 5 GW of photovoltaic (PV) and 1 GW of concentrating solar power (CSP) added annually from 2016-2025, resulting in total solar capacity additions of 164 GW in 2025.[3]

The Solar Energy Industries Association (SEIA) envisions this scenario based on robust growth in PV installations on residential rooftops and other locations as well as larger, utility-scale CSP plants. Furthermore, solar water heating is expected to take off as it has in other countries that have embraced renewable energy.

This robust scenario requires a long-term incentive plan to encourage manufacturing and power plant development, financing, and increased industry growth. Additionally, this scenario requires that units can be interconnected as installed without additional utility or permitting costs, that net metering applies nationwide at retail rates, and that continued cost reductions be realized through continued manufacturing scale-up and economies of scale.

Continued research and development will be required to maintain the pace of achievements in improved conversion efficiencies, focusing both on current processes and manufacturing methods as well as developing nano-structured materials for the next generation of PV technology. For CSP, new transmission capacity will be required to transmit power from areas with rich solar resources to regional power markets where the demand exists. Policies that offer rewards or incentives for the adoption of technologies like solar water and space heating are also needed.

Water Power

The water power technologies expected to contribute to this outlook are conventional hydropower, hydrokinetic power, and ocean energy which includes wave, current, tidal, marine biomass, and Ocean Thermal Energy Conversion (OTEC) power.

Conventional hydropower is already the leading source of renewable electric power capacity at over 75% of all renewable energy sites. Its quick, reliable load-following capability and seasonal capacity can enhance the performance of other renewables by balancing variability in resources. In addition, the potential for power generation from ocean currents and tidal flow is tremendous. Plus, the new field of hydrokinetic power offers a wide range of distributed power generation

options. Utilizing all the water power technologies, there is the potential to add 23 GW of capacity by 2025.[4]

There are still other areas of growth that have yet to be assessed, such as additions of capacity on man-made waterways (e.g. conduit power). Advanced research, development, and demonstration are necessary to support this growth for both improvements of conventional systems and development of new technologies. Incentives for commercialization will be needed for early hydrokinetic and ocean power technologies.

Geothermal Heat and Power

Geothermal energy is poised to expand rapidly. The Geothermal Energy Association (GEA) cites the 62 new geothermal energy projects in development as evidence of the industry's most dramatic wave of expansion since the 1980s. Geothermal's status as a baseload energy source – one that is available 24 hours a day, seven days a week – makes it a particularly appealing option for utilities.

Geothermal resources could contribute 100 GW of new capacity by 2025, tapping both identified resources and new discoveries in hydrothermal sites, co-production from oil and gas wells, and deep resources and engineered geothermal systems (EGS). Furthermore, geothermal energy for direct uses and heat pumps could provide significant additional energy not included in this total if policies support their growth.

The outlook for 100 GW of new geothermal capacity by 2025 assumes development of 20 GW from the hydrothermal resource base, development of 70 GW from co-production and geo-pressured resources, and 10 GW of deep geothermal sources and EGS systems.[5]

This scenario requires: long-term extension of the production tax credit; continued prioritization of expedited leasing and permitting decisions; expanded support for exploration and characterization of the resource base; support for development and demonstration of geo-pressured resources and co-production; and, continued development of the full range of geothermal resource and power technologies working towards the development and deployment of engineered geothermal systems.

Biomass and Bio-based Products

According to the U.S. Combined Heat and Power Association (USCHPA), biomass power projects could see a ten-fold increase from the current installed base of 10 GW. This increase would result in 100 GW of new biomass capacity by 2025.[6]

Growth is expected to take place in wholesale power generation as well as distributed production in pulp and paper mills, commercial and industrial facilities, and solid waste conversion to energy. Continued growth in farm, landfill, and wastewater treatment power projects will supplement this growth. A substantial portion of this new capacity would come from combined heat and power applications, where thermal energy that would otherwise be wasted is applied for productive uses, resulting in very high (up to 85%) efficiencies.

Due to the localized nature of fuel availability and thermal loads, the majority of new biomass power projects will be at distributed facilities near demand centers. In these applications, local energy resources will be used to fuel local development. Like other load-sited, distributed renewable projects, these biomass applications benefit the grid by alleviating congestion, freeing up capacity, and deferring expensive system upgrades.

Just over one-third of new capacity will require access to the transmission system. New transmission capacity will be required to transmit power from wholesale power generators in areas rich with biomass resources to regional power markets where demand exists.

Research and development will be required to achieve improved biomass conversion technology with lower capital costs, targeting both gasification and pyrolysis approaches.

The demand for biomass created by new biomass power and biofuel production would be many times greater than current levels; it is assumed that sufficient resources will be available to support these demands at economic prices. Recent studies suggest that resources will be sufficient.

Biofuels

New biomass power and biofuel production will greatly increase demand for biomass resources. However, recent studies by the National Renewable Energy Laboratory, the University of Tennessee, and Oak Ridge National Laboratory indicate that the U.S. agriculture and forestry industries have the potential to produce enough biomass resources to supplant 30%-40% of current U.S. petroleum products while meeting food, feed, fiber and export needs.

DOE has set a goal of "30% by 2030," and will publish a study that will examine market, policy, and technology changes required for the U.S. biofuels market to replace 30% of current levels of gasoline consumption by the year 2030.[7] This is an aggressive but achievable goal that will require policy commitment and technology advances. The key components of the biofuels opportunity are ethanol, biodiesel, and bio-based diesel fuels.

- **Ethanol fuel –** The U.S. produced 4.9 billion gallons of ethanol in 2006. Today, 111 ethanol plants in 19 states have the capacity to produce 5.4 billion gallons of ethanol. As of January 2007, an additional 78 plants are under construction, combined with seven expansions, which will increase industry capacity by 6.1 billion gallons. By the first quarter of 2009, the industry's annual production capacity is estimated to reach 11.6 billion gallons per year.

  This rapid growth can continue if the U.S. maintains and extends existing tax incentives for all ethanol blends, expands tax incentives for ethanol refueling infrastructure, and creates new consumer-based tax incentives to encourage flexible fuel vehicles and the purchase of ethanol. Such growth will also require the U.S. to build upon the industry's advancements in technologies to reduce energy consumption, improve biorefinery efficiency, develop new co-products, and – of crucial importance – move toward commercial deployment of cellulosic ethanol.

- **Biodiesel fuels –** The National Biodiesel Board (NBB) reports that U.S. production is on track to increase from 25 million gallons in 2004 to 226 million gallons in 2006. The number of plants has increased from 22 in 2004 to 85 in January 2007, with another 65 under construction. The industry envisions that biodiesel blends will displace 5% of the diesel fuel market by 2015.

  Technology is rapidly emerging to produce bio-based diesel fuels from a variety of feedstocks, including woody biomass and municipal and organic wastes. By U.S. law, these fuels are classified separately from biodiesel. Currently, there are no long-range

forecasts for these bio-based fuels. However, several might be commercial before the end of 2010.

Bio-based Products

In addition to fuels, bio-based products could include solvents, cleaners, lubricants, greases, panels for cars and trucks, agricultural products, pharmaceuticals, inks and paints. Essentially, almost anything made from petrochemicals can be produced from some form of biomass, displacing usage of some level of petrochemicals.

Renewable Energy Stored in Hydrogen for Transportation

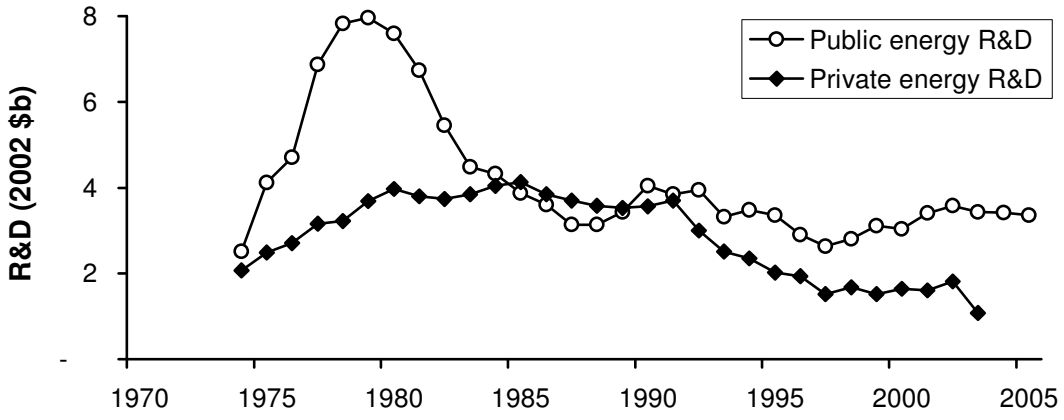
In addition to biofuels, there is substantial potential for renewable energy sources to meet transportation needs. The hundreds of gigawatts of renewable power potentially available could supply electric vehicles or charge the batteries of plug-in hybrids, power electric mass transit systems, and support hydrogen production through electrolysis for use with fuel cells. Together, the potential for renewable power to displace liquid transportation fuels is substantial.

Public Policy for Technology Research, Development, and Commercialization

Why haven't renewable technologies achieved their potential? A fundamental problem with the development and deployment of renewable technologies has been the uncertainty of government policy. Support for both research-push and market-pull policies has been constrained by short-term commitments, which are destabilizing to industrial growth.

If renewable energy is to be developed to its full potential, decades of under-investment in energy research and dissemination must end. Figure 2 shows the continuing reductions in funding that this sector has received.

Figure 2
Public and Private Sector Funding for Energy Research and Dissemination in the U. S.



Source: Kammen, D. M. and G. F. Nemet (2005) 'Reversing the incredible shrinking energy budget", *Issues in Science and Technology*, Fall, 84 – 88.

RENEWABLE ENERGY MARKET OUTLOOK & CHALLENGES

The assessments and analyses presented at the Phase II Conference offered valuable information about the outlook for renewable energy in the United States. Together, they form a picture of what a business-as-usual (base case) future might look like if no policy changes are implemented, and of the potential for a more aggressive renewable energy strategy (mid-range and higher potential cases). This section summarizes the range of sensitivity of the renewable energy outlook to public policy.

Business-As-Usual Outlook

The Energy Information Agency (EIA) presented the reference case from the *Annual Energy Outlook 2007*, assuming "all current standards, laws, and regulations remain as currently enacted." Under this scenario, total U.S. primary energy consumption is expected to increase from 100 quadrillion Btu (quads) in 2005 to 131 quads in 2030.

During this period, the share of renewable electricity generation is forecast to remain constant at 9%, while coal is expected to increase its share of electric power generation from 50% in 2005 to 57% in 2030. Ethanol use is expected to increase from 4 billion gallons in 2005 to 14.6 billion gallons in 2030, or about 8% of total gasoline consumption by volume – far short of what is needed. Even with currently available renewable energy technologies, this forecast is not consistent with an energy strategy that embraces sustainability, climate stabilization and a healthier environment. This official base case clearly indicates that without substantial change in policy, renewable energy is not expected to significantly increase its share of the U.S. energy market.

Mid-Range Outlook

There have been several "mid-range" conclusions, based on modest changes or extensions of policy and the assumption of conditions that are favorable to renewables.

The Western Governors' Association (WGA) conducted a two-year study of clean energy technologies in the region. WGA concluded that, in just the Western States, renewable energy could contribute upwards of 68,000 MW (68 GW) by 2020. In addition, the Electric Power Research Institute (EPRI) ran an analysis that emphasized the value in a "balanced generation portfolio" and included a CO_2 cost, beginning in 2015. This analysis estimates that electricity from new renewable resources (excluding hydropower) can reach 13% of demand by 2030.

The WGA estimate and EPRI "balanced generation portfolio" estimate appear to present a more aggressive strategy than the base case scenarios. However, compared to the assessments of the renewable industry and others, these would have to be considered mid-range potentials.

High Potential Outlook

Together, the renewable power estimates described in Section 3 present a dramatic picture of what would be possible under an aggressive renewable energy scenario. Additional renewable capacity could reach 550 GW by 2025. This is potentially more than the new, additional electric power generating capacity needed by that date according to EIA. Each technology has a different operating characteristic and capacity factor, so GWs do not necessarily add.

EPRI looked at a more aggressive strategy with both high natural gas prices and high CO_2 costs. This case, dubbed the "double whammy," shows further growth of new renewables in the electric supply sector. The results, excluding geothermal and hydropower power, show a renewable contribution to electricity of 16% by 2030, and as much as 25% by 2050.

The outlook for renewable fuels is equally robust. Biodiesel is growing fast. The National Biodiesel Board (NBB) has estimated that biodiesel could displace 5% of petroleum diesel in a near- to mid-term timeframe. The Renewable Fuels Association (RFA) has presented an overall outlook for its sector, noting the dramatic growth in the industry today. This growth is expected to be sustained, with ethanol reaching 14 to 15 billion gallons in the mid-term future. But this is not the full potential of the resource. RFA asserts that 30% of motor fuel could come from renewable sources by 2030, which would be 60 billion gallons of annual production. In addition, the advent of plug-in hybrid vehicles and other electricity-based transportation systems and technologies would allow renewable power to contribute to displacing the need for imported oil.

Support from Leading Organizations

A growing trend is emerging in American leadership. Many leading national campaigns and organizations support an aggressive shift to increasing the use of renewable energy. Although the details may vary, the goals are the same: creating jobs and economic growth, improving energy security, cleaning the environment, and stemming global warming. Time after time, when serious, credible experts assess the potential for renewable energy, they reach independent conclusions that are consistent with the transition to greater levels of renewable energy:

- **20% by 2020:** The Union of Concerned Scientists (UCS)' call for a national renewable portfolio standard – resulting in 180,000 MW (180 GW) of renewable power by 2020 – shows that natural gas prices would decrease, creating a net benefit to the economy.[2]

- **25% by 2025:** The 25 x '25 Initiative, supported by the Energy Future Coalition (EFC), commissioned a report by the University of Tennessee which shows that 25% renewable energy by 2025 is affordable and achievable and will create 3-5 million new jobs and spur $700 billion in economic activity.[8]

- **Over 30% by 2030:** For its recently released report, "Tackling Climate Change in the U.S."[3], the American Solar Energy Society (ASES) asked experts in efficiency and each renewable technology "to come up with their best estimates of what their technology could do [by 2030] ...with an aggressive climate-driven scenario in mind" (ASES, p.12). Independent assessments of the potential for CSP, PV, wind, biomass, and geothermal technologies came up with a combined contribution to the U.S. electricity grid of 2,208 Terawatt hours/year by 2030, about 40% of the EIA's projected demand for electricity under a "business as usual" scenario (i.e., not accounting for energy efficiency improvements). The potential contribution from energy efficiency is even greater.

Many of these campaigns, as well as the Apollo Alliance's outlook for 3 million jobs from clean energy solutions, are also supported by diverse coalitions which include business, labor unions, production agriculture, religious groups, conservation and environmental organizations, public health advocates, and local, state, and nationally elected officials.

Future Success in Each Technology

Achieving the high-potential scenarios will depend on progress made to advance each technology's performance, lower its cost, and overcome challenges of market acceptance at scale.

Identifying and overcoming the various obstacles for each technology and end use sector should be a priority for federal and state policies. None of the known impediments to achieving our goals appear insurmountable if there is the political will to support renewable energy. Here are some examples.

- **Wind power** – The challenges include: improved access to transmission; long-term production tax credit (PTC) extension; new state or national renewables portfolio standards (RPS) and effective implementation of existing RPS; continued research support; development of an off-shore regime in supportive manner; continued priority on federal lands; and recognition of bird/bat mitigation success.

- **Solar energy** – The challenges include: local covenant restrictions; consistent and effective net metering polices at the state and federal levels; silicon availability and price; new state or national RPS and effective implementation of existing RPS; research and support for reduced balance of systems cost; infrastructure development; competition with foreign markets; inclusion in state and federal renewable laws; modification of the investment tax credit to remove the cap and extend multiple (8-10) years; and other factors.

- **Water power** – The challenges include: regulatory streamlining and resolving licensing issues for the new technologies (ocean, tidal, and instream power); research and development support for both the next generation of conventional hydropower equipment and the new technologies; long term extension of the Section 45 PTC and inclusion of ocean, tidal and instream projects, equitable treatment in state RPS efforts; and transmission support.

- **Geothermal energy** – The challenges include: long-term PTC extension; new state or national RPS and effective implementation of existing RPS; restoration of DOE Research Program; support for exploratory drilling program and characterization of the U.S. hydrothermal resource base; demonstration of geopressured and oil field co-production; consistent work towards Enhanced Geothermal Systems demonstration; funding and prioritization of public land leasing and permitting; and inclusion in state renewable initiatives.

- **Biomass power –** The challenges include: extension of the biomass PTC, and the inclusion of a thermal credit to promote high efficiency combined heat and power applications; new state or national RPS and effective implementation of existing RPS; access to sustainable supply of feedstock, including from public lands; inclusion in state renewable efforts without excessive restrictions; continued research support; credits for other attributes (pollutant and criteria pollutant reductions, greenhouse gas emissions reductions, and recovered thermal energy) and, in the case of distributed biomass applications, recognition of grid benefits in tariff design and cost allocation; inclusion of landfill gas and appropriate municipal solid waste (MSW) technologies as creditable renewable energy systems; and reasonable interconnection standards.

- **Biofuels –** The challenges include: deploying first-of-a-kind biorefinery technology; increasing cellulosic biofuels research, development, deployment, and commercialization funding; expanding and modernizing fueling infrastructure; and increasing the number of flexible-fuel vehicles on the road.

Market Drivers

It must be recognized that achieving any scenario is subject to significant uncertainties in key market drivers. Important factors include the following.

- Volatility in oil and gas prices
- Pace and scale of action on climate change
- Extent of technology breakthroughs
- Policies / opportunities abroad

This section has presented a sense of the *range* of possible future outcomes for renewable energy in the U.S. Within the context of marketplace uncertainties, the major determinant of future market share for renewable energy is public policy.

- EIA's low/base-case scenarios assume no change in policy, and the resulting renewable development is minimal.

- Mid-range scenarios assume a continuation of the positive policies that are in place, plus market conditions favorable to renewables.

- The high-potential scenarios require favorable market conditions and a sustained commitment of public policy to see renewable energy scaled up to higher levels of contribution to U.S. energy supplies.

America's renewable energy industries are ready to take the U.S. in a new direction. Now the right public policies are needed to help chart this route.

BENEFITS OF RENEWABLE ENERGY FOR THE U.S. AND THE WORLD

When the high-potential scenarios that are described in Sections 3 and 4 are achieved, resulting benefits to the U.S. and the world will include increased energy supply, improved national security, better health, reduced risk of climate change and environmental impacts, and greater economic prosperity.

- **Energy supply –** The consensus outlook calls for 20% of U.S. electric power supply by 2020 based on the UCS proposal for a national RPS, 25% of U.S. energy supply by 2025 based on the EFC proposal for energy from rural America, and 30% or more of U.S. energy supply by 2030 implied by the ASES assessment of climate change mitigation.

- **National security –** The reduction of imported energy provides a more secure future. We can reduce imported oil from 60% today to a much lower level, and preclude the importing of natural gas via liquefied natural gas (LNG). Energy independence has long been a "top priority," but for the past 30 years has proved an elusive goal. If we can tap the potential of our domestic renewable energy resources, we can make real progress towards achieving true energy independence.

- **Environment and health –** A renewable energy future is an environmentally sound future with cleaner air, cleaner and more abundant water, lower chemical contamination, improved human health, and a safer environment for our children and grandchildren. A

key benefit that is often overlooked is the fact that renewable energy reduces our consumption of increasingly scarce clean water supplies.

- **Climate change –** As America turns to address global climate change, we find ourselves facing an enormous problem of potentially unprecedented impact. By capturing the potential of renewable energy and improving energy efficiency, we can drastically reduce greenhouse gas emissions and make the U.S. a world leader in mitigating the risks of climate change.

- **Economic prosperity –** Renewable energy is domestic energy and can be deployed using U.S. technology, capital and labor. With biofuels, we support companies and jobs in the Midwest instead of the Middle East. With renewable power, we employ U.S. workers to install U.S. technology and deliver U.S. services. The Apollo Alliance and other organizations estimate that renewable development can result in as many as 3 million U.S. jobs. All renewable energy technologies are "New Wealth Industries" with major economic multipliers, as the technologies are manufactured domestically and their products move to consumers through a variety of processes.

GUIDING PRINCIPLES FOR PUBLIC POLICY

The potential for renewable development, according to this consensus outlook, is much greater than previously published. The potential for renewable energy development is enormous, and is ready to be tapped. The sustainable solution is renewable energy and energy efficiency. But we must start now.

What kinds of public policy are needed for renewable energy to thrive? In summary, as a vision of renewable energy in America, the following are principles on which to base public policy.

- **Resolve –** We should act with decisiveness in favor of renewable energy and other energy technologies that support our national goals for security, growth, environment, climate, and jobs.

- **Comprehensiveness –** We need a comprehensive national renewable energy strategy that addresses the full range of technological and market issues, reflects the regional diversity of renewable energy resource economics and opportunities, and helps and rewards state and local governments for bold and effective coordinated action.

- **Competitiveness –** We should continue to utilize the competitive market as the most powerful driver of change, and increase U.S. competitiveness on renewable energy in the global marketplace.

- **Integration –** Our energy policies should address both the challenges of oil dependence and of global warming in an integrated way.

- **Results-oriented –** We need to build the infrastructure of a more sustainable society, including but not limited to:

- ***Electric Power Generation:*** We should support long-term incentives and other policies to catalyze investment in new renewable power for all technologies and both central station and distributed generation.

- ***Electric Transmission:*** We should build a modernized transmission system, similar to our national highway system, which links our domestic renewable energy sources with the cities and other demand centers.

- ***Electric Distribution:*** We should enhance electric distribution systems to allow optimal utilization of on-site distributed renewable technologies at the point of energy use.

- ***Renewable Fuels:*** We should support investment both in next-generation biofuels technology and the infrastructure to bring it to market.

- ***Energy Efficiency****:* We need to recognize that energy efficiency and renewable energy work together and offer many of the same fundamental benefits – environmental cleanliness, domestic resources, security, and platforms for economic growth – justifying policies that encourage more efficient buildings, industrial processes, and vehicles, as well as power generation using combined heat and power.

- **Technology –** The U.S. needs a tenfold increase in budget for an accelerated national R&D program that balances near-term needs with investments in longer-term research and science that will produce the next generation of technologies, and that returns the U.S. to global leadership on these technologies.

- **Stability –** There is an overarching need for long-term and stable policy commitments that allow industry, the financial sector, and individual Americans to make long-term investments in factories, bio-refineries, renewable power plants, and more efficient buildings and homes. Stability and long-term commitment are the new watchwords for renewable energy policy.

These guiding principles will allow our country to successfully transition towards a scale-up of the use of renewable resources to power and fuel America. This is a bold joint statement on the potential that the U.S. has before it, to seek solutions and make them a reality. It should be now clear that renewable energy has the potential to provide a substantial share of America's energy needs – beginning immediately.

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This has presented the testimony of Michael T. Eckhart, President of the American Council on Renewable Energy (ACORE). This material is scheduled to be published in a report entitled: "2007 Consensus Outlook on Renewable Energy in America."

Notes

[1] English et al. (2006). *25% Renewable Energy for the United States by 2025: Agricultural and Economic Impacts.* University of Tennessee at Knoxville. Available at: http://www.agpolicy.org/ppap/REPORT%2025x25.pdf.

[2] Statement of Alan Nogee, Director, Union of Concerned Scientists Clean Energy Program, before the U.S. House Committee on Energy and Commerce, Subcommittee on Energy and Air Quality, February 16, 2005. http://www.ucsusa.org/clean_energy/renewable_energy_basics/renewable-energy-and-electricity-testimony-2005.html

[3] *Tackling Climate Change in the U.S.: Potential Carbon Emissions Reductions from Energy Efficiency and Renewable Energy by 2030*. Charles F. Kutscher, Editor. American Solar Energy Society, January 2007. 180 pp. Searchable pdf at www.ases.org/climatechange.