

Chapter 3: ENERGY

BACKGROUND

- The [Intergovernmental Panel on Climate Change](#) has concluded that to avoid the worst consequences of global warming, worldwide carbon dioxide (CO₂) emissions should be stabilized by 2020.
- In the United States today, fossil fuels are responsible for 80 percent of greenhouse gas emissions.
- In 2007, United States CO₂ emissions related to energy use climbed [1.6 percent](#).
- The Energy Information Administration (EIA) predicts that on our present path, U.S. greenhouse gas emissions will grow nearly 36 percent between 2005 and 2030.
- The climate challenge opens an enormous opportunity – and enormous markets – for clean energy technologies.

OIL

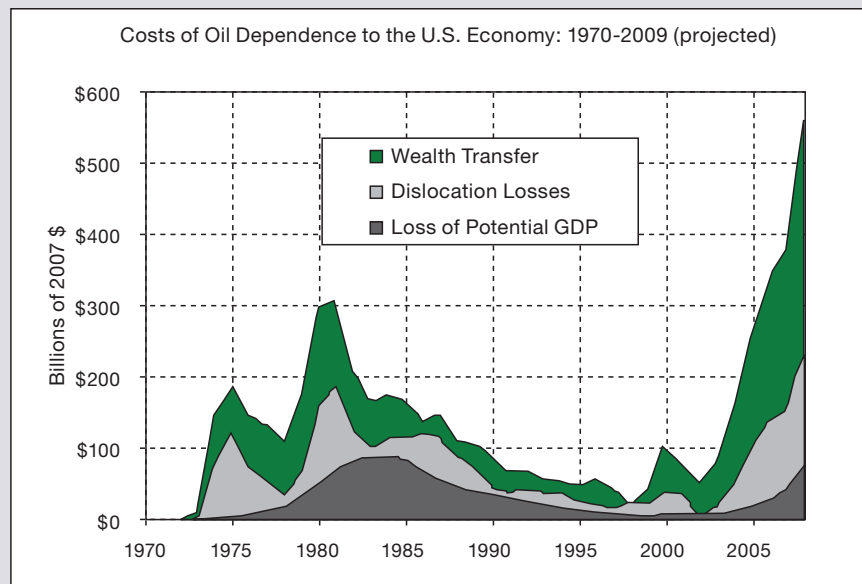
- America's extreme dependence on imported petroleum – approaching two thirds of the nation's oil consumption – undermines our national security and economic stability.
- According to researchers at Oak Ridge National Laboratory, oil dependence cost the U.S. economy [\\$8 trillion](#) in present value between 1970 and 2005, not counting the protection of Persian Gulf supplies or maintenance of the Strategic Petroleum Reserve.
- [Government researchers](#) estimate that the direct economic costs of oil dependence to the United States will reach \$560 billion dollars in 2008. Higher oil prices are expected to reduce U.S. GDP by more than 1.5 percent, or approximately \$230 billion. Most of the 2008 cost (\$330 billion) will consist of the transfer of wealth from U.S. oil consumers to oil exporting economies. This will bring the five-year (2004-2008) economic cost of U.S. oil dependence to \$1.7 trillion, of which \$1 trillion is wealth transfer to oil exporting states.
- Petroleum imports account for one-third of the U.S. trade deficit.
- [About 16 percent of America's oil imports came from the Persian Gulf in 2007; nearly 45 percent of U.S. imports came from members of the Organization of Petroleum Exporting Countries.](#)
- According to EIA, if drilling offshore in the outer continental shelf was allowed today, it would not begin until around 2017, would not reach peak production until about 2030 and would supply only 1.2 percent of the nation's annual oil.
- In 2007, the [United States exported an average of 1.433 million barrels of oil and petroleum products each day](#). In May 2008, U.S. oil exports amounted to nearly 10 percent of all the oil consumed in the nation each day.
- An analysis by the [American Enterprise Institute](#) estimates that additional domestic production of 1 million barrels a day would represent less than 1 percent of total world consumption in 2025 and would lower the price of crude by only 1.3 percent. Prices at the pump would be reduced by "a few cents at most."

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- Petroleum prices are set by the world market. Even if U.S. production could make a measurable impact on world oil supply, oil-producing nations could keep prices high simply by lowering their production.
- According to the [Consumer Federation of America](#), energy efficiency, conservation and alternative fuels can deliver more than 50 times as much oil savings as expanded domestic drilling.
- The production of oil from shale carries [high costs](#) in water consumption and carbon dioxide emissions.

Direct Economic Costs of U.S. Oil Dependence, 1970-2009

Source: U.S. Department of Energy



ELECTRICITY

- The U.S. electric power sector is the largest in the world, almost double the size of China's, 3.5 times larger than Russia's, and more than five times larger than that of India.
- On a per capita basis, U.S. consumers use five times more electric power than the global average.
- The electric power sector is the largest direct contributor to U.S. greenhouse gas emissions. As much as 35 percent of U.S. greenhouse gas abatement potential can come from the power sector, according to [McKinsey & Company](#).
- If we continue business as usual, 60 percent of the nation's electricity will come from coal, and the power sector will contribute 34 percent of total greenhouse gas emissions in 2030, according to the EIA.
- According to the [Apollo Alliance](#), we lose between 6 and 9 percent of all the power that enters today's electric grid, at a cost to the economy of nearly \$20 billion annually. Congestion and blackouts cost consumers another \$79 billion per year. Nearly 70 percent of the primary energy used to generate electricity in the United States – as much as Japan uses to power its entire economy – is wasted.

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- The U.S. power sector is projected to spend \$1.2 trillion between 2008 and 2020 on improvements to the electric grid, new power generation, upgrades to existing generation facilities and renewable energy.

NUCLEAR POWER

- It takes eight to 12 years to build a nuclear power plant. No new plants are expected to come on line in the United States before 2015.
- Nearly 12,960 new nuclear power plants would have to be constructed to hold global greenhouse gas emissions at levels that would avoid dangerous climate change. They would cost an estimated \$77.7 trillion, more than the Gross World Product (\$66 trillion).
- Building 45 new nuclear power plants in the United States by 2030 would supply only 1.2 percent of the nation's projected total energy needs in that year.
- Permanent storage of nuclear power plant waste, the potential for nuclear materials to fall into the hands of terrorists and rogue nations, and the fact that nuclear power plants are vulnerable to terrorist attack all remain [unresolved problems](#).

COAL

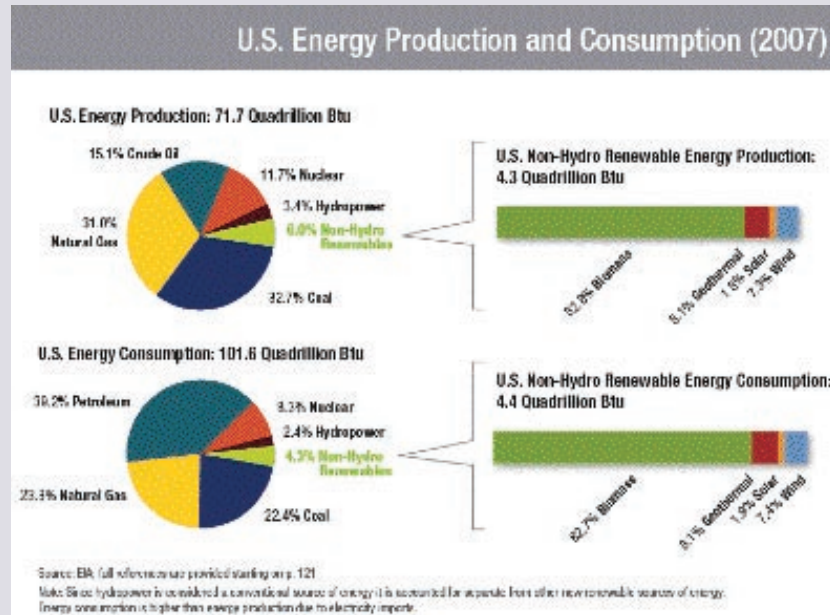
- The United States has 27 percent of global coal reserves.
- Coal-fired power plants account for 80 percent of U.S. carbon emissions from power plants.
- In 2007, the U.S. Department of Energy (DOE) reported that 151 new coal-fired power plants were in the planning or construction phase in the United States. By the summer of 2008, nearly 90 of those plants had been placed on hold as a result of concerns about CO₂ and other pollutants, the growing number of state-level Renewable Energy Portfolio Standards (RPS) and investor worries about the economics of coal under carbon pricing.
- One-third of our existing coal power plants could be retired by 2030 – as much as 104 gigawatts of generating capacity. Replacing this power will require substantial capital investment over the next two decades and represents an opportunity for newer, cleaner technology.
- The best hope for coal consumption in a low-carbon economy is carbon capture and sequestration (CCS), but the technology is not yet proven and, should it prove viable, is not expected to be widely available until after 2020.

NATURAL GAS

- Much of America's onshore conventional gas supplies in the lower 48 states already have been discovered. EIA projects that new production will come primarily from unconventional sources such as coal bed methane, tight sandstones and gas shale.
- Recent research suggests the United States has significant recoverable reserves – up to 1,000 trillion cubic feet – of [shale gas](#). The gas industry contends that new directional drilling and fracturing technologies may make it possible to increase gas production in the United States at lower cost.

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- More unconventional gas production will require solutions to environmental challenges, including disposal of produced water, undesirable chemicals used in fracturing shale formations, air pollution from flaring and large amounts of water consumption during extraction.



RENEWABLES

- [Renewable energy resources](#) made up only 10 percent of America’s installed energy capacity and 9 percent of total electric generation in 2007. At the same time, wind and solar energy are the fastest growing sources of electric power in the United States today.
- Worldwide and in the United States, renewable energy installations nearly doubled between 2000 and 2007. Wind power capacity grew 45 percent in the United States between 2006 and 2007; energy capacity from solar photovoltaic grew 40 percent. During the first half of 2008, at least 17,000 megawatts of [wind, solar and geothermal energy](#) were under construction in the United States.
- In 2007, investments in renewable energy projects totaled more than \$13 billion in the United States. Investments in wind energy projects grew from \$250 million in 2001 to more than \$8 billion in 2007.
- In 2007, venture capital investments in U.S. renewable energy companies reached \$2.5 billion, up from \$30 million six years before. Venture capital investments in solar technology alone increased from \$5 million in 2001 to more than \$1 billion in 2007.

WIND

- Between 2000 and 2006, wind energy generation quadrupled worldwide. In the United States, installed wind capacity multiplied 6.5 times between 2000 and 2007.
- U.S. wind capacity is expected to increase 45 percent in 2008, totaling nearly 20 megawatts of power. The [American Wind Energy Association](#) reports that America has surpassed Germany as the world’s leader in wind electricity.

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- The [DOE](#) says it is possible for the United States to obtain 20 percent of its electricity from wind power by 2030. However, the nation's antiquated and balkanized electric grid – consisting of 200,000 miles of power lines with 500 owners – stands in the way. The DOE estimates that capturing the full potential of wind power would require 12,000 miles of new transmission capacity costing \$20 billion in net present value.



www.fas.org/sgp/crs/misc/RL34546.pdf

SOLAR

- [McKinsey & Company](#) predicts that over the next three to seven years, the unsubsidized cost of solar energy will be competitive with conventional electricity in California and the Southwestern United States. The company projects that solar electricity will cost as little as 10 cents a kilowatt hour by 2020, down from 36 cents today.
- Several types of solar power – including water heating and passive solar design – are cost-effective and readily available.

GEOHERMAL

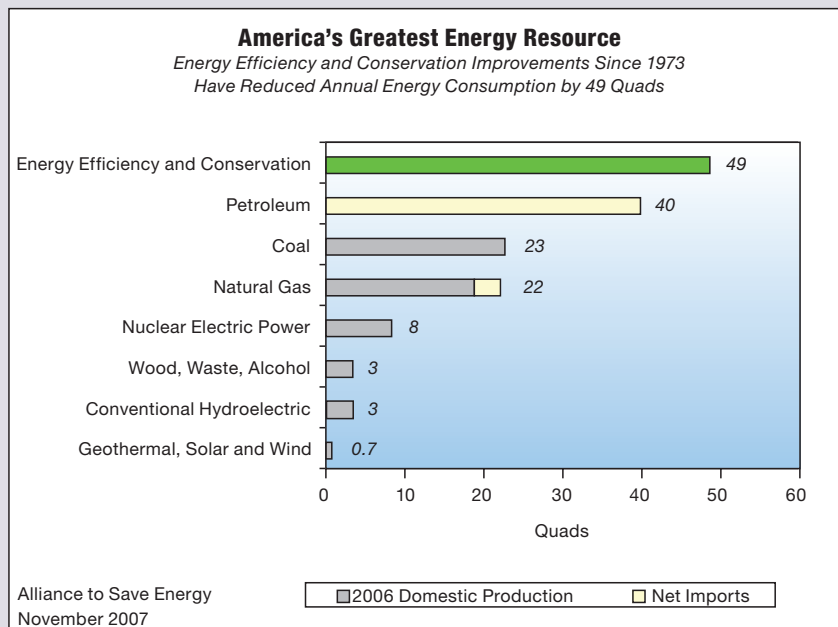
- A [study](#) published by the Massachusetts Institute of Technology concludes that geothermal energy can provide 100 gigawatts of cost-competitive, environmentally benign electric generation over the next 50 years.
- Between January and August 2008, the number of geothermal [power projects](#) under development in the United States increased 20 percent; 103 projects were underway, capable of producing enough electricity for 4 million homes.

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ENERGY EFFICIENCY

- For the past 35 years, America’s largest source of new energy supply has been through energy efficiency and conservation. (See Graph 1.)
- Studies by the [American Council for an Energy Efficient Economy](#) and others estimate that the United States can cost-effectively reduce energy consumption by 25 to 30 percent or more over the course of the next 20 to 25 years.
- [Analyses](#) by researchers from the Rocky Mountain Institute and several of the DOE’s national laboratories conclude that energy efficiency in buildings, transportation and industry could keep U.S. carbon emissions constant between now and 2030. Building on that foundation, six renewable energy technologies – concentrating solar power, photovoltaics, wind power, biomass, biofuels and geothermal power – could displace approximately 1.2 billion tons of carbon emissions annually by the year 2030, which is the magnitude of reduction that scientists believe is necessary to prevent the most dangerous consequences of climate change.
- [McKinsey & Co.](#) has concluded that half of the reduction of greenhouse gasses necessary to keep the long-term atmospheric concentration at 450-550 parts per million can be achieved with existing technologies.
- New yearly investments of \$170 billion between now and 2020 would be sufficient to capture the opportunity among all end users. These investments would generate an average internal rate of return of 17 percent and annual energy savings of up to \$900 billion annually by 2020, McKinsey reports.
- The [International Energy Agency](#) estimates that on average, \$1 spent to improve the efficiency of buildings, appliances and electric equipment avoids more than \$2 in investment in electricity supply.

U.S. Energy Resources
(Chart complements of the Alliance to Save Energy)



FRAMEWORK FOR FEDERAL POLICY

- The United States must make a rapid transition to a new energy economy with much higher levels of efficiency, much lower greenhouse gas emissions and much more supply from domestic, renewable resources.
- At the same time, regulators, policy-makers and market forces should move quickly to prevent the lock-in of carbon emissions from new sources, including conventional coal-fired power plants, inefficient buildings and gas-guzzling vehicles.
- New nuclear power plants should not be licensed in the United States until the nuclear power industry has solved the problems of permanent waste storage, nonproliferation of nuclear weapons and protecting power plants from terrorism.
- Federal subsidies should be phased out for the coal, natural gas, oil and nuclear power industries, except when public support is necessary for national security (such as maintaining the Strategic Petroleum Reserve). Energy subsidies should be limited to emerging technologies that offer high net-energy and low net-carbon benefits over their life cycles.
- Because we are part of a global economy, energy independence is unachievable as a purely national goal. Even with no oil imports, the United States would be vulnerable to oil shocks suffered by its trading partners and other key economies. Energy security is an issue requiring international collaboration.
- Energy policy must multi-task to simultaneously address national security, economic stability, energy security, global climate change and emerging natural resource challenges such as the competition for freshwater supply. Public policy should not support energy choices that address one problem at the expense of the others.

EXECUTIVE ACTIONS

1. To help achieve the nation's greenhouse gas reduction targets, issue a presidential directive establishing the following **national energy goals**:¹
 - a) [Cut the nation's petroleum consumption](#) in half by 2020 without increasing domestic production;
 - b) Achieve an average vehicle fleet efficiency of [50 miles per gallon](#) by 2025 and 200 miles per gallon by 2050;
 - c) Reduce economy-wide energy demand an average of at least 2.5 percent annually from 2010 to 2020. Improve energy efficiency by 20 percent in existing power plants and industries by 2025, using combined heat and power technologies, among others;
 - d) Generate 10 percent of America's electricity from new non-hydro renewable resources by 2015, 30 percent by 2020 and 50 percent by 2050;
 - e) Achieve zero-net-carbon and [zero-net-energy performance](#) in the United States in all new and substantially renovated commercial buildings by 2025, and in all new and substantially renovated residential buildings by 2030;
 - f) Reduce vehicle miles traveled in the United States 20 percent by 2020 and 50 percent by 2050; and
 - g) Meet the nation's electric power needs until 2030 [without additional conventional coal generation](#).

2. Establish a [National Energy and Climate Council](#) in the White House Office of Policy Development and appoint a National Energy and Climate Advisor to head the council, equal in stature to the National Security Advisor and the National Economic Advisor. The new council will coordinate implementation of the Presidential Climate Action Plan (PCAP); oversee climate and energy research; engage in international negotiations toward a post-Kyoto climate change agreement; and coordinate with state and local officials on mitigation and adaptation. In addition, the council will assist the administration with international strategies to reduce energy poverty and to cope with domestic and international climate-related emergencies.

Direct the National Energy and Climate Council to prepare recommendations for executive and congressional action to spur energy innovation in the United States through better coordination of federal research, better management of demonstration projects and other reforms such as those proposed in [“A New Strategy to Spur Energy Innovation.”](#)

By executive order, appoint the following to the National Energy and Climate Council: the secretaries of the Departments of Energy, State, Defense, Commerce, Homeland Security, Labor, Agriculture, Transportation, Interior, Housing and Urban Development and Treasury; the Environmental Protection Agency (EPA); the Small Business Administration (SBA); the directors of the National Science Foundation and the Climate Change Science Program; and the Office of Science and Technology Policy.

3. During the transition, convene a **National Leadership Conference on Intergovernmental Climate and Energy Security**. Former President Bill Clinton convened experts during his transition in 1992 to frame his economic policies. On April 18, 2008, 18 leading governors signed a [declaration on climate change](#), stating that “a federal-state partnership is the only way we can get the job done.” Invite the nation’s leading governors and mayors to frame an intergovernmental approach to energy and climate security – an action plan that coordinates the powers of all three levels of government. Participants in the conference should consider which national energy and climate goals are more effectively addressed with the authorities of states and localities² and which are better implemented at the federal level. The President should ask participants to consider whether the following federal policies are needed to achieve rapid nationwide reductions in greenhouse gas emissions:
 - a) Require that states allow gas and electric utilities to earn reasonable rates of return on energy efficiency and demand-side management programs, for example with traditional rate decoupling and the [Forward Capacity Markets](#) approach being applied by the New England Independent System Operator.
 - b) Establish a national [Renewable Energy Performance Standard](#) requiring that at least 30 percent of each state’s electricity be generated from renewable resources by 2020, and at least 50 percent by 2050.³
 - c) Establish a national energy efficiency performance floor. A federal standard might require each company that provides retail electric service to undertake efforts that result in a one percent annual savings in electric consumption by its customers. The DOE would establish uniform measurement protocols; state regulators would enforce the requirement and verify results. (The American Council for an Energy-Efficient Economy estimates that a 1 percent standard would provide consumers with [\\$12 billion in net benefits](#) annually by 2012 and would save enough energy to avoid construction of 227 typical power plants.)
 - d) Require that electric utilities, at the request of any new renewable energy facility owner, must enter into a 20-year fixed-rate power purchase agreement. The Federal Energy Regulatory Commission (FERC) could set uniform national renewable energy payment rates that provide

a 10 percent internal rate of return on investment for available commercialized technologies in regions constituting the top 30th percentile of renewable energy resource potential in the United States.

4. Charge the **Presidential Commission on Carbon Subsidy Reform** (see legislative action item below) with recommending reforms to make [federal energy subsidies](#) more effective, including:
 - a) Reduce subsidy levels for a given technology or activity every five years to spur research and encourage early adoption;
 - b) Retain subsidies for emerging industries long enough to provide a stable environment for private investment, and terminate them when the technologies have reached sufficient market penetration;
 - c) Design carbon-reduction and energy efficiency incentives for consumers on a sliding scale to reward best-performing products; and,
 - d) Periodically review the performance of subsidies to determine their impact on the maturation and commercialization of targeted technologies.
5. Direct the Secretary of Energy to conduct an immediate assessment of the nation's **recoverable natural gas reserves**, given advancements in drilling and fracturing technologies that may dramatically expand supplies of shale gas. Further, direct the secretary to assess the costs, benefits and potential for widespread conversion of existing conventional coal generation plants to natural gas, thereby replacing the dirtiest fossil fuel with the cleanest. The secretary's assessment should include the life-cycle carbon emissions of coal versus shale gas, including the costs of mitigating the environmental liabilities of each.⁴
6. Direct the Secretary of Energy to work with the National Institute for Standards and Technology, the FERC and the National Association of Regulatory Utility Commissioners to develop protocols and standards for a national **smart grid** to maximize the efficiency of the nation's electricity distribution system; improve its ability to mitigate the intermittency of wind and solar energy by moving power around the system; and accommodate distributed power systems. The Energy Independence and Security Act of 2007 establishes "modernization of the nation's electricity transmission and distribution system" as national policy; directs the DOE to create a Smart Grid Advisory Committee and a Smart Grid Task Force; directs the [National Institutes of Standards and Technology](#) to establish protocols and standards; and orders the DOE to create a program that reimburses 20 percent of qualifying smart grid investments. The President should direct the DOE to recommend additional methods of financing smart grid development;⁵ and, propose special incentives for the extension of the grid to stranded renewable energy resources – locations with good solar and wind resources, including tribal lands, that do not possess adequate transmission infrastructure.

Request that the advisory committee and/or task force study the feasibility of locating new transmission lines on existing and future rights-of-way, including interstate highway and rail corridors.

7. Direct the DOE to undertake a high-priority program of research, development and demonstration of **energy-storage technologies** that solve the intermittency problem of solar and wind power. This research should be given at least as high a priority as the DOE's work on CCS for coal generation and should be funded in part by requiring the coal industry to pay the maximum permissible cost-share in the DOE's CCS program.

8. Direct the DOE to work with the National Association of Regulatory Utility Commissioners to develop a **green rating and recognition system for electric and natural gas utilities**. The system could be modeled on the U.S. Green Building Council's LEED program for buildings, with points awarded for instituting interconnection policies for distributed generation; net metering; green power options for customers; low carbon footprint; LEED certification for utility buildings; a green fleet program; aggressive water conservation in generation operations; programs to introduce smart grid technologies into the utility's service area; and other initiatives to exceed national emission and environmental standards.
9. Through executive order, establish **life-cycle performance criteria** for federal loans, loan guarantees and other financial assistance where criteria are under the administration's jurisdiction. Criteria should include net energy benefits, net greenhouse gas emissions, net water consumption and other key economic and environmental factors that can be adequately quantified.
10. Direct that agencies administering federal loans, loan guarantees and grants related to energy production and consumption give **highest priority to projects that reduce carbon emissions** or enhance carbon sequestration services, insofar as current law allows. For example:
 - a) Direct the Secretary of Energy to modify criteria for the U.S. Department of Agriculture's [Rural Development Utilities Program](#) to restrict the program's loan guarantees for rural electrification to low- and no-carbon electric generation and the infrastructure to support it, consistent with the purposes of the Rural Electrification Act of 1936, the program's authorizing legislation.⁶ Examples of eligible projects would include: development of rural wind and solar farms; methane-to-electricity conversion at feedlots and municipal landfills; extension of transmission to stranded rural renewable energy resources; demand-side management programs; policies that facilitate distributed generation; and economic development activities related to the manufacture or assembly of renewable energy equipment (wind turbines, turbine blades, photovoltaic panels and equipment for concentrating solar power).
 - b) Direct the [SBA](#) to aggressively promote use of its: 7(a) Loan Guarantee Program to acquire energy efficiency and renewable energy equipment and designs; Energy Conservation loan guarantees to capitalize small businesses that design, engineer, manufacture, distribute, market, install or service energy efficiency and renewable energy devices; Pollution Control loan guarantees to plan, design or install facilities that prevent or reduce greenhouse gas emissions; and the variety of new loans, grants and debentures established in Title XII of the Energy Independence and Security Act of 2007.
11. Direct the DOE to work with the nation's most carbon- and energy-intensive industries to create **technology roadmaps** that lead to the goals of major energy efficiency improvements and to zero net greenhouse gas emissions. Direct that national laboratories use these roadmaps to guide their research, development and deployment related to industrial emissions. (In its [Industries of the Future](#) program, the DOE has already worked with many of America's most energy-intensive industries to develop pollution prevention roadmaps. These should be upgraded to include greenhouse gas emission reductions.) An analysis by the [American Council for an Energy Efficient Economy](#) indicates that U.S. industries are nearing a period of substantial investment in capacity, providing an opportunity for substantial improvements in energy efficiency and greenhouse gas emissions reductions.
12. Direct the DOE to include **carbon inventories and greenhouse gas reduction consultation** in the energy and waste reduction audits performed for small- and medium-size industries by the [Industrial Assessment Center](#) program.

13. Direct the Department of the Interior (DOI) to fully and promptly collect all **lease and royalty payments** due from energy companies for energy production on public lands. According to the General Accounting Office, the U.S. government charges among the **lowest royalty rates in the world** for energy production on public lands. DOI's inspector general identified several past issues in the collection of royalty payments, including the failure by the Minerals Management Service to collect royalty payments for drilling leases it issued in 1998-99, costing the government \$10 billion.
14. Direct the DOE to report annually on the **results of and progress achieved by energy programs and subsidies**. In a 2005 report, the General Accounting Office cited "a lack of a central source of information on the progress of federal energy-related efforts that may hinder policy makers in determining the direction of future energy policy initiatives."
15. Direct the DOE to provide funds to the National Renewable Energy Laboratory (NREL) to conduct a **grid parity analysis** comparing the projected costs of electricity from renewable fuels – solar, wind, geothermal, bio-fuels, etc. – with the projected costs of electricity generated with natural gas, clean coal technology and next-generation nuclear power. The analysis should examine the ability of on-site renewable generation, combined heat and power and energy efficiency to reduce burdens on the grid, lower the need for new infrastructure and increase the reliability and resilience of the grid (as well as the savings from such applications). NREL should determine if and when various renewable technologies are projected to provide cheaper electric power than coal, natural gas and nuclear. The findings will help determine where federal and private research dollars are best invested.
16. Direct the DOE, based on projections of domestic natural gas reserves, to assess need for and the full, life-cycle costs and benefits of planned investments in **LNG import infrastructure** in the United States, compared to investments in energy efficiency and renewable energy technologies sufficient to provide comparable energy value for comparable use. Externalities such as the defense of LNG port facilities, shipments and supplies should be included in the assessment. Estimates of the future cost of LNG in a scenario of intensifying international demand and competition for the fuel also should be included.
17. Put **solar panels** back on the White House. As a symbol of national leadership, President Carter installed solar panels on the White House. President Reagan removed them. The 44th president should put them back.
18. Direct the DOE to monitor and regularly report on the progress of **research and development of clean coal technology** to assess its ability to provide safe and reliable low-carbon electric power at competitive prices. According to the [Government Accountability Office](#), advanced coal generation will require gasification technologies that add about 20 percent to the cost of constructing generation plants; the technology carries higher perceived investment risks because it's new and will be affected by carbon pricing; the industry has not yet demonstrated the technological feasibility of the long-term storage of CO₂ captured by large-scale, coal-based power plants; and power from clean coal will cost 21 to 78 percent more than electricity from conventional coal plants, depending on plant design, the cost of fuel and the storage site characteristics.

The DOE, [McKinsey & Co.](#) and others predict that the cost of renewable electric technologies will continue coming down, with solar reaching grid parity in some parts of the United States in the next three to seven years. The President should direct the Secretary of Energy to carefully monitor the evolution of clean coal technology to determine whether it remains a wise investment of tax dollars. Factors for consideration are:

- a) What are the economic and environmental costs of the procrastination penalty – the opportunity cost of waiting for the technology to be refined and made market-ready?
 - b) What are the net-carbon, net-energy and net-environmental benefits of clean-coal technology over its life cycle, including mining and transport, compared to other electric generation technologies? (Carbon capture reportedly will require so much energy that it could reduce plant output by [10 to 30 percent](#).)
 - c) Will the nation’s rail capacity be sufficient to transport coal in sufficient quantities to meet power demand? Jay Etta Hecker, director of the physical infrastructure team at the Government Accountability Office, says railroads have “expressed uncertainty as to their ability to keep pace with some of the higher projections of future freight-rail demand.”
 - d) What investment in infrastructure will be necessary to transport captured carbon to suitable storage sites? The DOE reportedly has found that [North Carolina](#) lacks suitable geology and would have to build a pipeline to a sequestration site in Kentucky, at a cost of \$4 billion.
 - e) What will the costs and responsibilities be for long-term monitoring of sequestration sites and who will be responsible?
- 19.** Direct the DOE to analyze and synthesize the conclusions of recent studies on the potential contribution of energy efficiency and renewable energy to U.S. energy supplies, including:
- a) The [Solar Grand Plan](#), a strategy to rapidly deploy solar technologies to provide nearly 70 percent of the nation’s electricity and 35 percent of its total energy (including transportation) by 2050, with a federal investment of \$400 billion over the next 40 years;
 - b) [Tackling Climate Change in the U.S.](#), a study by the American Solar Energy Society that concludes renewable energy technologies can displace approximately 1.2 billion tons of carbon emissions annually by the year 2030 – the magnitude of reduction that scientists believe is necessary to prevent the most dangerous consequences of climate change. The report describes how energy efficiency measures could keep U.S. carbon emissions roughly constant over the next 23 years as the economy grows, and how renewable energy technologies could make deep cuts below today’s emissions;
 - c) [20% Wind Energy by 2030](#) by the DOE’s Office of Energy Efficiency and Renewable Energy. This analysis concludes that it is technically plausible to obtain one-fifth of the nation’s electricity from wind power by 2030;
 - d) [Carbon Free and Nuclear Free: A Roadmap for U.S. Energy Policy](#), which describes a strategy to achieve a zero-carbon economy in 30 to 50 years and to eliminate net oil imports in 25 years.
 - e) [The Outlook on Renewable Energy in America](#), by the American Council on Renewable Energy, which concludes that renewables could provide 635 gigawatts of new generating capacity by 2025, potentially more than the nation will need.
- 20.** Direct the Secretary of the Treasury to analyze the feasibility of using leverage acquired in recent federal rescue packages to require that the long-term costs of fossil fuels and risks associated with climate change are factors in rating communities and corporations. In addition, direct the EPA to recommend to Treasury how the [home energy rating system](#) might be used by Fannie Mae and Freddie Mac to determine eligibility for and the quality of home mortgages.

LEGISLATIVE ACTIONS

The President should include the following proposals in his first legislative package to Congress:

- 21.** Increase the **federal investment in energy research and development** tenfold, to \$30 billion a year for 10 years. Dedicate the investment to clean energy efficiency and renewable energy technologies. Continue to fund CCS research, but increase the cost-share required from the coal industry. Permit the fossil and nuclear energy industries to enter into collaborative research with the DOE's national laboratories, on a full cost recovery basis.
- 22.** Appropriate full funding for the provisions of the Energy Independence and Security Act of 2007, plus additional funds as proposed by the PCAP for activities and programs in the Act.
- 23.** Begin a rapid but orderly **phase-out of subsidies for fossil and nuclear fuels**⁸ and redirect them to the government's research, development and commercialization programs for energy efficiency and renewable energy technologies that meet a national performance standard (see below). [Jeffrey Sachs](#), director of the Earth Institute at Columbia University, estimates that federal spending on energy research – nuclear, wind, coal, solar and biofuels – totaled \$3.2 billion in 2006. He proposes an increase to \$30 billion annually, comparable to what we spend on medical research at the National Institutes of Health. The United States allocates only \$159 million annually for research on solar power, about what we spend in Iraq every nine hours. Despite the fact that climate change is regarded as a threat to national security, inflation-adjusted spending on federal energy research has shrunk by about half since 1979, while spending on military research has more than doubled and amounts to roughly 20 times what is spent on energy research. Estimates of overall federal nuclear and fossil energy subsidies vary widely, from [\\$10.8 billion by the EIA](#) to about [\\$60 billion by Earth Track, Inc.'s Doug Koplou](#). The Congressional Research Service has concluded that because energy subsidies are small compared to the size of total sales in U.S. energy markets, their repeal need not have significant impact on overall energy prices.⁹
- 24.** Institute a **National Climate Protection Subsidy Standard**. As it seeks solutions to global climate change, energy security and other pressing issues, the federal government should engage in problem solving, not problem switching. A solution to one critical problem can aggravate another. For example, the United States has the world's largest known concentration of oil shale, about three times the proven oil reserves of Saudi Arabia by one estimate. Seventy percent of the nation's oil shale is on federal land. [President Bush is promoting oil-shale production](#) in the West; the DOI decided on Sept. 4, 2008, to set aside nearly 2 million acres of public land for commercial oil shale development. Proponents argue that production of oil from shale can reduce U.S. oil imports. But [Western Resource Advocates](#) of Colorado estimates that producing 1 million barrels of oil daily from shale would require 12,000 megawatts of electricity – three times the electric power produced in Colorado during 2005 – resulting in more than 105 million tons of CO₂ emissions, an 80 percent increase in the CO₂ emitted by all electric generating units in Colorado, Wyoming and Utah combined. Production would also strain water resources in the water-short West. Likewise, liquid fuels from coal carry high carbon costs, from extraction through consumption.

Some developers of corn ethanol refineries burn [coal for process heat](#). To inhibit single-purpose investments that undermine other critical national priorities, Congress should create a minimum performance standard that measures net energy, emissions and economic performance, impact on freshwater resources and other quantifiable environmental and economic factors on a life-cycle basis. The standard would be applied to federal support of all types for consumer products, energy technologies and energy resources.

25. Expand the financing authority of the [Clean Renewable Energy Bond program](#) by an additional \$2 billion. This program, created in the Energy Policy Act of 2005, provides a federal tax credit to bondholders for zero-interest bonds that are issued by local governments, public power and rural cooperatives, and state governments to finance renewable energy projects. Applications and demands for this financing far exceed the amount that has been awarded.
26. Extend and expand the DOE's [loan-guarantee authority](#) for commercial energy efficiency and renewable energy projects (Title XVII of EPCA 2005). The loan guarantee authority, now authorized through 2009, should be extended to 2020. In 2008, Congress authorized \$38.5 billion in loan guarantee authority, including \$18.5 billion for nuclear power facilities; \$2 billion for advanced nuclear facilities for the front-end of the nuclear fuel cycle; \$10 billion for renewable and/or energy efficient systems and manufacturing and distributed energy generation/transmission and distribution; \$6 billion for coal-based power generation and industrial gasification at retrofitted and new facilities that incorporate CCS or other beneficial uses of carbon; and \$2 billion for advanced coal gasification. All of the amounts earmarked for nuclear and coal-related projects should be shifted to the renewable energy and energy efficiency projects.
27. Appropriate \$25 million annually to the [Renewable Energy Production Incentive \(REPI\) program](#). REPI was created in the Energy Policy Act of 1992, and is authorized through 2026. Under REPI, the DOE can make direct payments to not-for-profit public power systems and rural electric cooperatives to support operations at solar, wind, geothermal, ocean and biomass renewable energy projects, at a rate near 1.8 cents per kilowatt hour for electricity generated. There is an estimated backlog of unfunded REPI requests of more than \$80 million, with increasing demand each year. Yet REPI receives only \$5 million annually and the current administration has proposed to eliminate it.
28. Extend the Production Tax Credit for wind energy and the Investment Tax Credit for solar energy to 2020.

¹ For a discussion of the president's statutory authority for this and other executive actions, see "[The Boundaries of Executive Authority](#)," Center for Energy & Environmental Security, July 2008, 17-25.

² States and localities regulate utilities, pass and enforce building codes and govern urban development patterns, all of which have a substantial impact on greenhouse gas emissions.

³ While these goals seem ambitious, states already are proving that portfolio requirements can generate surprisingly rapid growth in low-carbon electric generation. After Colorado's citizens voted in 2004 to institute a 10-year renewable energy portfolio standard, solar and wind power grew so fast that the legislature doubled the standard three years later. After legislators in Texas approved a renewable energy portfolio standard in 1999, the state met its 10-year goal in only six years. Today, Texas is the nation's largest producer of wind electricity and has committed to the nation's largest investment to date in renewable energy – an expenditure of \$4.9 billion to extend its electric grid to stranded wind resources.

⁴ As stated elsewhere in the PCAP, the true costs of fossil energy must include carbon emissions during production, transportation and waste disposal. Among the environmental issues that must be addressed in the extraction of shale gas are water consumption and conservation, and the use of nontoxic fracturing agents.

⁵ The [Energy Future Coalition](#) proposes a process to begin development of a national smart grid, including the equivalent of a Highway Trust Fund to capitalize it.

⁶ For a discussion of the president's statutory authority for this action item, see "[The Boundaries of Executive Authority](#)," Center for Energy & Environmental Security, July 2008, 34.

⁷ Quoted Aug. 1, 2006, in Platts.

⁸ Federal subsidies for fossil and nuclear energy include tax incentives, loans and loan guarantees, risk shifting by providing insurance or indemnification at below-market prices, guaranteed purchase agreements, liability limits, low royalty and lease payments for exploration on public lands, Congressional earmarks, research and development assistance, technical assistance, price controls, direct spending, purchase requirements and regulatory relief. [Attempts](#) to redirect some fossil energy subsidies to energy efficiency and renewable energy subsidies were debated in the 110th Congress.

⁹ "[Energy Tax Policy: History and Current Issues](#)," Congressional Research Service, June 2008, 25-26. The Energy Information Administration came to the same conclusion in a [1999 analysis](#).