LEAGUE OF WOMEN VOTERS®

FAQ ON A 10-YEAR MORATORIUM ON NEW COAL-FIRED ELECTRIC POWER PLANTS

QUESTION 1: Why is the League of Women Voters calling for a 10-year moratorium on new coal-fired power plants?

ANSWER: We must take aggressive action to halt global climate change. The earth is getting warmer, and this is already having significant impacts. Evidence includes disappearing glaciers, rising sea levels, increasingly severe heat waves and droughts in some areas, intensifying hurricanes and floods in others, and more wildfires. If left unchecked, the effects of climate change could be catastrophic: millions of people displaced as rising sea levels flood coastal areas; many regions devastated by reduced crop yields and shortages of drinking water; human health threatened by the spread of malaria and other vector-borne diseases; numerous plant and animal species at risk of extinction.

Restricting greenhouse gas (GHG) emissions from coal-fired power plants is one of the most important steps we can take to counter global climate change. Coal is the single largest source of global warming pollution in the U.S. No new coal-fired plants should be built until their carbon emissions can be prevented from entering the atmosphere.

A 10-year moratorium on new plants, along with incentives – like Renewable Portfolio Standards and a federal Production Tax Credit – will encourage cleaner and less destructive technologies to grow. It will also allow time to test carbon capture and storage (CCS) technologies, assess their commercial viability, and determine whether storing CO_2 underground for hundreds of years is feasible and safe.

QUESTION 2: Even if global climate change is an important issue, why is such drastic action needed now?

ANSWER: Researchers are finding evidence that global climate change is happening faster than had been predicted – even as recently as five years ago. Arctic Ocean sea ice, for example, is melting faster than even the most advanced climate change models predict.[1] Many believe that the earth may be approaching a tipping point beyond which climate change becomes irreversible.

Leading scientists warn that sustained global warming of more than 2ºC above pre-industrial levels could bring us to that point. To prevent the global average temperature from rising above this level, studies have indicated that we must stabilize the concentration of CO_2 and other GHGs in the atmosphere at or below 450 parts per million (ppm). This assumption has been the basis for calls to reduce U.S. GHG emissions at least 80 percent below 2000 levels by 2050.

In a report published in April 2008, however, James Hansen and other climate scientists, looking at evidence from Earth's past experience, conclude that keeping the temperature from rising more than 2°C requires **reducing CO_2 concentrations from the current 385 ppm to 350 ppm or less**.[2] Equally convinced of the urgent need for aggressive action, environmental analyst Lester Brown has called for a campaign to cut emissions 80 percent by 2020.[3]

To meet even the minimum target of 80 percent emissions reduction by 2050, the U.S. must begin to act immediately. Cutting emissions from coal-fired power plants is key to achieving this target.

Coal produces more CO_2 per kilowatt hour of electricity than any other fuel. (The carbon content of coal is 56 pounds of CO_2 per million British thermal units [Btus]; for oil and gasoline, it is 43-47 pounds; and for propane and natural gas, it is 32-38 pounds.) Once built, a coal-fired electric power plant will operate for decades, pumping hundreds of millions of tons of CO_2 into the atmosphere over its lifetime.

QUESTION 3: What about Carbon Capture and Storage? If power plants have this new technology, won't that be enough?

ANSWER: Carbon Capture and Storage (CCS, also known as carbon capture and sequestration) holds promise but has not yet been demonstrated at a commercial scale. Massive amounts of CO_2 must be captured, compressed, transported, and sequestered deep underground where it must remain permanently. Key questions remain. Can the conditions for safe, permanent storage be met (i.e., burial sites that will not allow the compressed CO_2 to contaminate drinking water supplies or leak into the atmosphere; a stable geological environment to safeguard against earthquakes)? And will CCS be cost-effective?

It's a long shot at best. Large-scale demonstration projects of the technical, economic and environmental performance of an integrated CCS system are needed, and so far, government support of these projects has been limited.[4] In fact, the one large-scale CCS prototype project on the drawing boards, FutureGen, was cancelled in January 2008 because costs had risen to $1.8 billion. Further, the federal government's own analysis does not expect CCS to make an impact before 2030.[5]

QUESTION 4: How will the United States have enough electricity for the economy to grow if new coal-fired power plants aren't built?

ANSWER: There are five mechanisms for ensuring enough electricity to maintain economic growth while reducing our GHG emissions. All are far more economically efficient and less carbon intensive than building more coal-fired power plants.

1. The simplest and least expensive strategy is to reduce the demand for electricity through conservation and improved energy efficiency. Examples include more efficient lighting, motor fans, refrigerators, washing machines, and water heaters; improved space heating and cooling technologies; materials recycling; and requirements for much more building insulation. All these technologies are already available.
2. Increase the efficiency of individual power plants, whether they use fossil fuel or renewable energy sources.
3. Decrease line losses during the transmission of electricity. Energy losses in the U.S. transmission and distribution system in 1995 were 7.2 percent of total generation, representing 2.5 quads of energy and 36 million tons of carbon. New cable and transformer materials and real-time controls can reduce these losses.

4. Integrate combined heat and power (CHP) systems into conventional power plants to capture the excess heat created when electricity is generated and use it to heat commercial and residential buildings.
5. Switch to less carbon intensive, or non-carbon intensive, energy sources for electricity generation, especially wind and solar power. [6]

QUESTION 5: Aren't the predictions for energy conservation highly speculative?

ANSWER: California, which has been a leader in energy conservation and efficiency, has been able to keep per capita energy consumption essentially constant for three decades while enjoying a growing economy. The two extensive reports cited above (Q&A #4) provide detailed analyses of the large energy savings that can be achieved. Their findings are not based on speculation but on actual testing of the technologies and processes discussed. The reports were peer-reviewed, and the Intergovernmental Panel on Climate Change (IPCC) report was reviewed by IPCC member-governments as well.

QUESTION 6: Renewable resources can't really deliver enough energy to replace all the power plants we need, can they?

ANSWER: Given appropriate policy and financial support at all governmental levels, renewable energy resources, energy conservation, and improvements in efficiency could fill most of the gap. The potential of U.S. renewable energy is vast. A recent Department of Energy (DOE) report, for example, concludes that **wind** could provide 20 percent of U.S. electricity by 2030, avoiding construction of 80 gigawatts (GW) of new coal capacity.[7]

Almost all regions of the country have useful **solar resources**, according to the DOE's Energy Information Agency (EIA).[8] Solar collectors on parking lots and rooftops alone could provide most of the U.S. electrical energy supply. Plug-in hybrid and electric vehicles could become a low-cost means of electricity storage. New solar technologies, such as string ribbon and thin film, are lowering the cost of **solar photovoltaics (PV)**.[9] DOE projected last year that annual production of solar PV will increase almost 12-fold in five years and reduce the price to competitive levels.[10] Studies at the National Renewable Energy Laboratory and MIT found that **concentrating solar power (CSP)** plants, such as parabolic troughs and power towers, could, with federal and state policy support, produce 4 GW of electricity in the southwest by 2015.

Thermal energy stored in water and hot rock at drillable depths is available nationwide. Using current technology, up to 5.6 GW of new base load generating capacity could be supplied by geothermal resources by 2015.[11]

Research on **tidal power** has begun. The tides come and go twice a day and could help provide electricity to many of our major northern cities. **Biomass** plants have been producing power in Maine for years, using tree and sawmill waste, among other sources.

Larger, more efficient turbines can be installed on **hydro power** plants to produce more electricity from the same dams. Small generators installed on smaller water impoundments can provide electricity to local areas, adding reliability.

If energy subsidies were redirected from fossil fuels to renewable resources, the new support for research and development would advance renewable technologies, reduce their costs, and produce a greater variety of renewable options from which to choose.

QUESTION 7: Alternative energy sources are a great idea but none of them can provide base-load power for the future the way coal and nuclear can. Coal reserves are projected to be available for the next 155 years as opposed to oil and gas, which are projected to be exhausted within the next 40-60 years. How are we going to maintain our power needs without growing our base-load sources?

ANSWER: Some renewable energy sources, like **hydropower** and **biomass**, are predictable and controllable and can deliver both base-load and peak power. Other emerging renewable energy technologies like **geothermal** and **solar thermal** are also highly predictable and can supply base-load power.

According to the DOE report cited above (Q&A #6), high levels of **wind** power can be integrated into the power system and reliably supply 20 percent of U.S. electricity demand.[12] The variability of this energy source can be reduced by dispersing turbines across a wide geographic area. Building the additional transmission capacity required to bring power from areas of high-quality wind resources to areas of high electricity demand is both economically and technically feasible.

Solar electric power has a very important role to play in expanding the U.S. energy supply. Among its benefits: it generates the most power at times of peak demand (e.g., on hot sunny days when air conditioners are running); and it is usually located near the point of use, thus minimizing transmission costs.

Because wind and solar power are intermittent, advances in energy storage are needed to take full advantage of the potential of these important renewable energy sources. Promising storage technologies include compressed air, solar thermal energy storage, and various types of batteries, including large batteries in plug-in hybrids and electric vehicles.[13]

Sustained investment will help expand the capacity of all of these renewable resources to meet the country's future electrical needs.

QUESTION 8: Coal can be easily transported to points of use within our existing infrastructure of roads, rail and shipping. Won't we need to develop an expensive and new infrastructure for alternative energy?

ANSWER: Significant expansion of the transmission infrastructure will be required to manage future U.S. energy needs under any scenario. Current transmission lines are already over capacity and in recent years have caused brownouts and blackouts on the West Coast and in the Midwest. If proposed new coal-fired (or nuclear) power plants were built, new and improved long-distance high voltage transmission lines would be needed to bring the new power to end users.

Texas has just agreed to build a new transmission line for wind farms being constructed in that state. Electrical power generated by wind turbines 10-15 miles off the East Coast on the Continental Shelf can provide more than enough electricity for the heavily populated states along

the coast, from Massachusetts to North Carolina.[14] Wind is also abundant on the Great Plains. These new locations will require new transmission capacity.

Distributed energy sources (small-scale, on-site systems) like solar PV, however, do not require extensive new transmission lines. Local and smaller wind, solar, biomass, geothermal, hydro, and/or tidal power projects can be more easily tied into local electric distribution lines. They would also provide greater electric power reliability.

QUESTION 9: Coal can be transported in a safe and proven manner within our infrastructure and is not vulnerable to outside interference and possible terrorist attack. Wouldn't a new power infrastructure be more vulnerable?

ANSWER: Any large-scale coal-fired or nuclear power plant and the accompanying transmission infrastructure are vulnerable to terrorist attack. Distributed energy sources, such as solar panels on rooftops or turbines in wind farms, are much less vulnerable because of their geographic dispersal.

QUESTION 10: But what about costs? Isn't coal cheaper than all these other sources?

ANSWER: Coal has been cheaper than other fossil fuels (oil and natural gas) only if you don't consider the 'external' costs of coal use: health impacts, premature death, environmentally destructive mining, and the damage caused by climate change.[15] We are paying very dearly for our continued dependence on coal and other fossil fuels. Setting a price on carbon – either through a direct tax or a cap-and-trade system – will internalize some of those costs and help mitigate some of the damages. Shifting federal subsidies from fossil fuels to renewable energy sources will also have a positive effect. In some areas, wind power is already cost-competitive with natural gas.

QUESTION 11: What about states that produce coal? Won't this hurt their economies?

ANSWER: There will be many new, healthier and safer jobs in the clean energy economy to come. Workers whose jobs are dependent on coal may need assistance with retraining and relocation. Some of the states that produce coal have renewable resources such as wind, solar and/or hydro power that can replace some of the coal-related job losses.

As an example, a recently-approved, new 585-megawatt (MW) coal-fired power plant in Virginia is expected to create 800 construction jobs, 75 facility jobs, and 250 mining jobs.[16] New wind power development would generate comparable job growth. According to the DOE, building and operating 1000 MW of wind power in Virginia would create an estimated 1,645 new construction jobs and 230 new long-term jobs, approximately offsetting any loss of jobs resulting from not building a coal plant of similar capacity. (The DOE analysis also examines the water savings and CO_2 emissions reductions that would result from wind development.)[17]

QUESTION 12: Won't a moratorium merely keep all the nation's old, highly polluting power plants in place?

ANSWER: A moratorium will not immediately affect existing coal-fired plants; it will only prevent new conventional electric power plants from being built. However, stricter air pollution regulations, carbon taxes, and shifting subsidies from fossil fuels to renewables can make old coal plants uneconomical enough to shut them down.

QUESTION 13: What about clean coal technologies (e.g., more efficient combustion, liquefaction, gasification, and so on)?

New technologies can help reduce CO_2 emissions from coal-fired power plants, but there is no such thing as "clean coal." Combined Heat and Power (CHP) systems (also known as co-generation systems), for example, produce both electricity and heat from a single fuel source and thus require less fuel than equivalent separate heat and power systems to produce the same amount of useful energy. But these systems are not emissions free.

Liquefaction (producing liquid fuels from coal) and gasification (producing a mixture of hydrogen and oxides of carbon) can be operated to release less oxides of sulfur and nitrogen (which contribute to acid raid and smog), mercury, and particulates than conventional coal plants, but these processes release **more** CO_2 overall.[18]

QUESTION 14: How is it fair to focus only on coal rather than all fossil fuels, especially the pollution that comes from cars and trucks?

ANSWER: It is important to focus on coal because it produces more CO_2 per million Btus of energy than either oil or gas. The two largest sources contributing to CO_2 emissions in the U.S. come from using coal to produce electric power (33 percent) and using petroleum for transportation, including trucks, trains and airplanes as well as cars (32 percent).[19] (Other GHGs contribute about 16 percent of total U.S. GHG emissions, on a CO_2-equivalent basis.) Emissions from both coal-fired power plants and transportation must be addressed.

The recently enacted Energy Independence and Security Act of 2007 (EISA) increases the fuel economy standards for new cars and light trucks by 40 percent, to an average of 35 mpg by 2020. But improved Corporate Average Fuel Economy (CAFE) standards alone won't solve the problem; emissions from the transportation sector also depend on the total number of vehicle miles traveled and people's driving practices (e.g., speed, rapid starts and stops).

Moreover, a government analysis indicates that, although EISA will result in a decrease in previously projected CO_2 emissions in 2020, CO_2 emissions still will be about 8.5 percent higher than in 2006.[20] The analysis (which does not take CCS into account) shows that EISA will reduce the percentage of CO_2 coming from petroleum by about 2.3 percent relative to 2006 emissions, but it projects a 2.3 percent rise in emissions from coal. Thus, we must take steps to avoid increasing coal use **and** decrease transportation-related emissions in order to reduce overall CO_2 emissions.

QUESTION 15: Won't a moratorium on coal-fired electric power plants just mean more nuclear waste from nuclear power plants?

ANSWER: Under the Business-as-Usual scenario (no significant effort to reduce GHG emissions) presented by the EIA, the overall projected increase in electricity demand between

2007 and 2020 is about 14 percent.[21] Coal is the source for about 49 percent of today's electricity generation, while nuclear power provides about 19 percent. Under current laws and regulations, coal is projected by the EIA to provide about 50 percent of the electricity in 2020, while the share from nuclear power will decline slightly to about 18 percent. Thus, projected increases for coal and nuclear power are similar. Power from renewable energy sources is projected to increase to about 3.5 percent of the total by 2020, balanced by reductions in natural gas.

As the 2007 IPCC Working Group III report noted, however, there are other energy use scenarios that show much more rapid increases in renewable energy, conservation and efficiency. "Both bottom up and top down studies indicate that there is substantial economic potential for the mitigation of global greenhouse gases…that could offset the projected growth of global GHG over the coming decades (range from 25 to 135 gigatons of CO_2 equivalent)…. The actual level of greenhouse gases will depend on how the countries work together to make energy and technological choices, assign economic and social costs and reduce market barriers."[22]

If a moratorium on new coal plants were in place, several options are available to address the loss of the 14 percent of new electricity that could otherwise come from coal. Options include reducing the projected increase in electricity demand through more efficient technologies and/or doubling the new sources from nuclear power, renewables, and natural gas. Increasing nuclear power would increase the amount of waste by a similar amount.

Increasing electricity production from coal or nuclear sources adds different risks that should be assessed in the context of the economy and the public's acceptance of the risks. Improving efficiencies and increasing the amount of renewable sources could avoid these added risks. Several state analyses indicate that measures aimed at increasing energy efficiencies by about 1 percent per year can be achieved to hold electricity demand at current levels. [23]

QUESTION 16: Even if we reduce our coal use, China, India and other developing countries probably won't. How can we compete with them and why should we put ourselves at such a disadvantage?

ANSWER: The U.S. is responsible for nearly 30 percent of cumulative anthropogenic GHG emissions since 1850. Cumulative emissions from developing countries like China and India are rising rapidly but won't reach those of developed countries for several decades. Although also growing, per capita emissions of developing countries will likely remain much lower than ours.[24]

As the world's largest economy and largest per capita emitter of global warming pollution, the U.S. must provide leadership in international efforts to reduce GHG emissions. Aggressive action in this country will help influence China, India and other rapidly developing nations to take steps to control their own emissions. Moreover, by developing and sharing clean-energy technologies, the U.S. can help these developing countries leapfrog over the fossil-fuel-based model of development practiced here and take a more sustainable growth path.

Research indicates that pursuing a clean-energy strategy will not harm U.S. competitiveness. An EIA analysis of climate change legislation currently under consideration in the U.S. Senate indicates that emissions limits will have only a marginal effect on economic growth rates.

Moreover, other analyses indicate that promoting investment in climate-friendly technologies is likely to create employment and economic growth.[25]

QUESTION 17: Coal can be easily stored and drawn upon in emergencies. In this increasingly economically fragile and dangerous world, is it really the time to be playing with our energy supply?

ANSWER: Coal, by its very nature, can be easily stored and would be part of the mix during any energy emergency. However, one of the keys to energy security is diversification, which includes supporting "research and development efforts to reduce the costs of renewable energy technologies and accelerate the large-scale use of carbon-free electricity sources," as stated in the DOE's 2006 strategic plan on energy security.[26] Encouraging new non-carbon emitting technologies and improved efficiencies in electricity use, rather than expanding the use of one type of technology (coal), will reduce the risks to our energy supply and will expand economic growth in new areas.

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[1] National Geographic News, *Arctic Ice Melting Much Faster Than Predicted* (May 1, 2007). At: http://news.nationalgeographic.com/news/2007/05/070501-arctic-ice.html

[2] James Hansen et al., *Target atmospheric CO2: Where should humanity aim?* (April 7, 2008). The paper is available in pdf format at: http://arxiv.org/abs/0804.1126v1

[3] Lester R. Brown, *Plan B 3.0: Mobilizing to Save Civilization*, Earth Policy Institute, W.W. Norton & Co., New York, 2008.

[4] Massachusetts Institute of Technology, *The Future of Coal: Options for a Carbon-Constrained World*, J. Deutch & E. Moniz, co-chairs; study co-authors include A.D. Ellerman, H. Herzog, H.D. Jacoby (March 2007). At: http://web.mit.edu/coal/

[5] U.S. Department of Energy, Energy Information Administration, *Annual Energy Outlook 2008 with Projections to 2030* (Revised Early Release). At: http://www.eia.doe.gov/oiaf/aeo/eisa.html

[6] Interlaboratory Working Group on Energy-Efficient and Clean Energy Technologies. *Scenarios for a Clean Energy Future* (Oak Ridge, TN; Oak Ridge National Laboratory and Berkeley, CA; Lawrence Berkeley National Laboratory, 2000), Chapter 4--Buildings Sector and Chapter 7--Electricity Sector. At: http://www.nrel.gov/docs/fy01osti/29379.pdf

Intergovernmental Panel on Climate Change, *Summary for Policymakers. Contribution of Working Group III to the Fourth Assessment Report of the IPCC* (2007), p. 13. At: http://www.ipcc.ch/pdf/assessment-report/ar4/wg3/ar4-wg3-spm.pdf

[7] U.S. Department of Energy, *"20% Wind Energy by 2030: Increasing Wind Energy's Contribution to U.S. Electricity Supply,"* (2008), p. 15. At: http://www1.eere.energy.gov/windandhydro/pdfs/41869.pdf

[8] U.S. Department of Energy, Energy Information Administration, Solar Photovoltaic Resources. At: www.**eia**.doe.gov/cneaf/**solar**.renewables/page/**solar**photv/**solar**pv.html

[9] Arjun Makhijani, *Carbon-Free and Nuclear-Free: A Roadmap for U.S. Energy Policy*, IEER Press, Takoma Park, MD, 2007, and RDR Books, Muskegon, MI; 2007.

[10] U. S. Department of Energy, 2007. At: http://www.energy.gov/news/4855.htm

[11] American Solar Energy Society, *Tackling Climate Change in the U.S.: Potential U.S. Carbon Emission Reductions from Renewable Energy and Energy Efficiency by 2030* (2007). At: http://www.ases.org/climatechange/toc.htm

[12] Denmark already produces 20% of its electricity with wind power and is planning to go to 50% from wind. *Denmark to increase Wind Power to 50% by 2025, Mostly Offshore* (Dec. 5, 2006). At: http://www.renewableenergyworld.com/rea/news/infocus/story?id=46749

[13] University of Delaware, *V2G: Vehicle to Grid Power*. At: http://www.udel.edu/V2G

[14] *Researchers Find Substantial Wind Resource off the MidAtlantic Coast*, Jan. 2007. At: http://www.udel.edu/PR/UDaily/2007/feb/wind020107.html

[15] PACE University Center for Environmental Legal Studies, *Environmental Costs of Electricity* (1990), Chapter VI, Externality Costs by Resource.

[16] Chmura Economics and Analysis, *Coal and Virginia's Energy Future*, Virginia Economic Trends, 4th Quarter 2006.

Christian Science Monitor, *Virginia coal-fired power plant approved*, June 27, 2008.

[17] National Renewable Energy Laboratory, Department of Energy, *Economic Benefits, Carbon Dioxide (CO2) Emissions Reductions, and Water Conservation Benefits from 1,000 Megawatts (MW) of New Wind Power in Virginia*, Golden CO (June 2008). At: http://www.eere.energy.gov/windandhydro/windpoweringamerica/filter_detail.asp?itemid=1953

[18] MIT, *The Future of Coal*, op.cit.

[19] U.S. Department of Energy, Energy Information Administration, 2005 statistics. At: http://www.eia.doe.gov/environment.html

[20] *Annual Energy Outlook 2008*, op. cit.

[21] Ibid.

[22] Intergovernmental Panel on Climate Change, *Contribution of Working Group III*, op.cit.

[23] National Association of State PIRGs, *Energy Efficiency: The Smart Way to Reduce Global Warming Pollution in the Northeast* (August 2005). At: http://www.rggi.org/docs/rggi_energy_8_24_05.pdf

California Energy Commission, *Integrated Energy Policy Report*, 2007. At: http://www.energy.ca.gov/2007publications/CEC-100-2007-008/CEC-100-2007-008-CMF-ES.PDF

[24] Pew Center for Global Climate Change, *Understanding and Responding to Global Climate Change*. At: http://www.pewclimate.org/global-warming-basics/climate_change_101

[25] Ibid.

[26] *U.S. Department of Energy Strategic Plan*, Strategic Theme 1: Energy Security, 2006. At: http://www.cfo.doe.gov/strategicplan/strategicplan.htm