



FREQUENTLY ASKED QUESTIONS

April 2011

Do we need new nuclear reactors or coal plants to meet U.S. electricity demand?

No, at least not in the near-term. According to a 2009 Union of Concerned Scientists (UCS) report, [Climate 2030: A National Blueprint for a Clean Energy Economy](#), the United States will be able to meet projected consumer demand for electricity over at least the next 20 years without building any new nuclear reactors or coal-fired power plants. The study found that the United States could meet electricity demand over the next two decades and reduce power plant carbon emissions by 84 percent by significantly improving energy efficiency in buildings and industry, and by dramatically increasing reliance on clean, renewable energy sources, such as wind, solar, geothermal and bioenergy.

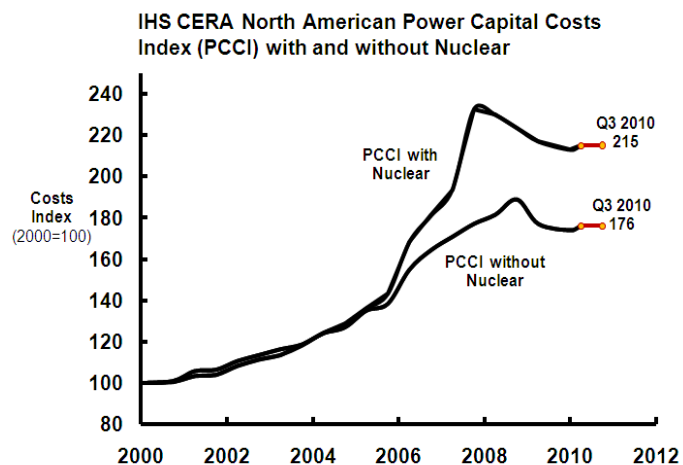
The Blueprint did include four 1,100 megawatt (MW) reactors that we estimated would be built as a result of existing federal subsidies, 20 new conventional coal plants that were either under construction or approved by 2008, and 12 advanced coal plants with carbon capture and storage (CCS) to demonstrate whether this technology will be feasible and affordable at commercial scale. However, all of these new nuclear and coal facilities could easily be replaced with new natural gas plants or additional efficiency and renewable energy, at a lower cost. For example, the total generating capacity added by these new nuclear and coal plants over the next 20 years represents about 10 percent of the new natural gas capacity that was added in the U.S. between 2000 and 2005. In addition, the UCS study was conducted before the recent [dramatic increase in projected natural gas reserves resulting from the development of technologies to extract shale gas](#) and the consequent decline in current and projected natural gas prices. It was also conducted before the decline in current and projected electricity demand due to the recession.

[A 2010 analysis by the Electric Power Research Institute \(EPRI\)](#) also shows that U.S. power plant carbon emissions reduction targets could be met primarily with efficiency and renewable energy in the near-term, while new nuclear and CCS plants would not make a meaningful contribution until after 2025-2030. Other studies have gone beyond the UCS Blueprint and EPRI analysis and found that it may be [possible to phase out coal and nuclear](#) power entirely, and even [to reach 100 percent renewable energy globally by 2050](#).

Can we afford new nuclear plants?

No, at least not compared to other low carbon alternatives. The Climate 2030 Blueprint found that significantly increasing energy efficiency, and expanding the use of commercially available renewable energy technologies would be [less expensive than building new nuclear reactors](#). Over the last

Figure 1



decade, the projected cost of building nuclear plants has skyrocketed, rising [much faster than the costs of other power generating technologies \(Figure 1\)](#) and has remained more expensive, which is consistent with [long-term historical experience](#). Even the CEO of the nation's largest nuclear utility recently said that new nuclear plants (along with CCS coal plants) are [among the most expensive low-carbon options available](#) (see especially his slides 3 and 5 at end), and that new nuclear plants would not be an economical option [for at least a decade or two](#), especially without a cap or price on carbon emissions and an increase in natural gas prices.

Can we phase out existing coal plants?

The [UCS Climate 2030 Blueprint](#) found that we could reduce coal use and power plant carbon emissions by about 85 percent by 2030 largely by increasing the level of energy efficiency throughout our economy and using more renewable energy. This scenario would reduce overall energy bills in every region by an average of \$900 per household by 2030, and result in cumulative national savings of \$1.7 trillion. The savings are produced mainly by improvements in energy efficiency, so that less energy and money are wasted. This scenario is also consistent with—and somewhat faster than—the 80 percent by 2035 [Clean Energy Standard](#) proposed by President Obama in the 2011 State of the Union Address (see pp. 25, 55). Analyses by [EPRI](#), the Energy Information Administration ([EIA](#)), and the Environmental Protection Agency ([EPA](#)) have also shown that phasing out or significantly reducing generation from existing coal plants is one of the most cost-effective ways to reduce U.S. carbon emissions.

Can we phase out existing nuclear plants?

UCS has not advocated such a phase out or analyzed such a scenario. The Blueprint adopted EIA's assumption that all existing nuclear plants would have their licenses extended from 40 to 60 years. The Nuclear Regulatory Commission has approved all such applications to date. Assuming a 60-year lifetime, existing nuclear plants would not begin to retire until after 2030, which is beyond the period we modeled in the Blueprint.

More fully utilizing [surplus natural gas capacity](#) that exists in most regions today, along with building new natural gas plants and investing in more efficiency and renewable energy, could potentially replace some existing nuclear plants (see especially pp. 3 and 14-15). It would certainly be challenging and more expensive to immediately shut down or phase out all existing nuclear plants, especially if existing coal plants are also phased out to reduce carbon emissions and other pollutants. More research would be needed to determine if a combination of natural gas, energy efficiency and renewable energy could affordably allow for the earlier retirement of some or all of the existing reactor fleet.

Other recent studies have gone beyond the Blueprint and found that it may be [possible to phase out coal and nuclear](#) power entirely, and even [to reach 100 percent renewable energy globally by 2050](#).

Is the big increase in renewable electricity in the Climate 2030 Blueprint, especially wind power, really feasible, and consistent with a reliable electricity system, even though wind and solar power are obviously not available all the time?

Yes. In the Blueprint, renewable energy increases to supply 50 percent of U.S. electricity use by 2030. More than half of the renewable generation would come from hydro, bioenergy, landfill gas, geothermal, and concentrating solar plants with storage, all of which can produce electricity around the clock or during periods of high demand. Wind would produce nearly 20 percent of electricity, consistent with

the U.S. Department of Energy's 2008 [20 percent Wind Energy by 2030](#) study, which found such a scenario feasible. Collaborative studies by electric grid operators, government agencies and others [in the East](#), [Southwest](#), [other regions](#) and [nationally](#) have all found that the grid can operate reliably with at least 20-25 percent of electricity generated from wind and solar power.

The cost of integrating these resources increases as their penetration grows, but even [achieving 20 percent of electricity from wind adds only about 10 percent to the wholesale cost of wind generation](#). These scenarios do require new investments in the transmission system, and more efficient and flexible operation of the grid, but they do not require any technical breakthroughs. In most cases, investments in new transmission will also provide broad, regional benefits to consumers as they gain access to a broader range of clean energy resources. The state of [Iowa](#) (see p. 10), [Denmark](#), and regions in Spain and Germany already produce 20 percent or more of their annual electricity needs with wind energy.

But don't we need coal and nuclear to provide baseload electricity?

No. A number of respected energy experts, including [Federal Energy Regulatory Commission Chairman Jon Wellinghoff](#) and [Rocky Mountain Institute's Amory Lovins](#) (see pp. 5-10) now regard the idea that the electricity sector needs "baseload" power plants as an anachronism or myth.

The day-to-day reliability of our electricity supply depends on the operation of the interconnected electric system as a whole, not just on any one type of baseload resource. Generating plants must be turned on or off and powered up or down to match constant changes in energy demand. Backup facilities must always be readily available to provide reserve power at a moment's notice in the event of a power-plant or transmission-line outage. Power plants must also provide other services to the grid to maintain grid voltage and keep frequency stable.

Baseload plants are normally defined as those that operate most of the time to meet a minimum level of electricity demand. Both coal-fired and nuclear power plants – as well as bioenergy, hydroelectric, and geothermal plants – typically operate that way. Coal and nuclear plants are not easy to start or stop, nor can they be powered up or down quickly to address instantaneous fluctuations in customer demand. The largest power plant on a system—often a nuclear plant—actually increases the amount of operating reserves a system needs to maintain reliability in the event that the plant has to be taken off line for any reason. More flexible plants, such as natural gas and hydroelectric plants, can be used for baseload or ramped up and down to meet changes in demand throughout the day and satisfy peak demands on a daily or seasonal basis.

Electricity from variable sources, such as wind and solar, generally is used whenever it is available because they have very low operating costs. The more variable generation in the electricity system, the more the system needs flexible and complementary resources, such as natural gas, hydropower or energy storage, to balance supply and demand over short periods of time. Excessive reliance on baseload resources like nuclear and coal that are more difficult to ramp up and down can actually make it harder or more expensive to balance a system with a high level of variable-output renewables. Siting wind and solar installations broadly across the country and linking them to an expanded transmission grid would help even out variations in the electricity supply that they can provide. Modern wind turbines have advanced electronics that also help grid operators adjust and maintain grid voltages and frequency.

Although adding more wind and solar to the mix makes managing the grid more challenging, engineering studies and operating experience in Texas and Europe indicate that [grid reliability can be maintained](#) with these resources providing up to 25 percent of electricity generation. [Technologies](#) that can make the task easier—and allow even higher levels of generation from these resources—include demand-response and smart-grid technologies that use price signals and automatic controls to help adjust power demand to meet available supply, as well as energy storage technologies, such as compressed air, solar with thermal storage, and batteries like those now found in electric vehicles. In addition, better wind forecasting techniques would give system operators more time to adjust to changes in energy demand.

What about after 2030?

After 2030, the task of reliably and securely meeting our nation's electricity needs will admittedly get more challenging. First, virtually all of the nuclear plants that now provide 20 percent of our electricity with very low carbon emissions are expected to retire between 2030 and 2050. Second, if we follow the Blueprint, we may have little room to increase the amount of wind and solar we can integrate into the system without new storage technologies, increases in flexible generation, or other adjustments to the system. We may also rapidly increase the use of electric vehicles by then to displace imported oil and provide low-emissions transportation.

On the other hand, considerable potential exists after 2030 to continue increasing energy efficiency and expanding the use of renewable energy technologies that are commercially available today. In addition, there are many emerging new technologies that will continue to develop that we did not take advantage of in the Blueprint because they are not yet economic or commercially available on a large scale. These technologies include: advanced low-wind and deep offshore wind technologies; tidal and wave power; enhanced geothermal technology that can tap deep hot water sources available in most of the country; fuel cells like the “Bloom Box”; advanced energy storage technologies, such as compressed air, flywheels, and batteries, including the use of electric vehicles and partially depleted vehicle batteries for grid storage; and new smart grid technologies that would manage electricity demand automatically and efficiently to instantaneously balance demand with supply.

Additionally, advanced coal plants with carbon capture and storage may be commercially available by that time, along with advanced, smaller nuclear plants that may be safer and more affordable than the current generation of new reactors. More research and development on all these technologies will be needed to ensure that a wide range of options is available to meet our future needs in a sustainable and environmentally responsible manner.

A fully referenced version of this fact sheet is available online at www.ucsusa.org.

The Union of Concerned Scientists is the leading science-based nonprofit working for a healthy environment and a safer world.



National Headquarters

Two Brattle Square
Cambridge, MA 02138-3780
Phone: (617) 547-5552
Fax: (617) 864-9405

Washington, DC, Office

1825 K St. NW, Ste. 800
Washington, DC 20006-1232
Phone: (202) 223-6133
Fax: (202) 223-6162



Printed on recycled paper using vegetable based inks
© UCS April 2011