



Global Warming and California's Electricity Supply

Clean Energy California

A Fact Sheet of the Union of Concerned Scientists

Increasing temperatures and population growth are projected to fuel a rising demand for electricity in California. As a result, California residents are likely to face dramatically higher electricity costs and endure air pollution from dirtier sources of energy used to meet this increased demand. Fortunately, California has an opportunity to advance new and innovative policies in its electricity sector to reduce heat-trapping emissions that cause global warming, thus driving progress on clean energy and energy efficiency and leading the way to reduced emissions worldwide.

Hotter Temperatures and Increased Electricity Demand

If global warming emissions continue unabated, statewide annual temperatures are expected to increase between 8 and 10°F by the end of the century. As temperatures rise, electricity demand will also increase, mainly due to increased air conditioner use. An 8 to 10°F temperature increase is expected to increase annual electricity demand by 20 percent, assuming no growth in population;¹ however, California's population is expected to grow from 36 million today to more than 55 million by 2050, resulting in even greater energy demand.²

Decreasing Hydropower Supply

As temperatures rise, diminished snowmelt flowing through dams, potentially exacerbated by decreasing precipitation, could decrease the potential for hydropower production, which now comprises approximately 15 percent of California's in-state electricity production.³ If temperatures rise between 5.5 and 8°F and precipitation decreases,⁴ hydropower production is projected to drop by up to 30 percent before the end of the century.^{5,6}

Higher Costs for Ratepayers

Rising energy demand combined with reduced hydroelectric output at critical peak times could place a significant financial burden on the state. By 2020, a mere three percent growth in electricity demand caused by global warming could increase average annual energy costs by nearly a billion dollars.¹ If global warming causes a 30 percent reduction in average in-state hydropower generation as projected, ratepayers would have to spend an additional billion dollars per year* to purchase sufficient energy to replace this lost hydropower.

A Potential Increase in the Burning of Coal

California's abundant supply of renewable energy sources such as wind and solar, along with increased energy efficiency, are fully capable of meeting California's normal growth in electricity demand without producing additional global warming emissions. However, the additional increase in electricity demand and loss of potential hydropower supply due to unchecked global warming could increase pressure on California to develop or purchase energy generated from dirty fossil fuels such as coal.

There are 27 new coal-fired power plants being proposed for the western United States. Increased coal use, however, will have a significant impact on the environment and public health; coal power plants emit more heat-trapping carbon dioxide than even the oldest, least efficient natural-gas-fired power plants, and are the
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* Estimated ratepayer cost assumes an average retail cost of \$0.10 per kilowatt-hour (kWh). Actual retail prices in 2003 (the latest year for which data are available) ranged from \$0.074 to \$0.195 (see www.energy.ca.gov/electricity/current_electricity_rates.html).

leading source of mercury emissions in the United States. Advanced technologies such as coal gasification have the potential to reduce smog-forming and heat-trapping emissions from coal-fired power plants. Unfortunately, only two of the plants being proposed would use coal gasification, and both are unlikely to use sequestration to prevent the carbon dioxide captured in the gasification process from being released to the atmosphere, at least in the near term. The global warming emissions from just three 500-megawatt conventional coal-fired power plants would offset all of the emissions reduced from the regulated utilities' energy efficiency programs.

Renewable Energy Potential in California

California is committed to generating at least 20 percent of its electricity from renewable energy sources (such as solar, biomass, geothermal, and wind) by 2010. Governor Arnold Schwarzenegger and state energy agencies have expressed an interest in increasing this goal to 33 percent by 2020. California has plenty of untapped renewable energy potential, and the state should focus on overcoming the regulatory and technical obstacles to maximizing that potential, thereby helping to reduce harmful global warming emissions. .

Reducing Global Warming Emissions from Electricity Generation

On June 1, 2005, Governor Schwarzenegger signed an executive order (#S-3-05) that requires the state to reduce heat-trapping emissions by 80 percent below 1990 levels by 2050. Scientists have concluded that to avoid the risk of severe global warming, the industrialized world will need to follow California's lead and reduce global warming emissions 80 percent below 1990 levels, and industrializing nations will need to follow a lower-emissions pathway as well.

California is currently implementing or considering several policies that will help the electricity sector reduce its share of emissions. These include a "cap" on heat-trapping emissions from utilities and a "greenhouse gas performance standard" that would limit emissions from any new power plant to the amount emitted by a combined-cycle natural gas power plant of equivalent generating capacity. The performance standard would also apply to new long-term contracts of imported electricity. The California Public Utilities Commission has already passed a policy to require large investor-owned utilities to account for the future cost of reducing carbon emissions in choosing energy sources.

These solutions are crucial first steps in curbing global warming emissions. But the administration and legislature must work together to develop additional policies, such as an enforceable cap on emissions from all major sectors, to avoid the most devastating consequences of global warming in the Golden State.

Sources:

¹ Franco, G., and A. Sanstad. 2006. Climate change and electricity demand in California. Sacramento, CA: California Climate Change Center. Online at www.energy.ca.gov/2005publications/CEC-500-2005-201/CEC-500-2005-201-SF.PDF.

² State of California, Department of Finance. 2004. *Population projections by race/ethnicity for California and its counties 2000–2050*. Sacramento, CA. May.

³ Cayan, D., A. Luers, M. Hanemann, G. Franco, and B. Croes. 2006. Climate change scenarios for California: An overview. Sacramento, CA: California Energy Center. Online at www.energy.ca.gov/2005publications/CEC-500-2005-186/CEC-500-2005-186-SF.PDF.

⁴ The expected hydropower production losses presented here are based on the projected streamflow losses of up to 27 percent. See Cayan et al. 2006 for further details.

⁵ Medellin, J., J. Harou, M. Olivares, J. Lund, R. Howitt, S. Tanaka, M. Jenkins, and T. Zhu. 2006. Climate warming and water supply management in California. Draft report. Sacramento, CA: California Climate Change Center. Online at www.energy.ca.gov/2005publications/CEC-500-2005-195/CEC-500-2005-195-SD.PDF.

⁶ Vicuna, S. R. Leonardson, J. Dracup, M. Hanemann, and L. Dale, 2006. Climate change impacts on high elevation hydropower generation in California's Sierra Nevada: A case study in the Upper American River. Draft. Sacramento, CA: California Climate Change Center. Online at www.energy.ca.gov/2005publications/CEC-500-2005-199/CEC-500-2005-199-SD.PDF.

