WATER DEMAND FOR ENERGY AND COMPETING SECTORS

Argonne's Environmental Science Division (EVS) examined water-consumption projections for energy sectors (coal, oil, natural gas, biofuels, hydrogen, and thermoelectric power generation) and nonenergy sectors (irrigation, domestic and public use, industrial and commercial use, and livestock) for the 2005–2030 period. It concluded that water consumption for energy production is projected to grow faster than for any other sector, primarily because of increased biofuels production.

PROBLEM/OPPORTUNITY

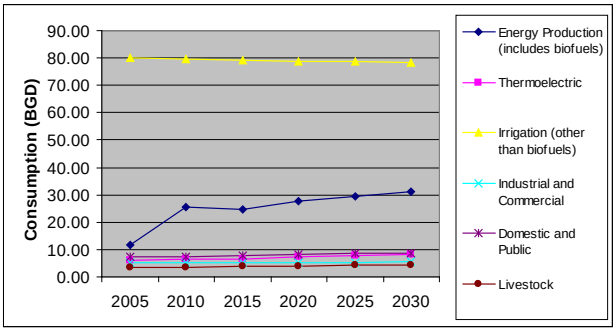
The links between energy and water (energy production requires large quantities of water, and water treatment and distribution benefit from readily available, low-cost energy) and growing concerns about the adequacy of U.S. water supplies make water a key component of energy policy. Information on the extent and location of water demand by competing users can help identify potential constraints for energy supply and production. Such knowledge can help decision makers develop policy and technology recommendations to avoid potential supply issues and to ensure that the nation's energy demands are met in a cost-effective manner.

APPROACH

The Existing Plants Research Program, managed by the U.S. Department of Energy's National Energy Technology Laboratory (NETL), has a research effort focused on water use at power plants. In a project funded by this program, EVS extended NETL's research into the larger context of water use by other energy sectors and nonenergy sectors. EVS developed water-consumption estimates for energy-production sectors by multiplying energy-production projections developed by DOE's Energy Information Administration (EIA) by sector-specific water-demand coefficients (e.g., gallons of water consumed per ton of coal mined) that relate water consumption to energy production. The projections for thermoelectric power generation were taken from NETL's 2007 report, *Estimating Freshwater Needs to Meet Future Thermoelectric Generation Requirements, 2007 Update* (DOE/NETL-400/2007/1304, September 24). EVS based consumption estimates for nonenergy sectors on projections provided in technical documentation prepared by the U.S. Forest Service to support its 2000 Renewable Resources Planning Act Assessment. Because the regions for which energy-production projections—and hence water-consumption estimates—vary depending on sector (e.g., Coal Supply Region for coal mining, U.S. Census Region for biofuels), a Geographic Information System was used to develop overlay maps to enable visual comparison of region-specific water-consumption estimates for the beginning and end of the projection period.

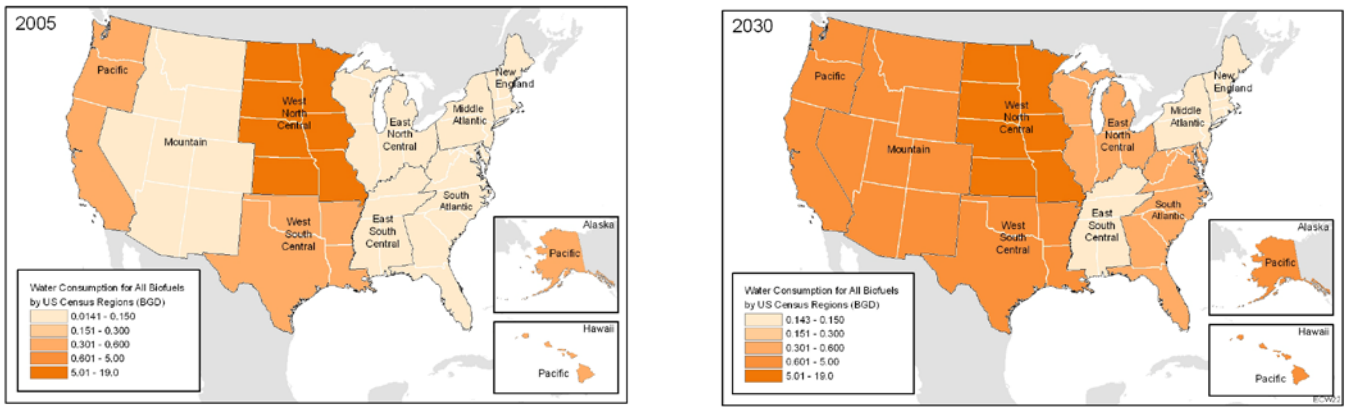
RESULTS

EVS's analysis projected total domestic water consumption to increase from about 114 billion gallons per day (bgd) in 2005 to about 136 bgd in 2030—an increase of nearly 20% over the 2005–2030 period. Water consumption by energy-production sectors is projected to increase from about 12 bgd in 2005 to 31 bgd in 2030, or by 2.5 times.



Water consumption for energy production increases faster than any other sector

The rate of increase in water consumed by energy production is higher than that for any other sector, and the amount of water projected to be consumed by energy production is higher than that for any other sector except irrigation. As a percentage of total water consumption, the amount consumed by energy sectors is projected to increase from about 10% in 2005 to about 27% in 2030. Most of this increase comes from increased biofuels production. Thus, water consumption for biofuels production is projected to more than triple—from an estimated 7.4 bgd to an estimated 26.3 bgd—between 2005 and 2030.



Estimated consumption for biofuels, 2005 and 2030

FUTURE

The results of the study can help inform energy and water policy decision making. Its conclusions suggest opportunities for additional research, particularly in the area of water consumption for biofuels, which dominates water-consumption projections over the next 25 years.

COMMUNICATION OF RESULTS

The results of the study are presented in *Baseline and Projected Water Demand Data for Energy and Competing Water Use Sectors*, ANL/EVS/TM/08-8, December 2008 (http://www.ead.anl.gov/pub/doc/ANL-EVS-TM08-8_water_demand_report.pdf).

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