**TESTIMONY OF**

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**U.S. HOUSE OF REPRESENTATIVES**

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Madam Chairwoman and members of the Subcommittee, thank you for the invitation to testify today on the current and future role of hydropower. The Energy Information Administration (EIA) is the independent statistical agency within the U.S. Department of Energy. We are charged with providing objective, timely, and relevant data, analyses, and projections for the use of the Congress, the Administration, and the public. Although we do not take positions on policy issues, we do produce data and analyses to help inform energy policy deliberation. Because we have an element of statutory independence with respect to this work, our views are strictly those of EIA and should not be construed as representing those of the Department of Energy, the Administration, or any other entity.

In 2007, domestic conventional hydroelectric power production accounted for 71 percent of renewable generation, which, in turn, accounted for 8 percent of all power generated in the United States. This translates into 248 billion kilowatthours of electricity, although the amount has varied quite significantly in recent years without dramatic changes in hydroelectric capacity. For example, 356 billion kilowatthours were generated from conventional hydroelectric facilities in 1997, but these same plants produced only 217 billion kilowatthours 4 years later. The wide variation in generation over this period is mainly a function of varying weather conditions, particularly changes in precipitation, since there was only a small change in installed capacity.

Most of the hydropower in the United States is located near the West Coast. In 2007, Washington, California, and Oregon together accounted for 140 billion kilowatthours, or fifty-six percent of total U.S. hydropower generation. Lesser amounts were generated in New York, Montana, Idaho, Arizona, Tennessee and Alabama, which were the other leading hydroelectricity producers in 2007. The geographic concentration of hydropower production in the West explains why years with scare precipitation and snowpack in that region can result in a dramatic reduction in total lower hydroelectric generation in the United States.

In its *Annual Energy Outlook (AEO)*, EIA publishes projections of energy supply and consumption to 2030, under the assumption that current laws and regulations remain in effect unless they are already scheduled to expire. In the *AEO2008* projections, issued earlier this year, hydroelectricity continues to play an important role in the electric power sector, but its share in overall generation falls. Less than 1 gigawatt of new capacity is projected to be added by 2030, and generation holds steady at approximately 300 billion kilowatthours. This contrasts with the growth of other renewable energy technologies over the same period. By 2030, the 71-percent share of renewable power that hydropower currently holds falls to just below 50 percent of total renewable generation. Hydroelectricity's share of total renewable generation is projected to decline because of the rapid rise in generation by other renewable technologies. It is important to note that EIA does not yet include unconventional hydroelectric power technologies, such as wave, tidal, or in-stream turbines in its model. Although these technologies may play a significant role at some point in the future, it is difficult to obtain reliable cost and

performance estimates of technologies that are in their early, experimental phase of development.

As noted, other renewable energy technologies are projected to grow at a much faster rate than hydropower. In the *AEO2008* reference case, their growth is largely spurred by State renewable portfolio standards, and, in the very near-term, by the extension of the renewable energy production tax credit. Both of these are modeled in the EIA reference projection. The renewable energy tax credit is set to expire at the end of this year but will produce another year of strong wind power development. Currently, over half of the States have mandatory renewable energy standards. The rules of these programs differ widely among the States. Some States allow existing hydropower to be eligible in the State total, while others do not. Some have special mandates for non-hydropower renewable generation levels, meaning certain portions of renewable generation cannot be met through hydropower, even with incremental capacity. It is difficult to generalize from these vastly different programs, but generally they stress non-hydropower renewable energy sources over conventional hydropower.

Policy proposals to limit emissions of greenhouse gas emissions, which are not reflected in the *AEO2008* reference case projections, could have a significant impact on the mix of fuels used to generate electricity. Coal-fired generation currently provides about half of the nation's electric generation, producing roughly one-third of total U.S. energy-related emissions of carbon dioxide. Conventional coal-fired power would remain a very attractive option to meet growing baseload capacity needs absent any concern over the

future level of U.S. greenhouse gas emissions. However, a stringent policy to reduce U.S. greenhouse gas emissions would likely engender an implicit or explicit value for carbon dioxide emissions that is high enough to significantly affect the cost of generating electricity using coal. This would create a need for additional supply of electricity from low- and no-carbon generation sources.

In its recent analysis of S.2191, America's Climate Security Act of 2007, EIA projects an increase of 1.5 to 6.1 gigawatts of hydropower capacity in 2030—depending on the alternative case assumptions used--over the *Annual Energy Outlook 2008* reference case in that same year. By comparison, there are between 40 and 275 gigawatts of new wind power capacity in the S.2191 cases than in the reference case in 2030. As is the case with hydropower, the wide range in wind power additions is driven by cost and availability assumptions for key low-emitting technologies, including nuclear, fossil plants with carbon capture and storage, and biomass facilities. When these technologies are assumed to be expensive or the ability to deploy them is limited, there is a much larger penetration of new wind and natural gas facilities. The relatively limited growth in the S. 2191 cases for hydroelectricity is largely due to the limited supply of sites on which hydropower can be expanded or created. Most existing sites do not have large potentials for incremental capacity, and the list of new sites in which new dams can be constructed is short. That said, there are some opportunities for conventional capacity improvements at existing dams, as well as placing electricity turbines at sites which may be dammed but currently lack generators. However, environmental concerns may limit such development and

could lead to the retirement of some facilities when they come up for license renewal. As previously noted, our modeling did not consider wave, tidal, or in-stream turbines.

Finally, while policies to limit greenhouse gas emissions would likely create new market opportunities for hydropower and other low- and no-carbon generation technologies, it is also important to recognize that climate change itself could have major implications for generation levels at existing hydropower facilities. In a recent report, the U.S. Climate Change Science Program and the Subcommittee on Global Change Research[1] pointed out that because hydroelectric generation is so sensitive to climate variability and weather patterns, even small changes could have significant impacts. Changes in temperature and/or precipitation patterns could both impact hydroelectric generation. Hydroelectric plants also could be impacted if there was a change in the number and/or intensity of extreme weather events. At this time, it is very difficult to quantify the potential impacts of such factors, and they are not reflected in our projections.

This concludes my prepared testimony, Madam Chairwoman. I will be happy to answer any questions you may have.

[1] U.S. Climate Change Science Program and the Subcommittee on Global Change Research, *Effects of Climate Change on Energy Production and Use in the United States*, U.S. Climate Change Science Program Synthesis and Assessment Product 4.5, October 2007.