

Electricity Technology in a Carbon-Constrained Future

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From EPRI's perspective, it is clear that greenhouse gas emissions, including CO₂, must be reduced over time. To better understand our future options, EPRI conducted a technical analysis of the potential for significant CO₂ reductions from the U.S. electric power sector within the next 25-30 years.

- We first identified specific needs for research, development, deployment and demonstration of electric technologies that, if successful, would result in a low-cost, low-carbon portfolio of options with comparable economics.
- Using the Energy Information Agency Annual Energy Outlook 2007 base case as our baseline, we then calculated the CO₂ reductions that would result from reasonable but aggressive deployment programs in seven specific areas:
 1. Increased end-use energy efficiency in homes, buildings and industry.
 2. Increased deployment of cost-effective large-scale renewable energy resources, sufficient to exceed future State renewable portfolio requirements.
 3. Maintenance of the existing nuclear fleet and substantial expansion to include new advanced light-water reactors.
 4. Improvement of new coal-based generation unit efficiency to reach nearly 50% by 2030 (including efficiency loss due to CO₂ capture and storage).
 5. Deployment of CO₂ capture and storage technologies at nearly every new coal-based generation unit placed into service after 2020.
 6. Expanding sales of "plug-in" hybrid electric vehicles that replace gasoline with increasingly cleaner electricity for up to 30% of their range.
 7. Exchanging central-station electric generation for higher-efficiency distributed energy resources (including solar PV) for up to 5% of total load by 2030.
- The analysis indicates that no one technology is a "silver bullet"—a portfolio of technologies will be needed. However, over the coming decades it is potentially feasible for the U.S. electric sector to first slow the projected increase in CO₂ emissions then to stop the increase, and eventually to decrease emissions while meeting an ever increasing demand for reliable and affordable electricity.
- The challenges to actually achieving these reductions are daunting in their scope and complexity. It will require a decade or more of very aggressive development, demonstration, and deployment of a broad portfolio of technologies to achieve the desired goal of eventually reducing carbon emissions in the electric sector.
- We expect to publish these and related findings in the peer-reviewed literature, and welcome potential reviewers and collaborators in this ongoing effort.