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Cutting CO2 emissions from existing coal plants

MIT Energy Initiative report details findings of symposium, identifies next steps

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Professor Ernest Moniz, director of the MIT Energy Initiative (MITEI) and former undersecretary of the U.S. Department of Energy, today unveiled a report on reducing carbon dioxide emissions from existing coal plants. The report is based on the findings of a major MIT symposium on retrofitting coal-fired power plants, and identifies a range of possible next steps for the consideration of policy makers, industry and others engaged in CO2 emissions mitigation.

"There is no credible pathway toward prudent greenhouse gas stabilization targets without CO2 emissions reduction from existing coal power plants. We urgently need technology options for these plants and policies that incentivize implementation," Moniz said. "We may not see a strong CO2 price signal for many years. In the interim, we need a large, focused, federal program to develop and demonstrate commercial-scale technologies."

The focus of the March 2009 symposium was the retrofitting of existing pulverized coal plants with the capture of CO2 from flue gases after coal is combusted, or post-combustion capture technology. Participants also identified a range of additional technology options for cutting CO2 emissions, including efficiency retrofits, co-firing of coal plants with low-carbon fuels, rebuilding existing subcritical units to ultra-supercritical units with capture, more extensive rebuilds such as oxy-combustion or Integrated Gasification Combined Cycle with capture, poly-generation, and the repowering of existing boilers with alternative fuels such as biomass or natural gas.

Moniz was joined at the announcement by Wayne Leonard, chairman and CEO of Entergy Corporation, who co-chaired the MIT symposium. Leonard spoke about the core issue for existing plants, noting that they will continue to operate for decades, even as industry turns to carbon-free electric power-generating technologies.

"Once built, coal plants are, in most cases, the cheapest source of base load power generation and will not be phased out absent very high CO2 prices," Leonard said. "It's basic economics."

Some of the key findings of the report include:

- Relatively large, high-efficiency coal plants already equipped with desulfurization and nitrogen oxide emissions controls are the best candidates for post-combustion capture retrofit. Such plants make up less than half of the existing fleet. However, specific retrofit projects will need to pass various site-specific screens, such as available space, increased water supply, and CO2 off-take options. A fleet-wide,



Photo / Donna Coveney

Ernest Moniz

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detailed inventory of plants and sites is urgently needed to determine which plants are suitable for retrofitting, rebuilding or repowering or for partial CO2 capture solutions tailored to the current plant configuration. This inventory should inform policy makers about the range of options for significant reduction of CO2 emissions from operating coal plants in different climate policy scenarios.

- The primary focus of research and development for existing coal plants should be on cost reduction of post-combustion capture. This is essential if retrofits are to be affordable in developing countries. An expanded R&D program should also include efficiency upgrades, rebuilds, repowering, poly-generation and co-firing with biomass. Consideration should be given to including a component for research on CO2 capture from natural gas power plants. A robust U.S. R&D effort with this scope requires about \$1 billion per year for the next decade (not including support for commercial scale demonstration).
- The federal government should dramatically expand the scale and scope for utility-scale commercial demonstration of coal plants with CO2 capture, including demonstration of retrofit and rebuild options for existing coal power plants. New government management approaches with greater flexibility and new government funding approaches with greater certainty are a prerequisite for an effective program.
- The world cannot achieve significant reductions in CO2 emissions, avoiding the most disruptive impacts of climate change, without commitments to reduce emissions from existing coal-fired power plants in the United States and China. Bilateral approaches on climate change should be encouraged and supported as a matter of U.S. policy. Joint R&D programs between the United States and China should be supported and funded.

The symposium included 54 subject matter experts from a range of stakeholder groups, including academia, government, public interest groups and industry. Symposium participants were provided three commissioned white papers on key issues in advance.

The symposium report summary is available for [download](#). For the full report please contact Patti Richards at prichards@mit.edu or 617-253-2700.

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