

Natural gas can play major role in greenhouse gas reduction

June 10 2011, By David L. Chandler

Natural gas is important in many sectors of the economy: for generating electricity, as a heat source for industry and buildings, and in chemical feedstock. Given the abundance of natural gas available through large global resources and the recent emergence of substantial unconventional supplies in the United States, worldwide usage of the fuel is likely to continue to grow considerably and contribute to significant reductions of greenhouse gas emissions for decades to come, according to a [comprehensive, multidisciplinary study](#) carried out over the last three years by MIT researchers.

The study — managed by the MIT Energy Initiative (MITEI) and carried out by a team of Institute faculty, staff and graduate students — examined the scale of U.S. natural gas resources and the potential of this fuel to reduce [greenhouse gas emissions](#). Based on the work of the multidisciplinary team, with advice from a board of 18 leaders from industry, government and environmental groups, the report examines the future of natural gas through 2050 from the perspectives of technology, economics, politics, national security and the environment.

An interim report with some of the study's major findings and recommendations was released in June 2010. The full report, including additional data and extensive new analysis, was released by MITEI this week.

Because it has the lowest carbon content of all fossil fuels, natural gas can play a critical role as a bridge to a low-carbon future. The study's

economic analysis of the effects of a national policy calling for a 50 percent reduction in greenhouse gas emissions shows there would be a substantial substitution of natural gas for coal in electricity generation. However, in order to achieve even greater reductions in carbon emissions — which may be mandated in coming decades — natural gas will in turn need to make way for other low- or zero-carbon sources of energy. It is in this sense that natural gas may be seen as a “bridge” rather than as the ultimate long-term solution itself.

The study found that, contrary to best estimates of a decade or so ago, natural gas supplies are abundant and should be ample for even greatly expanded use of the fuel in coming decades. This is largely the result of the development of “unconventional” sources, such as shale gas. Because of its abundance, widespread distribution and advantages in cost and emissions, use of natural gas is expected to increase substantially under virtually all scenarios involving national policies, regulations and incentives, the study notes.

Concerns have been raised about the possible environmental effects of developing shale gas using a controversial process called “fracking” (for hydro-fracturing), which involves injecting fluids into deep horizontal wells under pressure. The ultimate disposal of those fluids after they are pumped back out, or the possibility that they could contaminate water supplies, have been the subject of lawsuits and legislative attempts to limit the practice. The study found that “the environmental impacts of shale development are challenging but manageable.” The report says some cases of the gas entering freshwater tables were “most likely the result of substandard well-completion practices by a few operators.”

The study recommends that to address these concerns, “it is essential that both large and small companies follow industry best practices; that water supply and disposal are coordinated on a regional basis and that improved methods are developed for recycling of returned fracture

liquids.” Government funding for research on such systems should be “greatly increased in scope and scale,” the report says.

The robust supply situation enhances the opportunities for natural gas to substitute for other fuels. Using very efficient natural gas powerplants to replace coal-fired plants is “the most cost-effective way of reducing CO₂ emissions in the power sector” over the next 25 to 30 years, the report says. Natural gas will also play a central role in integrating more intermittent renewable sources — wind and solar — into the electricity system because they can easily be brought in and out of service as needed.

The study also finds important opportunities for cost and emissions reduction in industry by switching to very high-efficiency natural gas boilers, and for more efficient energy use in commercial and residential buildings through new standards that would provide consumers information on end-to-end energy use of space- and water-heating alternatives. Furthermore, the current large price difference between oil and natural gas, if sustained, could lead to increased use of gas as a transportation fuel, either directly or through conversion to a liquid fuel.

The study group suggests that U.S. national security interests will be served by policies that encourage integration of the presently fragmented global [natural gas](#) markets, and calls for better integration of such issues into the conduct of foreign policy.

The report includes a set of specific proposals for legislative and regulatory policies, as well as recommendations for actions that the energy industry can pursue on its own, to maximize the fuel’s impact on mitigating [greenhouse gas](#).

Provided by Massachusetts Institute of Technology

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