

By itself, abundant shale gas unlikely to alter climate projections

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A Duke policy analysis appearing in *Environmental Science and Technology* finds that if natural gas is abundant and less expensive, it will encourage greater consumption of gas and less of coal, renewables and nuclear power. The net effect on the climate will depend on whether the greenhouse gas emissions from producing and consuming natural gas—including carbon dioxide and methane - are lower or higher than

emissions avoided by reducing the use of other energy sources.

While natural gas can reduce greenhouse emissions when it is substituted for higher-emission energy sources, abundant shale gas is not likely to substantially alter total emissions without policies targeted at [greenhouse gas reduction](#), a pair of Duke researchers find.

If natural gas is abundant and less expensive, it will encourage greater natural gas consumption and less of fuels such as coal, renewables and nuclear power. The net effect on the climate will depend on whether the [greenhouse emissions](#) from natural gas—including [carbon dioxide](#) and methane—are lower or higher than emissions avoided by reducing the use of those other energy sources.

Most evidence indicates that natural gas as a substitute for coal in electricity production, gasoline in transport, and electricity in buildings decreases greenhouse gases. But natural gas production and consumption has higher emissions than renewables and [nuclear power](#).

"Over the range of scenarios that we examine, abundant natural gas by itself is neither a climate hero nor a climate villain," said Richard Newell, Gendell Professor of Energy and Environmental Economics and director of the Duke University Energy Initiative.

The findings are published in a special issue of *Environmental Science and Technology*, "[Understanding the Risks of Unconventional Shale Gas Development](#)."

Natural gas from shale formations is favored by proponents as a cleaner, inexpensive replacement for fuels such as coal and oil that emit more carbon dioxide and local air pollutants. But extracting, processing and transporting the fuel can result in emissions of methane—itself a potent greenhouse gas. The precise level of these [methane emissions](#) is

uncertain, and extensive research on the subject is under way.

"We find that so far increased natural gas has mostly taken the place of coal, but looking forward there also may be increased consumption for sectors such as industry, as well as some degree of displacement of zero-emission sources such as renewables and nuclear," said Daniel Raimi, associate in research at the Energy Initiative. "The net effect on U.S. [greenhouse gas emissions](#) appears likely to be small in the absence of policies specifically directed at greenhouse gas mitigation."

Newell and Raimi draw on a range of evidence, including modeling of two hypothetical futures: one where natural gas production and prices follow a "reference case" scenario, and another where increased shale gas production lowers prices and encourages increased consumption. They also account for a range of methane emissions scenarios, ranging from 25 percent below to 50 percent above the levels estimated by the U.S. Environmental Protection Agency.

"The fact that increased [shale gas](#) doesn't have a huge climate impact on its own doesn't mean it's not important. If broad climate policy is enacted, having abundant natural gas could be very helpful by making it cheaper for society to achieve climate goals," Newell said. "If natural gas is expensive, then it will be more costly to switch away from fuels that have higher greenhouse gas emissions, such as coal and oil. But keeping methane emissions low is essential to maximizing the potential benefits of natural gas."

The climate benefits of natural gas are reduced if there are a lot of methane emissions, but while "recent evidence suggests methane emissions may be higher than the EPA currently estimates, it's not clear how this new information will affect those estimates," Raimi said.

"Reducing methane emissions is important, but even if methane emissions from natural gas systems are significantly higher than current

EPA estimates, we did not find this significantly alters the impact of abundant [natural gas](#) on long-term national or global [greenhouse gas emissions](#) pathways."

Provided by Duke University

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