Center for American Progress

U.S. Natural-Gas Use Must Peak by 2030

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Introduction and summary

The impacts of climate change are already occurring: There were 25 climate-related extreme weather events in the United States in the period from 2011 to 2012 that each caused at least $1 billion in damages.[1] Fortunately, U.S. carbon pollution from energy consumption is at its lowest point since 1994, in part because electricity generation by natural gas is replacing electricity generation by coal.[2] The modern fuel-economy standards issued by the Obama administration have reduced emissions as well. Nonetheless, the U.S. Energy Information Administration, or EIA, predicts that U.S. carbon pollution will begin to rise again by the end of this decade.

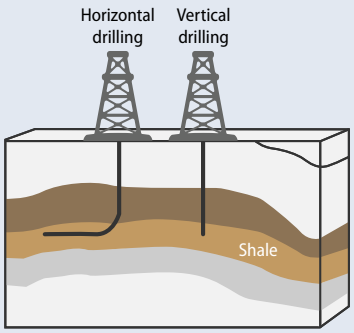
The United States is currently experiencing a boom in natural-gas production and use due to advances in drilling and extraction technologies. Because natural gas burns more cleanly than other fossil fuels and is currently affordable and abundant, it has been celebrated as a so-called bridge to a clean energy future and climate stabilization.[3] In this scenario, natural gas would significantly displace coal in the electric-power sector, which is the largest sector in terms of primary energy consumption,[4] and serve to balance more intermittent renewable sources of energy while we develop and deploy zero-carbon electricity systems.

This report finds that natural gas has an important role to play in achieving the emissions reductions necessary to stabilize the climate and prevent the worst impacts of global warming. In the near term, natural gas presents opportunities to reduce carbon pollution insofar as it burns more cleanly than coal and can be used to significantly replace coal in the generation of electricity. It also presents opportunities in the transportation sector, as natural-gas vehicles are a cleaner alternative to traditional vehicles and increasingly are being used in both private and public fleets.[5] In addition, the natural-gas expansion may present some near-term economic benefits for middle- and lower-income Americans by creating jobs and stimulating the manufacturing sector.

Terminology

Horizontal drilling

This is the process of drilling a well that curves and then extends into the reservoir horizontally. Horizontal drilling allows more of the reservoir rock to come into contact with the wellbore, or the drilled hole, compared to traditional vertical drilling.[6]



Hydraulic fracturing, or "fracking"

Fracking is a technique of gas or oil extraction in which a large amount of chemical-laced water is injected at high pressure into the wellbore, which creates and expands cracks in subterranean rock.[7] Each fracking project uses approximately 2 million to 4 million gallons of water.[8] Proppants, which contain sand or ceramic spheres, are injected to hold open the fractures so that gas can flow to the surface.[9]

Shale gas

Shale gas is natural gas found in formations of shale, which is a fine sedimentary rock. Horizontal drilling and fracking have made it possible and economical to extract natural gas from shale formations.

Dry versus wet natural gas

Natural gas is considered "dry" when it is nearly pure methane. "Wet" natural gas contains other hydrocarbon compounds as well, such as butane and ethane. These are separated from the methane before natural gas is sent to consumers.[10] Wet gas is considered more valuable, as the separated hydrocarbon compounds can be sold in addition to the methane.

Liquefied natural gas, or LNG

LNG is natural gas that has been liquefied by being cooled to approximately -161 degrees Celsius. The volume of LNG is approximately 1/600 of the volume of natural gas in its gaseous state, which facilitates transport.[11]

Fugitive methane emissions

Natural gas consists primarily of methane, which lasts for only 12 years in the atmosphere but is a potent greenhouse gas.[12] Compared on a pound-for-pound basis with CO_2, methane traps 72 times as much heat over a 20-year timeframe.[13] Throughout the lifecycle of natural gas, from drilling to end use, methane leaks into the atmosphere. These emissions are called fugitive methane emissions.

Carbon capture and sequestration, or CCS

CCS technologies capture CO_2 for storage or reuse. The allure of CCS is that it could be applied to fossil-fuel-powered electricity plants to dramatically reduce CO_2 emissions. There are a number of techniques for capture, including exposing combustion-exhaust gas to an amine- or ammonia-based solution that absorbs CO_2. No large-scale CCS projects are currently operational in the United States.[14]

Flowback wastewater, or "flowback"

Flowback is the fracking water that returns to the surface. It is contaminated not only with the original chemical additives, but also with elements extracted from the shale such as radium or barium.[15] In Marcellus shale, for example, it is estimated that 25 percent to 100 percent of the fracking fluid may return to the surface as flowback.[16] Flowback is stored in tanks or lined pits before it is either treated and recycled for use in another well or disposed of in deep injection wells.[17]

Beyond the near term, however, there needs to be a swift transition from natural gas to zero-carbon energy, particularly in the generation of electricity. Because the combustion of natural gas produces carbon pollution, albeit less than coal, too much reliance on natural gas over the long term would make it difficult or impossible to meet climate-stabilization targets. Failure to stabilize the climate would increase the frequency and severity of extreme weather events, which have been shown to disproportionately harm middle- and lower-income Americans, and the tremendous cost of disaster relief would erode any short-term economic benefits of the natural-gas boom.[18] In addition, heavy investment in natural-gas generation capacity could crowd out investments in long-term solutions such as wind, solar, wave, and other renewable electricity sources. A rapid shift from natural gas to zero-carbon energy is therefore critical. Our analysis finds that the use of natural gas must peak no later than 17 years from now, in 2030—which is sooner than many policymakers currently realize is necessary—if the United States is to meet its climate goals and avoid the worst impacts of global warming.[19]

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The expansion of natural-gas production should be consistent with four key principles designed to protect public health, the climate, the middle class, and our overall economy. We recommend federal and state policies that will help to realize them.

- There needs to be a swift transition from coal to a zero-carbon future by ensuring that the use of natural gas, particularly in the electric-power sector, peaks within the next 7 years to 17 years.
- The natural-gas expansion must be managed in an environmentally sustainable manner.
- The expansion of natural gas should be used to create dedicated revenues to support aggressive investments in research, development, and deployment of clean energy technologies; aggressive investments in energy efficiency; and investments in the resilience of communities threatened by climate-related extreme weather. That is, the expansion of natural gas should be used to create a financial bridge to a zero-carbon economy and climate stabilization.
- Measures should be adopted to protect middle-class families and manufacturing companies from any price increases that may result from liquefied natural gas, or LNG, exports.

This report covers some background information about natural gas and climate stabilization and articulates detailed policy proposals that meet the above principles.

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