The Role of Natural Gas in America’s Energy Mix

Our nation’s top energy priority must be the rapid expansion of energy efficiency and renewable energy resources. These are the quickest, cleanest, and most sustainable solutions to meeting our energy needs, while curbing global warming and other serious pollution problems. As we work to increase renewable and more efficient energy, however, more damaging energy sources—including fossil fuels such as coal and natural gas—will continue to play a role in our energy mix. Because power plants burning natural gas produce less air pollution than coal-burning plants, in the near term natural gas can actually serve to diminish a number of public health threats caused by generating electricity. To achieve this, though, sound policies must be in place to make certain that natural gas is used to replace coal and minimize methane emissions—a potent global warming pollutant—and does not displace investments in energy efficiency and renewable energy sources, such as wind and solar. As long as natural gas is part of our energy mix, the Natural Resources Defense Council (NRDC) will continue to demand improved safeguards for its development, and make it a priority to advocate for a truly clean energy future based on renewable energy sources and efficiency.

HOW MUCH NATURAL GAS DOES THE UNITED STATES USE, HOW DO WE USE IT, AND WHERE DOES IT COME FROM?

According to the U.S. Department of Energy’s Energy Information Administration (EIA), the United States consumed approximately 24 trillion cubic feet (TCF) of natural gas in 2010. Most natural gas is used to produce electricity (30 percent), for industrial uses (32 percent), and to heat commercial and residential buildings (34 percent). About 89 percent of this natural gas was produced domestically with the remaining 11 percent being imported, chiefly from Canada. To see the projected changes in the amount and sources of domestic natural gas through 2035, see the EIA chart U.S. Natural Gas Supply, 1990 to 2035 (figure 1).

In order to expand natural gas production across the nation, the oil and gas industry is using new, controversial hydraulic fracturing (“fracking”) techniques, a technology that makes it easier to extract gas from previously inaccessible sites, including shale formations, tight sands, and other unconventional gas plays. This technique involves mixing dangerous chemicals with large quantities of water and sand and injecting it into wells at extremely high pressure.

Over the last decade, the industry has drilled tens of thousands of new wells in the Rocky Mountain region, in the South, and in the eastern United States. In the East, the latest hotbed of activity, the focus has been on a massive 600-mile-long rock formation called the Marcellus Shale, which stretches from West Virginia, to Ohio and Pennsylvania, to New York State.
IS NATURAL GAS A CLEAN FUEL?

No, natural gas is not a clean fuel because it is a fossil fuel and not a single fossil fuel can be called clean. The extraction and production of all fossil fuels—including natural gas, coal, and oil—produces a range of negative environmental and public health impacts (please see http://www.nrdc.org/energy/frackingrisks.asp). As noted earlier, natural gas is a cleaner burning fuel than coal, meaning that when natural gas is burned at a power plant to generate electricity for our homes and businesses, it emits far less carbon dioxide pollution than coal burned at a power plant—as well as far less mercury, acid rain, fine soot, and other forms of air pollution. For instance, coal-burning power plants today produce over half of the nation’s human-caused mercury emissions, while natural gas power plants produce almost none. That is an important public health and environmental advantage. But the production of natural gas, including its extraction process and transport to power plants, can result in various environmental and public health impacts, many of which are preventable (please see http://www.nrdc.org/energy/frackingrisks.asp). That is unacceptable.

CAN NATURAL GAS HELP CURB CLIMATE CHANGE?

Yes, but we can only ensure this result with stricter standards. Also, in order to fully assess natural gas’ contribution to climate change, we need much better data about methane emission rates from its development under current production practices. As of now, we know that burning natural gas rather than coal to produce electricity creates much less carbon dioxide. We also know, however, that there are substantial methane emissions from its extraction, as well as from leaky equipment and pipes that transport natural gas. The good news is that while we are not certain as to exactly how much methane is emitted during these processes, we do know how to reduce this pollution. This is significant because, pound-for-pound, methane is a much more powerful heat-trapping pollutant than carbon dioxide. And, fortunately, significant efforts are underway at the U.S. Environmental Protection Agency (EPA) and in the academic and private sectors to improve our knowledge of the rate of methane emissions from burning natural gas, in part through companies’ new obligations to report these emissions under the Clean Air Act. This means we will have more accurate data in the years to come.

We do not need to wait for better data on current emissions before putting stronger safeguards in place to protect against the full array of harmful impacts from inadequately regulated natural gas production, including requirements for the use of best practices to minimize releases of methane and other contaminants. As documented by the EPA's Natural Gas Star program, there are proven, cost-effective technologies and practices that improve the operational efficiency of natural gas production and reduce methane emissions at the same time. Less methane leakage translates into not only less heat-trapping pollution, but also more natural gas to sell, meaning that tightening up the production process can actually be profitable. Fortunately, some companies are already adopting these practices. The rest of the industry should be required to follow suit.

The ready availability of techniques to cut heat-trapping emissions upstream from natural gas power plants is a key difference from new investments in coal power plants. Building a conventional coal plant locks in high pollution loads for decades. By contrast, the emissions from natural gas...
gas can be cut substantially at any time by cutting upstream emissions—something that can and must be done without delay. In the longer run, carbon dioxide emissions from natural gas power plants must also be reduced, either by phasing these plants out in favor of renewable energy sources, or by capturing the carbon dioxide they produce and disposing of it in secure underground rock formations.

As quickly as possible, we need to move away from fossil fuels altogether and replace them with energy efficiency and renewable energy resources such as wind and solar that cannot leak, spill, pollute the air or water, or run out. For now, natural gas will continue to play a role in our energy mix and that is why it is so crucial for the industry to clean up its act.

DOES NATURAL GAS HAVE A ROLE TO PLAY IN TRANSPORTATION?

Yes, but only in limited applications. Given the environmental and public health impacts of natural gas production, and the availability of other alternative fuels that may be just as efficient and clean, if not more so, natural gas vehicles should be used only in settings where they will produce real clean air benefits. Overall, the best policy is to set strong vehicle efficiency and emissions standards and let all forms of alternative fuels compete to meet them.

Today natural gas fuels thousands of transit and school buses, sanitation trucks, and other vehicles while creating less pollution than combustion of gasoline or diesel fuels in similar vehicles. But overall, there is no one-size-fits-all best vehicle fuel choice.

Natural gas can be used in vehicles in two ways. Electricity from natural gas power plants can be used to power electric vehicles. Natural gas can also be used directly as a vehicle fuel. Generally speaking, driving on electricity produced by natural gas power plants is more efficient and cleaner than putting natural gas directly into vehicle engines. For the same amount of natural gas, plug-in electric vehicles (charged from a natural gas-fired power plant) can travel about 20 percent further—displacing more oil—and can cut three times more carbon dioxide pollution than natural gas vehicles. However, using natural gas directly as a vehicle fuel can be environmentally preferable in regions when using electricity is not an option, or where the power used to charge plug-in electric vehicles comes from older, inefficient coal-burning power plants.

Similarly, there is a new fleet of more advanced, cleaner, and efficient vehicles that use a range of fuels, with no categorical winner among the new natural gas, gasoline, and diesel vehicles. For example, the natural gas fueled-Honda Civic is certified as one of the cleanest and most efficient vehicles on the road today. In the truck and bus market, new high-pressure, direct injection natural gas engines have the potential to provide diesel-like fuel efficiency and provide 15 percent to 20 percent lower carbon emissions than a comparable diesel engine. However, there are many other kinds of efficient vehicles entering the car, truck, and bus markets that use a range of fuels—including advanced gasoline, diesel, plug-in and conventional hybrids, and battery electrics. Some of these vehicles will be as efficient, if not more efficient, than natural gas vehicles.

ARE WE MAKING PROGRESS IN USING NATURAL GAS MORE EFFICIENTLY?

Yes, we are using natural gas to heat our homes and businesses much more efficiently than we did in the past, but we still have a long way to go to achieve all possible cost-effective efficiency improvements. Efficiency is important because it allows us to achieve the same level of comfort in our buildings using significantly less natural gas.

Recognizing that all forms of electricity generation have negative environmental impacts—especially coal, nuclear, and natural gas—it is critical that we use all fuels in the most efficient manner possible. NRDC has a 30-year history of finding innovative approaches to develop affordable ways to get more work out of less natural gas and electricity usage. We pioneered a strategy of coordinating efficiency standards with financial incentives that has repeatedly resulted in utility systems finding investments in energy efficiency to be a cost-effective alternative to new natural gas and electricity resources. As a result, the average U.S. household uses a third less natural gas today than it did in 1980, and many gas-fired appliances are more than twice as efficient as their predecessors. For example, thanks to federal efficiency standards issued by the U.S. Department of Energy in 2011 for natural gas home furnaces, the United States will save enough gas through 2045 to heat all the homes in New York State for more than 11 years.

We are building on this success by advocating for all cost-effective opportunities to improve the efficiency of natural gas.
gas use throughout the U.S. economy. Since 2004, NRDC has worked with regulators and a range of stakeholders, including the American Gas Association (AGA) to advance energy efficiency by removing linkages tying utilities’ financial health to increased natural gas consumption in homes and businesses. As a result, in more than a dozen states, regulations are now in place that remove perverse economic incentives for utilities to favor natural gas over on-site renewable energy and increased energy efficiency. NRDC is also working with AGA, consumer groups, and states on policies to accelerate the gas industry’s energy efficiency investments and upgrade efficiency standards for buildings and appliances.

In sum, substantial progress has been made, but more cost-effective opportunities to improve the efficiency of natural gas use throughout the U.S. economy remain.

NRDC is also working to improve the efficiency of gas-powered electricity generation and seize opportunities to use waste heat from electricity production to reduce energy needs in other sectors. NRDC is also working to establish carbon pollution standards for all power plants. The first such standards were set by California as part of the permit for a new natural gas power plant being built in Hayward, California, with the support of the plant’s owner. NRDC is working to require all fossil fuel generation to meet such standards.

HOW DOES NATURAL GAS INTERACT WITH RENEWABLE ENERGY?

Natural gas and renewable technologies interact in ways that can be both complementary and competitive. To scale up renewable energy technologies, we need strong federal and state policies in place to support the deployment of sustainably sited renewable energy sources and to create a level playing field with other dirtier forms of electricity generation by regulating carbon pollution.

As the nation continues to build up renewable energy sources, natural gas can play a supportive role by providing a backup for renewable energy generation. Natural gas is an important source of operational flexibility on the grid, meaning that natural gas plants can quickly respond to signals in the market to smooth out load and help meet demand, given that the output from renewable energy sources can vary. Natural gas plants are one of a number of ways to help integrate scaled up renewable energy sources into our electricity system, helping us to get a larger fraction of our electricity from renewable energy like wind and solar.

Additionally, natural gas and renewable energy investment profiles are complementary, which assists in their co-investment. Renewable energy sources typically have higher up-front capital requirements and low operational costs, while natural gas generation is not as expensive initially but has higher, fuel-related operational costs. Finally, both technologies can potentially benefit from policies that seek to reduce carbon emissions.

However, natural gas is a competitor as well. Low natural gas prices increase the cost differential of renewable energy, making it harder for renewable energy projects to secure financing and compete with natural gas. Federal and state policies that promote the deployment of renewable energy and reduce the cost of renewable technologies, as well as policies that regulate heat-trapping pollution, will help to ensure that renewable energy can reach its full potential in the United States as quickly as possible and that natural gas does not displace renewable energy sources.

ESTABLISHING STRONGER SAFEGUARDS AND CLEANER ENERGY

Our nation’s top energy priorities should be energy efficiency and renewable energy, rather than gas, coal, oil, or nuclear power. Energy efficiency and renewable energy sources are the fastest, cheapest, and cleanest solutions to climate change and other pollution problems, and provide sustainable energy sources that can power our nation into the future.

As we work to build up these clean energy resources, natural gas will continue to play a role in our energy mix. That is why it is critical to put strong safeguards in place to ensure that any natural gas development occurs as safely as possible. For more information, please see: http://www.nrdc.org/energy/frackingrisks.asp.