Natural Gas Is Repeating Coal's Mistakes

Joseph Daniel

There was a time—not that long ago—when coal was king.

COAL AS AN EXAMPLE

Coal benefited from a lack of regulation, generous federal subsidies, and no organized public opposition. These conditions made coal the most financially attractive resource for electric utilities. But that all changed. Public opposition to coal became organized and regulations began to force industry to internalize some of the worst externalities caused by coal. Shifts in energy policy and fuel prices sent signals to the energy market to look for alternatives. Coal consumption has dropped 35 percent in the past 10 years, and coal companies went from being king to being bankrupt.

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Today, there are no serious proposals to build new, large coal plants in the United States, and for good reason. Not only are the economics no longer favoring coal, but the environmental and health impacts of coal make it a resource that is met with extreme (and merited) public opposition.

There was, of course, a transition period between these two times, when coal went from primacy toward its fall from grace. In the interim, in some circumstances, coal was cheaper, and in others, natural gas was cheaper. Natural gas is now in a similar transition period, with renewables presenting as the cheaper alternative in many circumstances, and likely to be the cheaper alternative in all circumstances in the not-too-distant future.

Many in the industry expect gas fuel prices to increase at the same time that wind and solar costs decrease. Recognizing the human health and environmental impacts of under-regulated natural gas production and transportation, states are passing laws making natural gas expensive at the same time that states are making it easier and more affordable to developers of wind and solar.[1] Wind and solar are quickly becoming universally cheaper alternatives to natural gas, and the industry will eventually find itself in the same place coal does today.

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Coal lost the battle for being the dominant source of electricity on two fronts: economics and public opinion. The delivered cost of coal has increased while the costs of natural gas, wind, solar, and energy efficiency have decreased. The same economic conditions that

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indicated coal's decline a decade ago now exist for gas.

In 2010, the Clean Air Task Force calculated the human health impacts of only a subset of the coal fleet to be nearly $100 billion a year.[2] These health impacts created legal justification for regulation and eroded public support for coal while simultaneously reinforcing public support for clean energy. Public health concerns and public opinion resulted in new regulations, which further hurt the economics of coal.

The environmental impact of natural gas, too, is spurring public opposition in the same way it did for coal. Multiple states have already banned natural gas production using hydraulic fracking or placed a moratorium on the practice until more information is available. As mentioned earlier, there are already state legislative bodies that have taken actions that make natural gas more expensive, and support for these types of policies is likely to get stronger, not weaker, in the future. All of this will inevitably catch up with natural gas, and the industry should start anticipating a suite of state and eventually federal regulations aimed at reining in gas's impact on the environment and public health.

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Worst of all for coal was that these two forces were self-perpetuating. The worse the economics became, the broader the coalition against coal became. This, in concert with the irrevocable harm coal imposes on human health, made it easier to push for regulations against coal, which hurt the economics, restarting the cycle all over again.

ECONOMICS

Path to Oversupply

Until recently, economic growth and electric demand growth were strongly linked. However, over the past five years, the US GDP has steadily grown by at least 1.5 percent per year, while load growth has ranged from –1.3 percent to 0.7 percent. Now, our economy is significantly more efficient and grows more efficient each year, resulting in flat to declining load in most parts of the country. Stagnant load means that utilities don't need to build as much new generation capacity as was once thought, but that hasn't stopped them from trying.

Natural gas developers should be wary that the industry's infrastructure planning is not well-coordinated and often relies on overly ambitious load forecasts. Not too long ago, electric utilities often assumed demand forecasts around 2.0 percent annual growth per year, but now zero to 1.0 percent is the new normal. Meanwhile, gas pipeline studies often rely on increasing demand to justify capital expenditures. They largely point to growth within the electric sector as the source of new natural gas demand. The electric sector made unnecessary investments based on unrealistic projections of demand, and now the natural gas midstream industry is making the same mistakes.

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The electric sector currently has about 500 gigawatts of natural gas already installed across the country. Over 30 more gigawatts are currently under construction, and another 100-plus gigawatts of capacity are being planned.[3] This far exceeds reasonable estimates of what will actually be needed to meet demand.

The Energy Information Administration's (EIA's) *Planned Additions* has proven to be an accurate predictor of what actually gets built. While the specific, individual units being tracked through EIA data may or may not end up being built, the amount of capacity, in aggregate, the data has proven an accurate predictor of what gets built. Based on the past eight years of data on proposed additions, the EIA tends to overestimate the amount of gas capacity by 13 percent on the year ahead, but only 7 percent over actual on a four-year cumulative basis.

Based on the EIA's 2016 *Planned Additions*, it is unlikely that much more than 50 gigawatts

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of gas will be built over the next four or five years. If we assume that most of what is currently under construction will be built, only a small fraction (about 20 percent) of what is still in development will ever become operational. Therefore, most units in development will never generate a single dollar of revenue for the developers and leave the developers stranded with piles of debt. This forecast of how much natural gas is likely to be built also exceeds the amount of natural gas the electric industry needs, which means the industry will be overbuilt with natural gas power plants. This could suppress energy and capacity markets, making it impossible for the owners of those assets that do get built to recover the investment, while simultaneously making the industry overexposed to natural gas price volatility.

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In order to support this rapid expansion of natural gas power plants, the midstream gas industry would have to spend hundreds of billions of dollars building gathering pipelines, compressors, cross-state transmission lines, spur lines, and storage facilities. Oversupply and diminishing demand will lead to a glut, suppressing revenues and cutting into the profits developers used to justify these projects. When these assets go unused, it will be impossible for developers to recoup expenses.

Risky Endeavor

Simply put, investing in natural gas infrastructure is not a smart business strategy.

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For one, this infrastructure comes with incredible downside risk. As noted earlier, about 20 percent of projects still in the development phase are likely to be built in the next four years, which means the initial financing costs may never be recouped. Those that do become operational will face falling demand and declining prices.

Pipeline project endeavors are even riskier. Most project debt is taken on when construction begins. Thus, losses are kept to a minimum when plants or pipelines are stopped prior to construction. However, for pipelines, increasing opposition has delayed and even stopped pipelines after their construction has begun, costing investors millions of dollars.

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Coal lost its economic grip to gas, and now gas is losing its grip to clean energy. If a gas plant or pipeline isn't capable of being economically competitive for 20, 30, or 40 years, those financially invested in the project could end up losing money. When natural gas prices are low, the gas plants might operate, but when gas prices spike or rise over time, natural gas can't compete. Renewables, on the other hand, are procured through long-term energy contracts called power purchase agreements (PPAs). These agreements are locked in for decades and provide guaranteed revenues for wind and solar developers.

Many states reached historical peak demand years ago. Energy efficiency and demand-side resources like rooftop solar are forcing forecasters to refine their assumptions. While many utilities have made strides to improve demand forecasts, most still assume that loads will continue to grow at rates near past levels.

There are a number of reasons why this happens: not accounting for utility energy efficiency programs, underestimating the amount of rooftop solar, or just making overly ambitious assumptions.

Yet lower-than-expected demand paired with more-than-expected available capacity yields revenues far below expectations. This is not a far-fetched fantasy; it has already become a reality, for instance, in Texas, where the system operator, ERCOT, has long pro-

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jected need for new peaking resources to meet load growth that has never actually come to fruition. There are a number of reasons why this happens: not accounting for utility energy efficiency programs, underestimating the amount of rooftop solar, or just making overly ambitious assumptions about the impact of economic growth on demand.

Regardless, industry projections led merchant generators to build new capacity. Merchant generators' revenues were so far below expectations that one generator, Panda Energy, has taken to suing ERCOT over its projections. It is widely believed that many independent power providers in Texas are not able to cover their costs, and that they are forced to rely on their cash reserves to keep them operating. The hope is that utilities with less robust balance sheets won't be able to stay in the market and the oversupply issue will correct itself. Essentially, these companies are playing a game of balance-sheet chicken.

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To be sure, oversupply in the electric sector is an enduring problem, but the problem of oversupply in gas midstream infrastructure could quickly become far worse. The industry is poised to spend about a half a trillion dollars based on an assumption that the electric sector will once again experience robust growth. But that simply isn't the case. Gas industry forecasts that make such suggestions are then used as justification to build infrastructure, despite the underlying assumptions being deeply flawed.

In general, gas use for home heating is declining,[4] leaving electricity as the primary source of new demand for gas midstream infrastructure. But even that new demand will be, at best, temporary, as there are better alternatives to gas (discussed later). As better electric-sector alternatives continue to gain prominence, gas use will decline, reducing needs for both volume and capacity of gas.

A Better Alternative

Modern financial instruments make it possible to profit off of virtually anything, but not all investment opportunities are created equal.

Capital investments should balance risk potential and reward potential. Risk can't be reduced to zero. Thus, certain levels of risk are acceptable if the potential upside reward outweighs those risks. Objectively, at this moment, investments in natural gas projects are high-risk, low-reward. Reduced project risk, reduced costs, and secured long-term contracts for revenues make renewables the far more attractive investment.

The biggest, most widely discussed risk with natural gas is the fact that it has and is expected to continue to experience significant fuel-price spikes. Fuel-price volatility is an inherent consequence of natural gas's inability to meet changing supply-and-demand needs. Supply bottlenecks can occur as far upstream as the gas-extraction phase or as far downstream as distribution system constraints. Price spikes and fluctuation are only compounded by general expectations for natural gas fuel costs to rise in the future.

Wind and solar are lower-risk in comparison to gas and would provide equal to greater returns to utilities and financiers. Project risk in particular is far lower with clean energy than with fossil fuels. Wind and solar projects' costs are well-known and well-defined. Delays for projects are less frequent and shorter than for their fossil-fuel counterparts. If a 500-megawatt gas turbine comes down for maintenance, the entire 500 megawatts are unavailable; with a wind farm, smaller, individual turbines can be worked on while the bulk of the farm still generates electricity.

Not only are renewables less risky, but they are less costly. One way to compare the relative cost of energy resources is the levelized cost of energy. The most recent studies on the levelized costs of energy demonstrate the same thing: wind and solar are cheaper than gas. Most low-end estimates of gas's levelized costs are about $50 per megawatt-hour; meanwhile, the high-end estimates of utility-scale solar are about $50 per megawatt-hour—suggesting that in many places new solar resources are already cheaper than new gas resources. And compared to wind, where prices are as low as the teens, gas looks even worse today.

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The economic outlook of natural gas is only going to look worse as renewable energy economics gets better. The cost to install a megawatt of wind is coming down while the performance of those turbines is going up, which will continue to drive leveled costs of wind down. The cost to install energy efficiency keeps improving and will exacerbate oversupply issues. All of this will lead to a continuing suppression of market prices.

And renewables, unlike gas, are usually procured through long-term PPAs, meaning that the developers of clean energy actually have secured a long-term revenue stream.

PUBLIC OPINION

Gas Is Not Green

Natural gas is—in some ways—like Olestra, the synthetic fat alternative that gained popularity as a substitute because it did not increase the amount of fat or calories in the foods it was added to. However, as the product became more frequently used, the health benefits were called into question and the potential side effects became alarming. Regulators in some countries even went so far as to ban the use of the product as a food additive.

Similarly, natural gas did, at one point, seem like an environmentally friendly alternative to coal. Its stack emissions were lower than coal, it contains negligible amounts of mercury, and production doesn't require the removal of mountaintops. However, the more we learn about natural gas, the clearer it becomes that natural gas is not as environmentally friendly as once thought.

Even the claim that natural gas is comparatively advantageous to its counterpart, coal, is increasingly difficult to support with new scientific studies coming out that call into question the validity of such "benefits." There can no longer be any doubt that the extraction, transportation, and combustion of natural gas have tremendously negative impacts on the natural environment, climate, and public health. Techniques commonly used to produce natural gas have been linked to methane leaks, earthquakes, and water contamination.

A major concern of natural gas—and Olestra, for that matter—is leakage. Natural gas is nearly entirely composed of methane, and that methane easily leaks out during the production, transportation, and distribution of natural gas. While there are technical and policy mechanisms to reduce these methane leaks, there is no way to prevent them outright. Methane is a powerful global warming gas, far more potent than carbon dioxide. Depending on the timescale being considered and depending on the methane leakage from natural gas, natural gas may be just as impactful on climate change as coal.

Report after report reveals more public health and public interest concerns associated with hydraulic fracturing. Scientific consensus is honing in on a singular conclusion that fracking can result in the contamination of groundwater and may cause earthquakes. Public opinion ultimately led to some countries banning Olestra; similarly, mounting public opinion against fracking has led to states banning the practice and many states considering such bans. Even if you deny the danger natural gas clearly poses, the power of public opinion is a dangerous thing to ignore.

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The market does not internalize many environmental costs, but that doesn't mean that environmental concerns shouldn't translate into investor concerns. Just the opposite: corporations that were heavily invested in coal often ignored the environmental impact of coal and therefore were ill-prepared to deal with its inevitable decline. These organizations operated with blinders on; focused only on providing a single type of service (electricity), they were unable to see the changing landscape of their industry.

The human health impact of coal became so great that the government had to intervene and enact regulations to protect citizens. Had the industry taken stock of the harm they were causing, they could have solved for it more quickly, and avoided barreling into myriad bankruptcies. However, the corporate tunnel-vision focus on near-term profits and familiar technologies blinded them to the downside of business decisions.

Costly for Consumers

Most utilities realize that natural gas is risky, which is why they try to shift the risk onto captive customers.

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By putting natural gas power plants and the pipelines into the rate base, utilities pass these risks to consumers. When gas and electric utilities invest in natural gas infrastructure, it is the captive consumer who ends up paying the price at the end of the day. Hundreds of billions of dollars in capital costs nationwide are eventually recovered through utility bills.

But consumers are hit again, when electric generators burn the natural gas as fuel and pass through those costs to consumers. Maintaining lower customer bills has been part of the regulated utilities' objective for decades. This goal has also been part of the narrative from proponents of deregulation and market expansion.

Thus, regardless of regulatory status, all utilities are supposedly trying to maintain the lowest overall system costs, an objective achieved by accounting for the long-run capital and operating costs of resources over the lifetime of those resources. Recalling that the levelized cost of clean energy is lower than natural gas is the strongest suggestive evidence that utilities seeking to maintain lower customer bills should be procuring clean energy over natural gas.

If, over the long run, solar costs are $50 per megawatt-hour (nearly all associated with upfront capital) and gas generation is $55 per megawatt-hour (about 70 percent of which is fuel cost), then the utility investing in solar will see a higher return on their investment and lower costs for their customers.

Most importantly, the majority of customers want clean energy. They don't want their rivers to be polluted, they want air they can breathe, and they want their children to enjoy the same outdoor experiences they did. And they will support those companies pursuing clean energy. That preference is why nonutilities are procuring so much clean energy. Profit-driven companies like Google, Wal-Mart, and Amazon are all dedicated to self-imposed clean energy standards.

If utilities don't offer clean energy to their customers, the customers will find ways to procure it on their own.

HISTORY REPEATING ITSELF

Companies heavily reliant on coal are now in desperate need of increased subsidies, government handouts, and regulatory exemptions. The best the industry can hope to do is maintain its current levels of production, which are almost 40 percent below peak production. Even if the companies manage to accomplish that feat, it will be short-lived.

By not anticipating the inevitability of the changing industry landscape in the past, some utilities doubled down on bad bets, notably by further investing in coal plants when transitioning away from coal would have been more prudent. Coal-mining companies laid off workers and took on debt to expand coal operations at a time when they should have been diversifying the company's portfolio. Unwilling to recognize that today's political environment is a poor indicator of long-term regulatory climate, myopic companies are now facing stranded asset costs, unfavorable public opinion, bankruptcy, and an uncertain future.

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Companies like certainty, and to that end, renewables can provide them with far more certainty than natural gas. While renewables have a steady, reliable stream of income, gas power plants have to bet that gas prices will remain low enough to compete in the marketplace. Renewables are already competitive, and their ability to deliver a win-win for consumers and industry will only grow.

NOTES

1. State policies making natural gas expensive include: California's AB32, Massachusetts Global Warming Solutions Act, the Regional Greenhouse Gas Initiative, state fracking bans in New York and Vermont, and proposed bans in other states and proposed bans at the local level.
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