Preface

"History does not repeat itself, but it does rhyme."
—Attributed to Mark Twain

How many times in the past fifteen years has conventional wisdom been turned on its head? In the last two years of the 1990s, financial commentators and accepted experts across America touted the virtues of technology shares, only to see the internet/technology market implode. More recently, conventional wisdom held that "housing was the best investment a family could make" and that one "should buy all the house possible," since housing prices had not gone down since the Great Depression. At the height of the housing boom, David Lereah, the Chief Economist for the National Association of Realtors, discussed the virtues of owning real estate in his 2006 book *Why the Real Estate Boom Will Not Bust and How You Can Profit From It*.[1] To be fair, Mr. Lereah had plenty of company in getting the housing debacle terribly wrong. In March 2007, Federal Reserve Chairman Ben Bernanke testified before Congress that, "the impact on the broader economy and financial markets of the problems in the subprime markets seems likely to be contained."[2] For someone with superior access to information about our economy and banking system, it is beyond me how Mr. Bernanke could have found the excess leverage and subprime activity to be "contained," when it nearly crashed the world's financial system later that same year.

But surely the experts will not be wrong about the United States' supplies of natural gas—right? Surely—just as we all "knew" that real estate was the be-all, end-all of investments—we now "know" that America really does have a hundred-year supply of natural gas. Surely the industry professionals and government officials who are promoting accelerated use of natural gas as a bridge fuel are relying upon facts?

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In reality, the facts—simple facts—do not support the thesis that the US has anywhere close to a hundred-year supply of natural gas. After reviewing America's sources of natural gas supply for more than three years, it is quite clear to me that various groups have vastly overestimated our country's likely natural gas reserves and potential resources. More importantly, America is nearly certain to experience a severe deliverability crisis between 2013 and 2015, due to the natural gas industry's inability to balance supply with growing demand. And when natural gas runs out, America shuts down. We depend on natural gas to produce fertilizer for the majority of food we eat, to heat 51 percent of our homes and to generate 31 percent of our electricity.[3] In other words, without adequate natural gas supplies, the quality of life we have enjoyed for decades falls off a cliff.

So what can we do? The good news is there is lots we can do to mitigate the impact of the coming decline in US natural gas supplies. But before any solutions are put in place, much of today's conventional wisdom about natural gas, its supply and its deliverability will have to be discredited. In this book I will review the history of the natural gas crisis of the 1970s and why it is relevant to the coming crisis; provide a realistic assessment of America's natural gas supply/demand balance, including a detailed review of all of our country's major sources of supply; and suggest solutions to mitigate the effects of the coming natural gas crisis that quietly lurks over the horizon.

The past five years have provided an excellent example of the boom-bust cycle that has forever plagued the natural gas industry. Take the 2008 surge in drilling, for example, which was an attempt to mitigate rising natural gas prices. As a result of this huge drilling increase, America was left with a glut of natural gas supply. Couple this increased supply with the sudden global economic meltdown and recession, which made buyers scarce (no one was buying anything they didn't have to), and prices for natural gas plummeted as producers were forced to offload gas into a weak market. It has taken four years, and a large reduction in natural gas-directed drilling, to return US natural gas storage to more historical levels. Meanwhile, persistently low natural gas prices, at a time of rebounding oil and other commodity prices, have given rise to the

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widespread, and totally incorrect, belief that the supply outlook for natural gas has changed in a fundamental way. Much of this misconception can be attributed to the idea that advances in technology—specifically, horizontal drilling and hydraulic fracturing—will unlock decades worth of supplies from previously unavailable shale deposits. And, while it is true that shale gas is and will continue to be an important source of supply, the simple fact is that it will have a far smaller impact on future supplies than many energy pundits would have you believe. In fact, the erroneous conviction that advances in technology will keep natural gas cheap and available for the foreseeable future is certain to make the fallout from the coming natural gas deliverability crisis far more severe than it would be if we were prepared for the inevitable.

Another factor that will exacerbate the coming crisis is the misplaced belief that higher natural gas prices always lead to increased production. While it is correct that, in general, higher prices tend to lead to increased supplies, it is also—always—true that hard geological limits always trump squishy economic rules. For example, in 1970—a time of single-digit oil prices—the Cook Inlet area of southern Alaska produced approximately 230,000 barrels of oil per day (bop/d); now, it produces approximately 11,000 bop/d.[4] Despite all the advances in seismic and drilling technologies and the triple-digit oil prices of recent years, the truth is that southern Alaska has likely reached its geological limit for oil production. Similarly, there is strong evidence, which I will provide in Part Three, that the next surge in natural gas prices will not increase supplies, as the entire US has likely reached its geological limit for gas production.

Over the past fifteen years, industry leaders and policy makers have repeatedly identified natural gas as a clean-burning alternative to coal and oil, touted it as a significant source of American jobs and suggested that we find new uses for this supposedly abundant resource. I find several flaws with this line of thinking. First, natural gas is a finite and depleting commodity. It cannot be planted in the spring and harvested in the fall. Second, the US is an increasingly mature hydrocarbon-producing region and, to the surprise of many, continues to rely on imports for a portion of its annual natural gas supply.[5] I find it exceptionally poor

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economic reasoning to encourage the increased usage of a commodity when current demand cannot be met by domestic supplies.

Unlike believers in the myth that America has a hundred-year supply of natural gas, I am far less sanguine on the outlook for natural gas production. Domestic oil production peaked in 1970–71 and marketed US natural gas production reached a pre-2011 peak in 1973, at 22.65 trillion cubic feet (tcf).[6] While the date of US peak oil production is not in dispute, many industry executives and policymakers believe that the upturn in gas production that began in 2008 is only a harbinger of the bright future of US domestic natural gas deliverability. I disagree. I do not believe the all-time 2011 peak for marketed gas production will ever be materially exceeded, due to the advanced maturity of the majority of America's conventional natural gas fields and limited future shale gas production growth.

How this book is organized

I have divided this book into four parts. In Part One, I will provide a brief history of the US natural gas market and its regulation. I will pay special attention to the gas crisis of the 1970s, the nation's first. Prior to the deregulation of the natural gas market that began in 1978, Washington D.C. bureaucrats set natural gas prices using a byzantine system. I will discuss how these price controls led to severe and long-lasting market imbalances. I will also detail the economic and personal fallout from curtailments of natural gas that occurred in virtually every region of the country. As a result of gas supplies that could not meet demand in the 1970s, businesses lost profits and closed facilities, municipalities closed schools and homeowners watched helplessly as their heating bills skyrocketed. Finally in Part One, I will examine the hundred-year supply myth and how a handful of shale gas promoters have grossly distorted the potential impact of shale gas on America's future supply.

In Part Two, I will review the major sources of domestic demand for natural gas. The major driver of demand since the mid-1990s—similar to the period leading up to the natural gas crisis of the 1970s—has been the building boom of natural gas-fired power plants. Increased consumption of natural gas by the electricity generation sector has made US de-

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mand more inelastic than at any point in history. Some of this increased demand has been offset by declining consumption from manufacturers—such as the chemical and fertilizer industries—that have relocated to foreign jurisdictions with lower natural gas prices and labor costs. Apart from the workers in these industries, who have had to find other means of employment, US consumers had the best of both worlds: no local pollution and cheap prices for the products that they consumed during America's recently ended twenty-year shopping spree. However, I see the multi-decade trend of off-shoring industrial production reversing, since triple-digit oil prices and overseas wage inflation are translating into rapidly rising import prices. In other words, the world is about to get a lot less flat in the very near future. Lastly in Part Two, I will briefly discuss the state of the natural gas vehicle (NGV) market in the US and the likelihood of increased demand for natural gas from the transportation sector.

Part Three will review the sources of US natural gas supply. I will focus on the major sources of US production, both conventional and unconventional, and their deliverability potential. To provide as granular a view as possible of US production, I will cover five of the major gas-producing states and the Gulf of Mexico in substantial detail using historical production data. The environmental concerns surrounding hydraulic fracturing will be reviewed in Part Three.

The importance of liquefied natural gas (LNG) to America's overall supply will be examined in this section. Despite the building of numerous re-gasification facilities and the expansion of America's four legacy terminals, there is mounting evidence that growth in LNG imports will be extremely difficult, maybe even impossible. In Part Three, I will also discuss the importance of Canadian natural gas exports to the US market. A very mature Western Canadian Sedimentary Basin (WCSB) and the slow development of new discoveries, such as the Horn River Basin, will end the era of cheap Canadian supply.

In the final part of the book, I will provide suggestions to help reverse the coming crisis and increase transparency in the natural gas market. I will provide numerous solutions that will reduce our dependence on natural gas. Finally in Part Four, I will examine the faulty data

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collection methods of the US Department of Energy's Energy Information Agency (EIA) and how the agency has consistently overstated the importance of shale gas.

The US must embrace increased efficiency, conservation and renewables immediately or untold and irreversible damage will be done to our economy. We simply have no other choice. America's natural gas resources are far less than many industry leaders and policymakers would like you to believe and natural gas prices are headed far higher than previously thought possible. If America does not reduce its consumption of natural gas it will shortly find itself cold, hungry, unemployed and in the dark. Not a great way to go through life.

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