

CARBON POLICY

Petroleum and Natural Gas

On February 2, 2012, one of the most significant events in sixty-four years of American energy history was virtually ignored by the media, the public, and all but a small cadre of energy experts and policymakers. The Department of Energy reported that not since 1949 had the United States exported more refined energy products—gasoline, heating oil, and diesel fuel—than it had imported.¹ And this, moreover, occurred in a remarkable year when US petroleum exports exceeded imports for the first time since 1989.² These and similar data seemed prophetic to many energy experts, policymakers, and stakeholders: a gateway on the road to a new American “energy independence” had been passed. Others weren’t so sure.

AN ERA OF TRANSFORMATION

Few eras in US energy history since 1970 have been more surprising or unexpected than the remarkable transformation in the status of US petroleum and natural gas supplies that began shortly before Barack Obama’s presidency and is now predicted to prevail well beyond 2030. The primary responsibility for these transformations cannot be claimed by the White House, Congress, nor the major political parties. Rather, these transformations result from a mix of technological innovation, increasing energy efficiency, changes in the domestic and global energy economies, and increased petroleum imports from Canada. Riding this

wave of change in the domestic energy economy are increasing predictions of a growing energy independence that will fortify future national security.

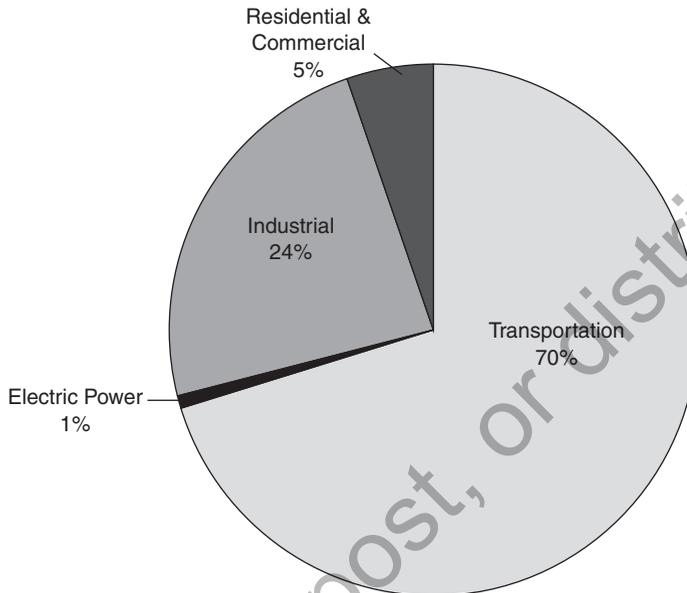
Predictions about future energy conditions and their security implications, however, always depend upon assumptions about the future of the domestic and global energy economies, about frequently uncertain environmental and political events, and about the reliability of emerging technologies. Despite encouraging energy data and optimistic predictions of many experts, the future impact of recent transformations in domestic petroleum and natural gas status remains uncertain in many respects. Even as the new era of petroleum and natural gas development was apparently arriving, for example, a former high official in the Obama administration was warning about America's continuing vulnerability to a global energy economy in which the United States is only one participant. "We have allowed ourselves to be worked slowly into a very delicate position with this international oil market controlled largely by countries who are at best neutral toward the United States, at worst antagonistic," he said. "It's all so delicate that one little quiver here can shake the whole thing."³ In short, the United States never completely controls its own energy destiny.

PETROLEUM

Virtually all the petroleum, produced domestically or imported, ends in the gas tank of a light vehicle, bus, or truck. As Figure 3-1 indicates, about 70 percent of domestic petroleum consumption is created by the transportation sector. At the same time, domestic production of petroleum continues to grow with the boom in "fracking" technology, which is discussed later in the context of natural gas. By mid-2013, US oil production reached the highest level since January 1992, encouraging energy experts to expect more increases in the future.⁴

Growing Exports, Decreasing Imports

How recent has been the transformation in the US petroleum economy is evident in the changing status of petroleum imports and exports since 2000. In Figure 3-2, which illustrates the long-term trend in US petroleum imports and exports since 1990, the most important lines are

FIGURE 3-1**United States Petroleum Consumption by Sector, 2012**

Source: U.S. Department of Energy, *Total Energy: Monthly Energy Review*, Tables 3.7a, b, and c (March 28, 2012).

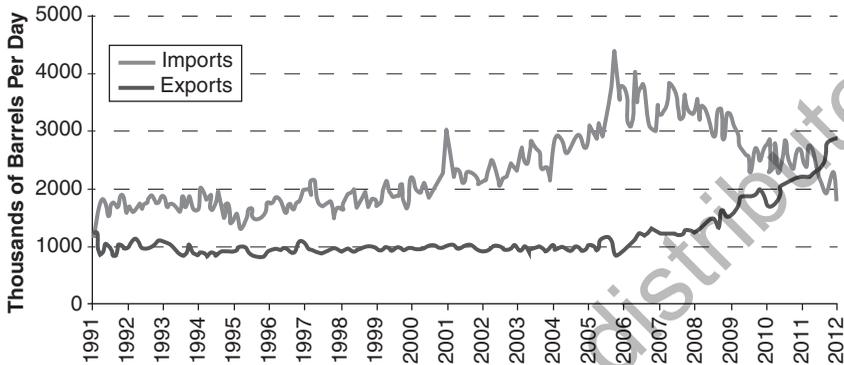
the sharply rising size of exports beginning about 2006 and the intersection of imports and exports in 2011, marking the first time since 1990 that the United States became a net exporter of petroleum products (which include other petroleum fuels besides gasoline).

A second important indicator of the rapidly changing petroleum economy, and a closely watched statistic for energy policymakers, is Figure 3-3 that reports the percentage of US petroleum consumption dependent on imported oil. The proportion of imported oil has been rapidly decreasing. In 2005, the nation imported 60.3 percent of its oil. In 2011, that figure was 40 percent and will likely drop further as domestic production continues to grow.⁵

Many factors have contributed to these changes. Since 2008, Americans have been driving less while auto energy efficiency has been increasing.

FIGURE 3-2

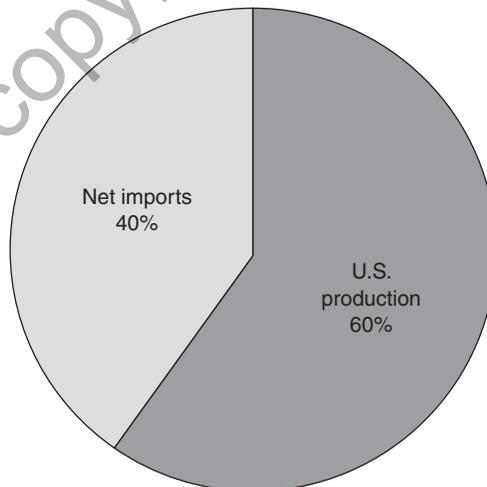
US Imports and Exports of Petroleum Products, 1991–2012



Source: Energy Information Agency. Presented by Morgan Housel, “3 Huge Recent Economic Developments You May Have Missed,” *The Motley Fool*, January 20, 2012, at www.fool.com/investing/general/2012/01/20/3-huge-recent-economic-developments-you-may-have-.aspx.

FIGURE 3-3

US Net Imports of Petroleum as a Proportion of All Domestic Petroleum Consumption, 2012



Source: U.S. Energy Information Administration, *Monthly Energy Review* (April 2013).

Ethanol, now required as an additive, has enlarged the domestic gasoline supply at a time when foreign demand for exported American gasoline has grown. Increased use of biofuels, ethanol, and diesel fuels continues. The severe recession beginning in 2008 has inhibited domestic petroleum consumption in most economic sectors. And fracking technology, soon to be discussed, is creating a surge in both petroleum and natural gas production.

The growing size of US domestic petroleum production has prompted the federal Energy Information Administration (EIA) to predict that by 2017, the United States will become the largest global petroleum producer, replacing both Saudi Arabia and Russia.⁶

Risks As Well As Rewards

Predictions about growing US energy independence sustained by a continually rising petroleum and natural gas production are safest when forecasters are nearsighted and fix their vision on an energy horizon confined to a decade or less. As predictions reach increasingly into the future, risks increase. Economic models commonly used to predict future domestic and global energy markets depend upon numerous assumptions concerning future domestic energy policy, technological change, global politics, and much else that may prove unpredictable. In 2000, for example, most energy experts were predicting a continuing decline in domestic petroleum production and increasing national security risks by heavy US dependence on imported Middle Eastern oil. Moreover, future political events can surprise all policymakers.

The US Energy Information Administration, among the most reliable and competent of America's important sources for energy information and energy modeling, has suggested a number of uncertainties that arise in making its current long-term energy forecasts. First, major global energy producers, such as Saudi Arabia and Russia, will continue to have significant influence in setting global petroleum prices, which can affect future demand for US petroleum abroad and the price of domestic oil. Additionally, domestic economic trends, such as a continuing recession, or sudden economic shocks from an unexpected source, such as international conflicts, can upset future energy scenarios. Federal energy

policies can also change. Finally, important current and anticipated future energy technologies may not develop as anticipated.⁷

The Politics

The federal government continues to exert its most potent influence on the domestic petroleum industry through taxes, tax subsidies, regulation of worker safety, and environmental impacts involved in energy production and consumption. Tax subsidies have been by far the most politically contested of all federal and state energy policies for more than five decades. The petroleum industry is among the most heavily subsidized of all domestic industries. Tax breaks at almost every stage of petroleum production have resulted in an effective tax rate estimated to be lower than virtually any other industry.⁸

Petroleum tax subsidies have been a favorite target of criticism by the Obama administration. The petroleum industry continues to fight fiercely and successfully to protect its presently generous tax subsidies. The Obama White House, moreover, has had to accept what every Democratic president has experienced since World War II: When it comes to petroleum subsidies, state loyalty trumps party loyalty among congressional Democrats. Oil-state Democrats seldom vote against the industry when subsidies are at stake.

The traditionally close ties between oil-state Democrats and the industry is testimony to the importance the oil producing states assume in America's energy governance. Petroleum and natural gas exploration has created geographically large and politically influential petroleum royalty dependencies throughout the American West, the Gulf of Mexico, the Atlantic coast, and Alaska. At the outset of the Obama administration, "Alabama, Louisiana, Mississippi, and Texas receive [d] 37.5 percent of the revenues collected by the federal government for offshore energy production," reported the Southeast Energy Alliance, and on-shore states "such as Colorado, Montana, New Mexico, and Wyoming receive 50 percent of the royalties collected for energy development on federal lands."⁹ The Alliance asserted that North Carolina, ambitious for a share in potential OCS energy production, could receive as much as \$577 million annually. Energy industry visions of future state income from new energy production are frequently exaggerated, but there is

doubtless enough potential income to whet the appetite of income-strapped state and local governments.

Much of the responsibility for regulating the petroleum industry's workplace safety, environmental impacts, and infrastructure management is shared by the federal government with the states. Historically, states with significant petroleum or natural gas resources have given the responsible regulatory agencies dual and potentially contradictory mandates both to regulate and to promote petroleum or natural gas exploration and production. "Wyoming regulators," as noted in a survey of these state regulatory agencies,

are expected to "serve" the industry. Pennsylvania's Bureau of Oil and Gas says its goal is to "facilitate" development. And nearly every other oil and gas agency has a mandate or mission statement establishing increased development as a goal. "We're there to regulate and promote, if you will," Wyoming Oil and Gas Supervisor Tom Doll explained. "Protecting the environment—that's part of the task."¹⁰

The Deepwater Horizon tragedy discussed in chapter 1 is a reminder of how deeply the energy states are committed to petroleum production. The West is equally ambitious about its petroleum resources. The White House and the Department of the Interior (DOI) are continually pressed by western state political leaders, including particularly congressional Republicans representing Utah, Colorado, Wyoming, and Montana, to facilitate greater development and further expansion of federal petroleum and natural gas exploration leases.

The political weight of petroleum-dependent geographic constituencies is powerfully amplified by trade associations representing the petroleum and natural gas industry and the hundreds of satellite advocacy organizations for industries and trade groups dependent upon petroleum and its by-products. Petroleum dependent industries, moreover, are a very substantial constituent of the much larger and politically powerful "energy lobby," a broad coalition representing all current conventional energy producers who are estimated to collectively employ more than 1,500 registered lobbyists to look after their interests in Washington.

GOVERNING PETROLEUM: SEEKING A POLICY FUTURE

The energy crises of the 1970s set in motion a variety of federal government interventions in the national and international petroleum markets intended to relieve the short-term, adverse political and economic impacts of domestic shortfalls in petroleum supply. The history of subsequent US petroleum policy is a complex skein of federal attempts to protect national security and to stabilize the domestic petroleum market. The mélange of policies included efforts to control domestic petroleum prices, to buffer the US economy from the shock of future restrictions on oil imports while encouraging more domestic petroleum production, to guarantee domestic reserves sufficient to protect short-term national security, to create an equitable allocation of existing supplies in case of further import shortfalls, and to prevent domestic petroleum producers from harvesting “unfair” profits from sudden escalations in domestic retail gas prices, among other measures.

The substance and impact of these policy experiments have been exhaustively studied and continue to be debated. Energy policy analyst Peter van Doren’s conclusion seems reasonable:

America’s experience with oil regulations from the 1930s through the 1970s has been much studied, and an academic consensus is that those regulations had large negative effects on both oil producers and consumers. Congress has typically responded to petroleum-market problems with inappropriate legislation that has damaged markets and prompted further rounds of legislation and regulatory action.¹¹

By the early 1990s, in any case, most federal efforts to regulate the domestic petroleum market ended, or transformed into emergency measures, as a result of improving domestic petroleum supply, general price stability, and the absence of effective blockades of imported petroleum.

As the United States heads into the second decade of a new century, numerous policy options continue to be debated to ensure greater security and economic stability of petroleum supply in the future. Equally important, plausible policy options—those politically feasible and potentially effective economically—will often depend to a considerable

extent on whether the policy horizon is short term (a few decades) or longer. As a practical matter, noted in chapter 2, short-term policy alternatives are likely to receive greater attention from the White House and Congress and consequently to define the energy policy debate in the political marketplace. Among these policy options, several assume continuing prominence.

Federal Subsidies and Related Petroleum Production Incentives

In July 2011, during the impassioned partisan battle in Congress over extending the limit on the national debt and thereby avoiding a rapidly impending national crisis, contention broke out anew over federal energy subsidies. Apparently, there is seldom a time too troubled for Congress to deny itself an opportunity to debate about energy subsidies. Controversy over the scale and apportionment of federal energy subsidies is a perennial congressional event, beginning with dispute over how the allocations are measured and to which energy sector's advantage. There is no uncertainty, however, that federal subsidies for petroleum exploration and production are generous and fiercely defended by the petroleum industry and its partisans. The EIA has estimated, conservatively, that federal support for the US petroleum and natural gas sector equaled at least \$2.8 billion in 2011. Equally important, and unlike support for most unconventional energy resources, particularly solar and wind energy, federal subsidies for petroleum and natural gas, like other fossil fuels, is written into the US Tax Code and is not time limited.¹²

Partisan dispute over the extent of these petroleum subsidies has intensified in recent congressional sessions, with Republicans generally defending existing subsidies against Democratic initiatives to reduce their scope and duration or, alternatively, to increase the tax burden, particularly on petroleum. This partisan polarization is complicated, as we earlier noted, by the political stakes in petroleum production held by states dependent upon energy royalties, or hoping to become so. Disagreements about the magnitude of federal support for petroleum are often grounded, as well, on embedded disputes over how much federal support should be invested in renewable energy and over the comparative proportion of the federal budget allocated to the two energy sectors. Equally important, the economic, political, and national security

stakes involved in new petroleum policies are increased because policies intended to significantly influence the future of domestic petroleum production and consumption must necessarily be framed in terms of policy impacts over many future decades.¹³

Environmentalists have been consistently critical of the scale and duration of federal petroleum and natural gas subsidies. They have often been joined by partisans with other, sometimes different policy priorities and professional perspectives, such as national security experts, physical and biological scientists, who nonetheless share a concern with reducing US dependency upon petroleum, domestic or imported. When it comes to policy strategies, discussion almost always focuses upon reducing subsidies, or increasing corporate taxes, or some combination of both. As usual, the devil in the details becomes a divisive influence, even among allies of restrained petroleum production, and thus further complicates an already tangled array of policy options for future petroleum subsidies.

Accelerated Domestic Exploration and Production

Proponents of increased domestic petroleum supply customarily look mostly to a combination of four options: OCS lands, onshore federal lands, Canadian reserves, and oil sands or shale. All these options involve environmental risks whose magnitude is a major source of controversy between partisans and opponents of increased domestic petroleum supply.

OCS lands. The Deepwater Horizon disaster in 2010 again forced upon national attention the contentious political and environmental controversy inseparable from energy development on the Outer Continental Shelf (OCS lands). The controversy is compounded by federalism issues, as well. Jurisdiction over OCS lands is divided between the coastal states, whose authority extends three miles from their ocean borders (except for Texas and the west coast of Florida where state jurisdiction extends to nine nautical miles), and the federal government, which controls OCS lands for 200 miles beyond the state three-mile limit.

Altogether, production from existing state and federal energy leases accounts for about 30 percent of domestic petroleum production and 25 percent of natural gas. The Energy Policy Act (2005), which passed during the G. W. Bush administration and was intended to encourage

more domestic production, also increased federal subsidies for OCS energy production. Estimates of the remaining OCS petroleum and natural gas reserves vary considerably, but most suggest very substantial known and potential reserves. The DOI, for instance, estimated in 2006 that reserves of 8.5 billion barrels of oil and 29.3 trillion cubic feet (tcf) of natural gas exist (the United States consumes about 19 million barrels of petroleum and 1.6 million tcf of natural gas daily).¹⁴

Regulation of energy exploration on the vast federal OCS is vested in the Department of the Interior and, until recently, primarily in the DOI's Minerals Management Service (MMS). The DOI has historically strong ties to petroleum, natural gas, and other fossil fuel interests because DOI's historic, and inconsistent mission, has been to both encourage and regulate exploration and production of resources on the public domain. The Deepwater Horizon oil spill thrust the MMS into unwelcome national attention and dramatized the agency's failure to enforce federal environmental regulations upon petroleum corporations drilling in the Gulf of Mexico. The MMS became a classic example of the problem created when federal agencies are responsible for both regulating and promoting the same industry.

Investigation by the DOI's own inspector general, a bipartisan congressional committee, and numerous other official and unofficial entities between 2007 and 2011 revealed the MMS's close identification with regulated petroleum corporations and the congenial collaboration that resulted even before Deepwater Horizon. "Federal officials who oversaw drilling in the Gulf of Mexico," the inspector general reported in 2008, "accepted gifts from oil companies, viewed pornography at work, and even considered themselves part of the industry." A Louisiana MMS district manager was unapologetic about his agency's regulatory soft touch. "Obviously, we're all oil industry," he said.¹⁵ He continued,

Almost all of our inspectors have worked for oil companies out on these same platforms. They grew up in the same towns. Some of these people, they've been friends with all their life. They've been with these people since they were kids. They've hunted together. They fish together. They skeet shoot together . . . They do this all the time.

In the aftermath of more investigations following the 2010 Gulf oil spill, the Obama administration radically reorganized the MMS to end this intimate and pernicious collaboration between regulators and the regulated.

The White House and Congress continue to share a keen and, increasingly, partisan interest in the future of the OCS lands. While congressional Republicans have pressed for accelerated OCS energy development and Democrats have usually advocated restraint, political and economic cross pressures often blur partisan differences, particularly concerning the OCS lands under state jurisdiction. Thus, for example, Florida's Senate and House delegations of both parties are usually together in opposing any OCS development likely to create environmental damage to the state's coast. President Obama initially appeared to favor restrained energy development on OCS lands but, even in the aftermath of Deep-water Horizon, was compelled in the presence of the country's persistently deep economic recession to modify his stance and to advocate "safe and responsible" oil production. He went so far as to declare that his administration officials were working to speed up the leasing process for exploration in the already developed National Petroleum Reserve-Alaska (ANPR), "while also giving oil companies better financial incentives to use and extend certain existing leases in the Gulf of Mexico and elsewhere."¹⁶ The president also indicated his support for accelerated testing of areas off the East Coast for possible future drilling.

ANWR. In addition to the Gulf of Mexico, another continuing flash-point of OCS controversy has been the waters close to the Arctic National Wildlife Refuge (ANWR). The ANWR constitutes 16.6 million acres of prime polar bear wilderness in the remote northeastern coast of Alaska, among the wildest and most inaccessible of US public lands. Like most public lands owned by the federal government, ANWR's size and purpose are defined by Congress, and the responsibility for its oversight is vested in the DOI.

Much of ANWR has been opened to oil and natural gas exploration. The Trans-Alaskan pipeline, created in 1971, has been producing almost one million barrels of petroleum daily from Prudhoe Bay on Alaska's North Slope, and 90 percent of the adjacent coastal lands remain open

for gas and oil leasing. However, about 1.5 million acres of the coastal plain, considered to be the most biologically rich and vulnerable within the ANWR, has been restricted from energy exploration unless such activity is specifically authorized by Congress. This region is the epicenter of the political conflict over the ANWR.

The ecological riches of this area, known as “1002 Area,” are undisputed. This natural endowment includes 160 bird species; the most important onshore denning area in the United States for polar bears; the principal calving ground for 130,000 migratory porcupine caribou; habitat for grizzly bears, arctic foxes, wolves, wolverine, and numerous whales; and many endangered plant and animal species. Ruggedly beautiful wilderness and vast Arctic panoramas invite recreation and tourism. Alaska’s natural endowment resonates powerfully among environmentalists who believe much would be sacrificed to produce exaggerated quantities of petroleum unlikely to alleviate significantly the nation’s energy problems.¹⁷

Some of the stakeholders in the ANWR conflict are highly visible: Congress, the White House, the DOI, environmental advocates, energy industries, labor unions representing workers employed in related energy production, and foreign governments, including Japan and China, that might become large consumers of the petroleum produced from the 1002 Area, and Alaska. Alaska’s situation is unique. Royalties from energy production are the state’s economic foundation. Every Alaskan resident—man, woman, and child—is reminded about this economic dependence by an annual check representing his or her share of more than \$660 million in annual dividends from state oil royalties.¹⁸ Alaskans largely support energy exploration in ANWR and resent what they consider interference by Washington, DC, and other interests, especially environmentalists, in what should be Alaska’s own affair. Many of Alaska’s Native Americans, however, are unlikely to cheer. The Inupiat Eskimos and the Gwich’in Indians, an indigenous subsistence culture, are among the native tribes heavily dependent on the 1002 Area’s continued ecological vitality for food and fuel. The state’s commercial fishing interests were also disturbed by the possible degradation of their offshore stocks.

Proponents of energy exploration in the 1002 Area speak primarily about national security, energy supply, and coexistence between energy

production and environmental protection. They assert, for instance, that drilling in the area could produce petroleum equal to thirty years of oil imports from Saudi Arabia. They also contend that newer, more efficient energy production technologies will limit the amount of land that would be disturbed by energy production to a few thousand acres and, in any case, that the ecological disruption involved is vastly exaggerated by environmental opponents. Most important, proponents of further energy production argue that the reserves now untapped under the 1002 Area will improve US security by decreasing dependence on imported oil.¹⁹

Since 1980, the DOI has been ready to sell energy exploration leases on the 1002 Area, but, because Congress must first agree, the political battle over exploration has been waged largely within Congress and the White House. Since 1996, legislation permitting the leases has been approved in the House of Representatives twelve times and then defeated, usually in the Senate.²⁰ Generally, the ANWR issue has been a partisan affair, dividing pro-development Republicans from Democratic opponents and leaving Congress deadlocked over the ANWR issue throughout the Obama administration.

Obama declared his opposition to ANWR development, during his first presidential campaign. However, the Obama administration has become increasingly irresolute on the issue. Generally, the Obama administration has repeatedly declared that the Alaska refuge “is a very special place” that must be protected but energy exploration has not been precluded if it can be proved environmentally safe. Public opposition to OCS development, including the ANWR, appeared to grow in the immediate aftermath of the Deepwater Horizon oil spill. However, with the passage of time and the persistent increase in retail gasoline prices through much of 2012, public approval for new OCS development appeared to increase significantly while opposition to ANWR exploration seemed to diminish, thus, leaving the ANWR insecure and destined for continual contention among a multitude of political and economic interests.

Oil shale and the Keystone XL pipeline. The price of global crude petroleum has risen almost continually since 2000, providing petroleum producers with incentive to seek or to expand once unprofitable alternative

petroleum sources and to develop technologies for their exploitation. “Oil shale” has become the prime candidate for accelerated development to supplement traditional petroleum reserves.

Oil shale, sometimes called “oil sands” or “tar sands” is primarily three different petroleum products: oil shale (rock that releases petroleum-like liquids when heated in a special chemical process); tar sands (heavy, thick, black oil mixed with sand, clay, and water); and heavy crude oil (thicker and slower flowing than conventional oil). Significant quantities of petroleum are usually mixed with these materials “like an egg in cake batter,” requiring a much more complicated and expensive technology for extraction and refinement than traditional petroleum reserves. Global oil shale contains an enormous volume of potentially extractable crude petroleum, often called “bitumen.”

The most extensive deposits . . . are in North and South America. A region covering parts of Colorado, Utah, and Wyoming contains oil shale totaling about three times the proven oil reserves of Saudi Arabia. About two-thirds of the world’s supply of tar sands (estimated at 5 trillion barrels, though not all of it recoverable) is found in Canada and Venezuela. Venezuela also has the largest known reserves of heavy crude oil, estimated at 235 billion barrels.²¹

Canada and oil shale. Canadian oil shale has been especially attractive to American energy policymakers because it is a large and secure oil and natural gas source. The Canadian deposits, mined since 1967, cover an area approximately the size of England, primarily in Alberta province, and contain an estimated 170 billion barrels of oil. The Keystone XL project would double the amount of Canadian petroleum presently imported into the United States and would itself provide 5 percent of current US petroleum consumption and represent 9 percent of US petroleum imports.²²

Three existing portions of the pipeline now extend from Alberta Province to Oklahoma. The fourth component, the proposed Keystone XL, would add several additional segments to the existing line to create a new route from Alberta Province to the Gulf of Mexico. This new route

would extend the pipeline for the first time through Montana, Nebraska, and Oklahoma to the Gulf Coast. The 485-mile southern leg of the new pipeline is virtually complete. After initially opposing the southern segment, Obama approved it in March 2012 after the developers made sufficient changes to satisfy the White House. What remains in dispute is the so-called Northern leg, a 1,179-mile northern line yet to be built between Hardisty, Alberta, and Steele City, Oklahoma.

The “fracking” controversy. The fracking technology rapidly spreading across the United States and Canada for oil shale drilling has been environmentally controversial, as the later discussion about natural gas further illustrates. What is undisputed is that oil shale mining requires extensive surface and subsurface geological disruption with potentially adverse environmental impacts. A National Academy of Sciences report notes that oil shale mining “is much more costly, energy intensive, and environmentally damaging than drilling for conventional oil. The processes by which we mine and refine oil shale and tar sands to produce usable oil, for example, involve significant disturbance of the land, extensive use of water (a particular concern in dry regions where oil shale is often found), and potential emissions of pollutants to the air and groundwater. In addition, more energy goes into these processes than into extracting and refining conventional oil, and more CO₂ is emitted.”²³ Canada’s Alberta oil shale production has removed thousands of acres of Boreal forest, requiring the displacement of 100 tons of surface soil for every barrel of refined petroleum eventually produced. Surface water is often polluted with potentially harmful levels of heavy metals—including cadmium, copper, lead, mercury, nickel, silver, and zinc.²⁴ However, evidence of fracking’s adverse environmental impact has been fragmentary and inconclusive. The US EPA is expected to issue an important report on the environmental aspects of fracking in late 2013 or 2014.

Because the proposed XL line crosses international borders, responsibility for its environmental assessment and eventual permitting rests with the US Department of State (USDOS). The State Department’s required environmental review of XL, completed in 2011, declared the project would have “no significant impact” on the environment, a decision quickly renewing an already heated controversy over the pipeline.

The pipeline issue creates an unusual mix of partisans and opponents. On the supporting side are business groups, oil companies, labor unions (plumbers, pipefitters, operating engineers, construction unions), the Canadian government, numerous congressional Republicans and construction equipment manufacturers, and congressional representatives of Utah, Colorado, and Wyoming who contended that the Obama administration was “locking up” their own states’ large oil shale reserves.²⁵

On the other side are environmentalists, ranchers, and farmers in Nebraska and other states designated potential pipeline sites; political conservatives who “don’t like the idea that TransCanada [the pipeline builders] might say that their land had to be used for this pipeline”; proponents of renewable energy development; and many congressional Democrats and conservationists, among others.²⁶ There was no doubt that many environmental organizations, normally dependable Democratic presidential supporters, had been prepared to penalize Obama in the 2012 election if he permitted Keystone XL.²⁷

No final decision about Keystone XL. In November 2011, the State Department, with the President’s endorsement, announced that it would delay an XL decision because “it was concerned about the Nebraska part of the route and . . . finding and reviewing an alternate path could take until 2013,” apparently leaving a prickly political legacy for the next White House occupant.²⁸ Then, in January 2012, the president postponed a decision about the northern segment of the Keystone, arguing that more time should be given to study that portion after the 2012 presidential election. Later in 2012, Obama approved the southern XL extension, still leaving the fate of the northern segment unresolved. So the issue remained into 2013 when it appeared that a final White House decision might not appear until 2014.

Regardless of the pipeline’s eventual fate, many petroleum industry spokesmen, policy analysts, and political representatives from states with significant oil shale deposits are predicting a vigorous “boom” in domestic petroleum production driven by the new shale fracking technology. One group of experts has predicted that at least twenty US shale formations can yield significant new crude oil. But other energy industry experts, wary of the economic uncertainties in future petroleum markets

and the durability of the newer mining technologies, are less certain about the long-term implications of accelerated oil shale mining. Once again, predictions about long-term petroleum use, like predictions about the future of other energy sources, rest uneasily on a shifting foundation of assumptions about future economic, political, and social conditions. The increasing development of oil shale drilling and the generally benign regulation it currently experiences from federal and state governments suggest a high probability that it will account for an increasing proportion of domestic crude oil production, perhaps accounting for as much as 10 percent of total annual domestic crude oil production within a decade.²⁹

Creating More by Using Less: Petroleum Conservation and Substitution

Increased conservation of petroleum usage remains an important and feasible strategy for diminishing the rate of growth in domestic petroleum production and consumption. Usage conservation can displace otherwise consumed petroleum and thereby extend the future supply of petroleum. Most experts believe presently available technologies, together with existing and proposed future federal, state, and local legislation, could reduce annual domestic petroleum consumption by 10 to 15 percent.

Since energy policies are always related, many policies not targeted primarily at reducing domestic petroleum consumption may directly, or indirectly, encourage greater petroleum conservation. Federal air pollution standards, for instance, encourage the use of cleaner burning auto fuels and greater fuel efficiency. State policies intended to reduce emission of climate warming gases, such as CO₂, may also encourage industrial and commercial installations to substitute biofuels, such as ethanol or natural gas for petroleum.

Federal and state governments have already enacted numerous laws explicitly promoting petroleum conservation. These include the following:

- Auto and truck fuel efficiency standards—federal law currently requires that all new automobiles and light trucks purchased in the United States achieve an average fuel efficiency of 35 miles per gallon by 2020

- Labeling, which provides consumers comparative information on fuel efficiency
- Incentives, both financial and nonfinancial, which target manufacturers and consumers to encourage market front-runners to develop and purchase more efficient vehicles
- Technical assistance, which assists the public and private sectors in adopting fuel-efficient technologies and implementing policies to reduce fuel consumption
- Urban planning and behavior change, including zoning, traffic design, and idle reduction rules to reduce fuel consumption
- Research and development (R&D) support to encourage development and testing of more energy efficient technologies—for example, incentives to increase efficiency and market competitiveness of hybrid and alternative fuel engines
- Replacement of petroleum in the transportation sector with biofuels, or blended petroleum and biofuel³⁰

Alternative fuels for petroleum became one of the most significant energy conservation issues crowding the Washington policy agenda at the end of Obama's initial term when the federal government's continuing promotion of ethanol—the nation's most important transportation fuel additive—was entangled in congressional controversy over reducing the national debt.

Ethanol

In 2011, at a time when the virtues of “renewable energy” had become virtually a cliché in American political discourse, ethanol fuel producers and blenders faced a paradox. For the first time in more than three decades, they confronted a fierce political battle to protect their privileged status in federal and state law.

Most Americans may know little about ethanol, but they use lots of it. Ethanol is as close to the average American as the nearest gas pump. Virtually all gasoline now sold in the United States contains ethanol, a “biofuel” distilled from corn. Producers and marketers of gasoline customarily blend ethanol and gas in the cargo tanks of gasoline delivery trucks before the mixture is transported to energy markets. Most

gasoline consumed in the United States is blended in a mixture of 10 percent ethanol and 90 percent gasoline (often called E10), the legal limit of ethanol additive permitted by federal law until 2010.

Domestic corn ethanol is an example right out of Government 101, exemplifying how energy resources, like numerous other commodities in the American energy economy, are politically promoted, protected, and defended through the institutional, legal, and economic structures of the American policy process. In this respect, as subsequent chapters will illustrate, there is nothing unique to corn ethanol, which joins other energy resources like coal, petroleum, and nuclear power in acquiring economic advantages through public law and which, once attained, are formidably difficult to diminish and powerfully defended by the beneficiaries.

A financially privileged biofuel. In the aftermath of the energy shocks during the 1970s, the federal government passed the Energy Policy Act (1978), creating a subsidy for blenders, and created a tariff to protect domestic producers from imported ethanol. Ethanol gained additional federal patronage as a result of two major congressional acts passed during the G. W. Bush administration. The Energy Policy Act of 2005 required an increasing volume of ethanol and biodiesel to be blended with the US fuel supply between 2006 and 2012. The Energy Independence and Security Act of 2007 mandated a progressive increase in domestic renewable fuel use to 36 billion gallons annually by 2022. These combined incentives created an increasingly strong ethanol market growing from two million gallons in 1981 to about thirteen billion gallons in 2010. By 2011, combined federal ethanol subsidies exceeded \$6 billion annually.³¹

Most experts believe that the two Bush-era programs practically ensure a continually growing market for ethanol fuel. Moreover, the EPA ruled in October 2010 that cars and light trucks in model year 2007 and thereafter can also use a richer blend of 15 percent ethanol and 85 percent gasoline (“E15”). The newer blend requires a *flex fuel vehicle* that is expected to become more common as environmental regulations and increasing gasoline prices increase ethanol’s market appeal.³² Producers and blenders of ethanol fuel, having successfully defended this federal largesse for more than three decades, now confront increasing opposition

to continuing federal subsidies and import tariffs in the aftermath of the severe economic recession beginning in 2008 and the resulting federal budget crises.

End to subsidized ethanol? The federal subsidy for ethanol producers and blenders created in 2005 was mandated to expire at the end of 2011. The mandate was renewed for five additional years in 2011, however, despite considerable opposition from an unusual alliance of environmentalists, fiscal conservatives, producers of competing biofuels, and many congressmen in both parties. Fiscal conservatives and a substantial bipartisan congressional coalition believe that federal law now ensures a growing future demand for fuel ethanol that precludes the need for continuing subsidies, especially when federal budget deficits have created an economic crisis requiring severe reductions in federal expenditures. The battle against the mandate has continued well into Obama's second term.

Many environmentalists assert that ethanol has been unwisely exempted by Congress from a provision of the 2007 Energy Independence and Security Act requiring all other, potentially competitive biofuels to reduce greenhouse gas (GHG) emissions by 20 percent compared to gasoline, thereby, giving ethanol a competitive advantage over alternative, and more environmentally beneficial, biofuels. (Corn-based ethanol creates more GHG emissions than alternative biofuels, such as cellulosic and sugar cane.) Additionally, they argue that federal subsidies have encouraged the increasing conversion and environmental degradation of farm land—about 40 percent of all corn cultivated domestically is used for ethanol production—that could be used for more environmentally beneficial crops. Additionally, corn ethanol production is asserted to be more energy intensive than potentially competitive biofuels.³³ Moreover, the critics add, the subsidies aren't needed to ensure corn ethanol an attractive market. Ending federal subsidies, remarked a spokesperson for the influential Environmental Working Group, "is definitely overdue. We think of it . . . as a 50-year old that needs to move out of their parent's basement."³⁴

Ethanol growers are concerned that the end of federal subsidies will also be accompanied by termination of the tariff on imported ethanol that has protected domestic producers from global competitors,

particularly Brazil, the second largest global producer of corn ethanol and an aggressive marketer internationally. Competitive ethanol imports, argue corn ethanol proponents, also will cost Americans jobs and income. “Ethanol is America’s fuel: It’s made here in the United States, it creates US jobs, and it contributes to America’s national and economic security,” asserted retired Gen. Wesley Clark, cochairman of Growth Energy, a major ethanol industry interest group.³⁵ And, striking a note intended to resonate with environmental advocates, corn ethanol proponents have warned that opening the domestic market to imported Brazilian ethanol will accelerate further destruction of the already badly reduced Brazilian rain forest ecosystem.

NATURAL GAS: A MIX OF REWARDS AND RISKS

Natural gas in its several different forms is, in many respects, the most attractive of all the fossil fuels in the nation’s near future. Natural gas is commercially produced primarily from oil fields and natural gas fields, although the industry is now aggressively extracting natural gas from unconventional sources such as shale gas and coal bed methane. Traditional *casinghead*, or “associated” gas, principally methane mixed with numerous impurities, is refined into ethane, propane, butanes, pentanes, and other commercial forms, which for convenience are often collectively called “natural gas.” While the largest proven natural gas reserves are located in Russia, Iran, and the Arabian Gulf states, US proven reserves are significant and, as new extraction technologies develop, steadily increasing. To many US energy sectors, natural gas is increasingly attractive, economically and environmentally, as an alternative to petroleum and coal *if* its entailed risks prove acceptable. And, like all projections about future domestic energy use, predictions depend upon numerous assumptions or “scenarios”—such as continued economic growth and absence of major political crises—that caution against treating predictions as if they are destiny.

Domestic Resources: Increasing Supply and Demand

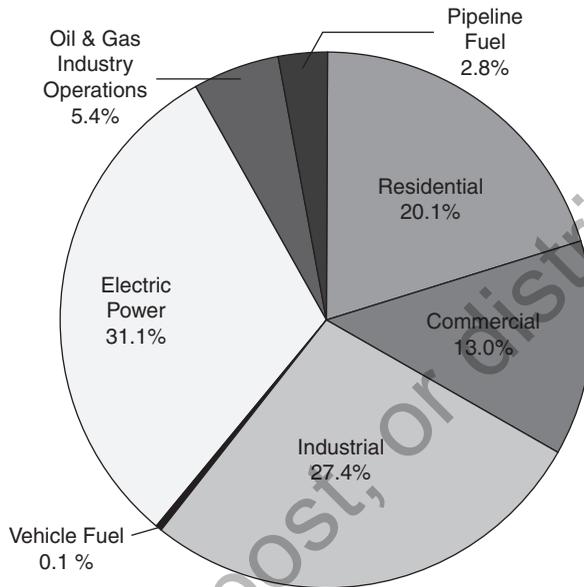
Proven reserves of domestic onshore and offshore natural gas have grown annually since 1999 as a result of improved technologies and the development of economically practical extraction from shale with

fracking technology.³⁶ According to the EIA, the United States possesses 2,543 trillion cubic feet (tcf) of potential natural gas resources. At the 2010 rate of US consumption, this is enough natural gas to supply over one hundred years of domestic use. More than 90 percent of current domestic natural gas originates from onshore sources, the rest primarily from the Gulf of Mexico. Nineteen states are estimated to possess significant natural gas reserves.³⁷ Domestic production of natural gas is expected to increase significantly in the future, but so is total US energy demand; the EIA has predicted that by 2030 natural gas will provide about 25 percent of domestic energy consumption—about the proportion of current consumption. However, the predicted changes in how natural gas is produced and consumed are important.

A Versatile Fuel

Natural gas is the most versatile of domestic fossil fuels. As Figure 3-4 indicates, it provides a significant portion of energy to several important US economic sectors. The anticipated growth in natural gas supply into a widely predicted boom is the result of increased profit margins for gas extracted from shale, and especially from the technological improvements in horizontal hydraulic fracturing, or fracking. The potential productivity of fracking has also incited increased pressure upon Washington from many states to accelerate gas exploration on federal lands within their borders. The environmental controversy is certain to magnify as expectations for future gas production from hydraulic fracturing increases: the DOE has estimated that fracking may provide as much as 20 percent of the nation's total natural gas supply by 2020.

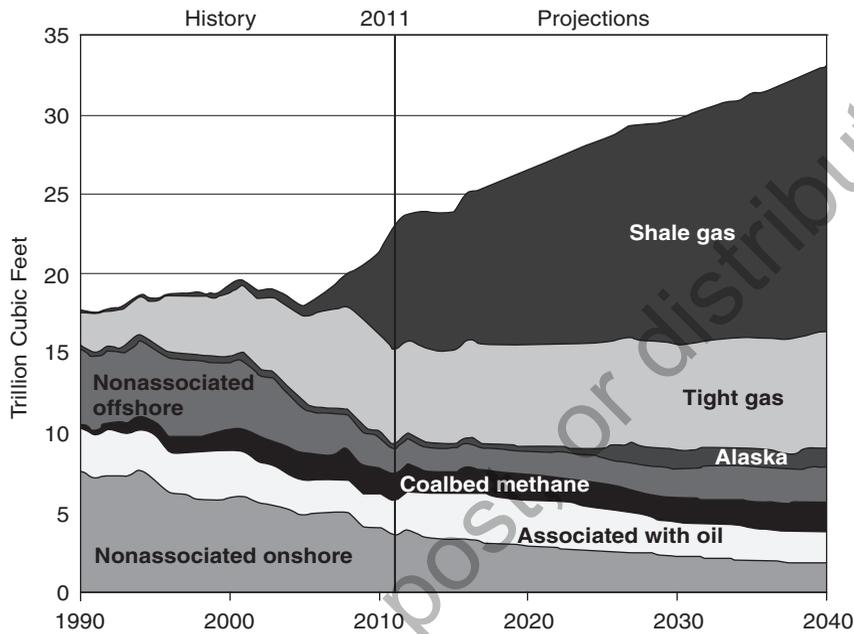
Much of the expected change in future natural gas production and consumption is expected to result not only from increased fracking but also from changes in fossil fuel consumption by the electric power and industrial sections, which together consume almost two-thirds of current natural gas production. Both economic sectors have responded to tougher air pollution regulations and the increasing economic attractions of natural gas by substituting gas for coal-fired facilities in existing or planned installations. Progress Energy, for example, one of the nation's largest electric utilities, has announced plans to shut down eleven North Carolina coal plants by 2017 and to substitute natural gas in two of them.³⁸

FIGURE 3-4 US Natural Gas End Use, 2012

Source: Center for Climate and Energy Solutions, "U.S. Natural Gas Overview of Markets and Use, 2011," at <http://www.c2es.org/publications/natural-gas-markets-use-overview>. Based upon U.S. Energy Information Administration, *Natural Gas Annual*, 2012 (Washington, DC: Energy Information Administration, 2012), Table 1, p. 1.

"Almost a Miracle" or an Environmental Menace?

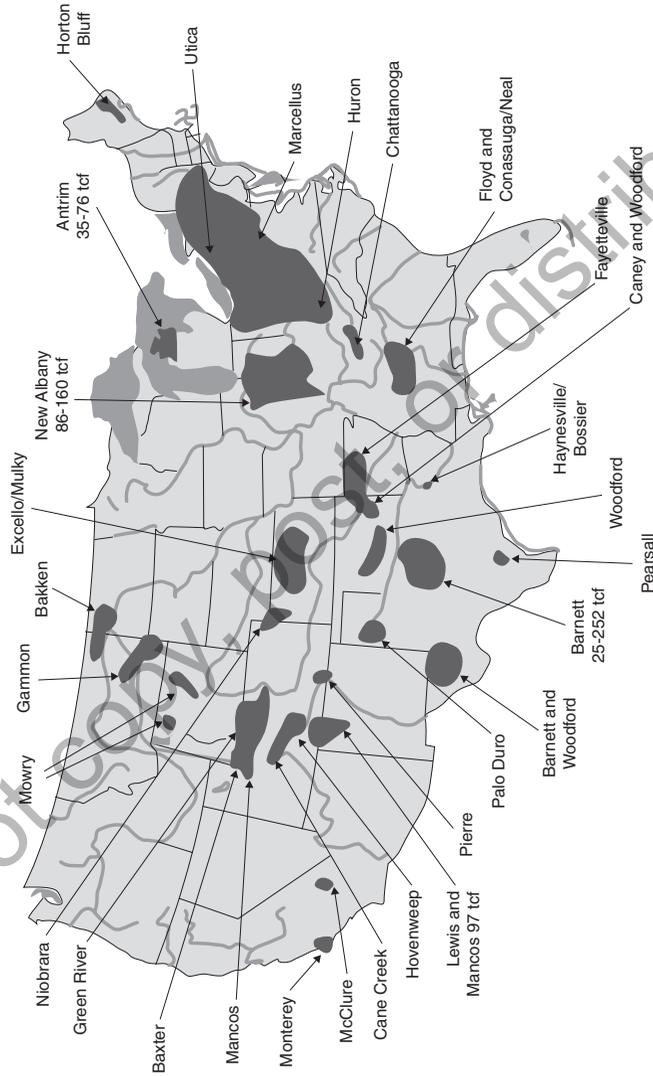
In 2000, the future domestic supply and economic competitiveness of natural gas seemed problematic, an important concern because natural gas has many environmentally attractive qualities. It releases fewer emissions of regulated air pollutants and CO₂ per Btu than coal or petroleum, a major reason electric utilities consider it an attractive substitute for more environmentally polluting coal. Thus, the prospect for an unanticipated growth in future gas reserves sufficient to enhance its economic competitiveness with other fossil fuels has been potentially good news for natural gas consumers and, especially, for the industry itself.

FIGURE 3-5 US Dry Natural Gas Production by Source, 1990–2040

Source: U.S. Energy Information Administration, *AE02013 Early Release Overview* (Washington, DC: Energy Information, 2013), 2.

The fracking boom. Enormous deposits of oil shale underlie the United States, as illustrated in Figure 3-6. The natural gas industry is riding a rising tide of optimism sustained by fracking technology. At the outset of the Obama administration, the new drilling boom incited by fracking seemed to many industry leaders a certain path toward a bright future. “It’s almost divine intervention,” burred Aubrey K. McClendon, chairman and chief executive of the Chesapeake Energy Corporation, one of the nation’s largest natural gas producers. “Right at the time oil prices are skyrocketing, we’re struggling with the economy, we’re concerned about global warming, and national security threats remain intense, we wake

FIGURE 3-6 US Shale Oil Formations, 2011



Source: Charles R. Anderson, "The Real American Energy Opportunities," *An Objective Individualist*, at <http://objectiveindividualist.blogspot.com/2011/02/real-american-energy-opportunities.html>. Based on U.S. Energy Information Administration, *Natural Gas, Shale Gas and Oil Plays, Lower 48 States* at http://www.eia.gov/pub/oil_gas/natural_gas/analysis_publications/maps/maps.htm.

up and we've got this abundance of natural gas around us.”³⁹ Not all industry experts share this confidence. Still, steadily increasing gas production throughout the Obama administration's first term encouraged most energy experts and financial markets to view the industry's future with cautious optimism.

A disputed environmental impact. The issue that most conspicuously threatens to dissipate optimism about a coming boom in natural gas production is the environmental risks entailed with fracking technology.

Hydrologic fracturing “involves pumping liquids under high pressure into a well to fracture the rock and allow gas to escape from tiny pockets in the rock.” Millions of gallons of chemically treated water called “brine” mixed with sand is blasted down a drilling hole to shatter petroleum shale and release the embedded gas. The return water, called “flowback,” is a cocktail of water, chemical toxins, and carcinogens; other chemical wastes sometimes including radioactive components; and inert substances that must be purified before the flowback is suitable for other uses. Most of the return water, however, is pumped back underground into shale sites for containment. Almost all natural gas exploration and production from leases on federal lands, most west of the Mississippi River or in the Gulf of Mexico, use fracking technology regulated by the Department of the Interior. The largest private fracking operations are sited on the Barnett Shale formation near Fort Worth and on the vast Marcellus Shale underlying portions of Pennsylvania, New York, West Virginia, and Ohio. Pennsylvania alone has more than 57,000 gas producing wells. These nonfederal sites are presently regulated by the states.

Environmentalists and many residents in communities near fracking operations regard hydrologic fracturing ambivalently. They recognize fracking's economic appeal, especially amid a severe economic recession, but they also contend that fracking disrupts surface and ground water and eventually can infiltrate community water supplies with a variety of environmentally hazardous chemicals, such as dissolved or ambient methane, and inert materials.⁴⁰ Because many existing and planned fracking operations are located near sources of drinking water for large population centers, such as Chicago, Philadelphia, and New York, state

and local officials have become increasingly insistent that federal EPA and state environmental regulators investigate the environmental risks associated with the technology. Federal law does not now require drilling companies to disclose the ingredients for their mining water.⁴¹ Under considerable political pressure from oil shale states, environmentalists, Congress, and communities near fracking operations, the EPA has initiated studies to characterize the content and dispersion of flowback. The final report is scheduled in 2014.

Many gas production companies contend their brine formula is a trade secret and refuse to disclose its composition. Also, they contend that their brine is environmentally safe because it is injected thousands of feet below drinking water aquifers, sufficiently deep to avoid groundwater contamination, and that the flowback not returned deep underground is purified before it's released for other purposes. Moreover, drillers assert that proven technologies are available for distilling an environmentally safe liquid from flowback when needed. (The CEO of Halliburton Co., a major energy consulting firm, was so convinced of the safety that he invited an associate to drink some of it during a meeting of the Colorado Oil and Gas Association, and the media reported that his associate consumed a "bit of the liquid.")⁴²

Many states overlying large oil shale deposits are not waiting upon EPA's final determination about fracking and have initiated their own investigations with a view toward possibly regulating fracking themselves. New York is among the earliest to impose constraints on hydrologic fracturing until more is known about its environmental consequences. Environmentalists and many residents of communities near fracking operations maintain that the flowback has already created surface and groundwater contamination, air pollution, and residual solid wastes from brine processing including heavy metals and other chemicals toxic to humans and ecologically dangerous.

Governance: Future Policy Options

The future of domestic natural gas policy is a fabric bound together with "ifs" and "buts." With no economically and technologically viable short-term substitute, further domestic exploration and production of natural gas seems inevitable. The Obama administration continued a

long-standing federal policy of encouraging domestic natural gas exploration and production on both public and private lands, while simultaneously assuring it would vigilantly regulate the adverse impacts if fracking proves an environmental hazard, thus, leaving the future unsettled. Washington is also under considerable pressure from natural gas producers, the economic sectors dependent upon natural gas—especially the electric power industry—and some states to open additional public and private land overlying gas shale to further exploration and natural gas production. Since the Energy Policy Act (2005) currently exempts fracking operations from federal regulation and a final EPA determination of fracking's environmental impacts, an essential requisite for any future federal regulation is several years in the future; thus, the short-term regulatory initiative has been assumed by the states—unless an environmental disaster on the scale of the Deepwater Horizon crisis compels rapid federal attention to hydrologic fracturing.

At the same time that natural gas is expected to constitute at least a quarter of domestic energy consumption over the next several decades, federal and state governments also have the ability to create additional incentives to fortify the electric power industry's already strong desire to increase its consumption of natural gas as a primary fuel. These incentives might include federal or state tax subsidies for increased production, state regulatory commission requirements that utilities use an increasing proportion of natural gas for power generation, or federal and state regulations that encourage greater utility and industrial reliance on natural gas to replace fossil fuels with higher CO₂ emissions for energy units, and much else. Major policy studies concerned with future domestic energy consumption show that natural gas is, at the very least, an environmentally attractive alternative to other fossil fuels in creating a "bridge" to greater reliance on renewable energy and all the more attractive because it is a secure domestic resource.

Environmentalists have been divided and tentative about the role of natural gas in the nation's energy future. They recognize that continued reliance on natural gas perpetuates the importance of fossil fuels, with all their recognized environmental liabilities, in future energy production. The emergence of fracking as an important production technology awakens apprehension about the long-term environmental risks involved in

future natural gas consumption but, at the same time, the availability of natural gas as a less air polluting substitute for coal, especially in electric power production, may enhance its appeal.

Several states overlying large gas shale deposits, such as New York and Pennsylvania, have either adopted, or are considering adopting, short-term moratoriums on new fracking operations until federal or state environmental agencies can make a reliable assessment of the environmental risks entailed in the technology. States may also have an option to control some aspects of fracking by regulating CO₂ emissions, thus, creating a strategy for encouraging greater natural gas consumption as a substitute or alternative for coal consumed in industrial and commercial sectors. Some communities near fracking sites are also contemplating regulation, and in a few instances, they have already initiated efforts to characterize the environmental impact of the process. The three-layer deep governmental concern about fracking regulation also creates a classic federalism issue involving uncertainty and potential conflict over regulatory powers and responsibility for drilling oversight.

CONCLUSION: THE FOUNDATION OF ENERGY POLICY

Petroleum and natural gas remain the foundation fuels of the American energy economy. Since World War II, petroleum has provided almost exclusively the energy powering domestic transportation and will continue to be the primary source of transportation for many future decades. Beginning in 2005, new and unconventional technologies associated with fracking have vastly increased the potential supply of natural gas and petroleum, leading many experts to predict a surge in domestic petroleum that within a few decades will vastly improve national energy security now hostage to imported petroleum. Fracking technology, additionally, is widely predicted to create a boom in future petroleum and natural gas supplies. The policy implications of a fracking boom might be profound. A growing future supply and diminishing cost of natural gas, already a significant fuel source of electric power, could accelerate the substitution of gas for coal as the primary fuel for power generation. Since natural gas also creates significantly lower emissions of air pollutants and climate warming chemicals than coal combustion, the collateral value of natural gas in future environmental regulation could also be important.

Petroleum and natural gas also pose significant policy challenges for national policymakers. The long-running conflict over federal government subsidies and tax concessions for petroleum producers remains. Controversy prevails about access to domestic petroleum and natural gas reserves; about the priorities to be accorded renewable energy, nuclear power, and energy conservation; and about governmental subsidies for alternative energy from biofuels, such as ethanol. Environmentalists and their allies continue to press Washington and the states for more vigorous environmental regulation of the production and consumption of carbon fuels and, especially, for an aggressive national regulatory program for climate changing emissions from carbon combustion. Domestic petroleum producers have urged the White House and Congress to accelerate their access to domestic petroleum reserves on interior public lands and the OCS. These controversies have been intensified by a growing polarization between Republicans and Democrats in Congress and the White House across almost all domains of energy policy.

In many respects, the resolution of these essential policy issues will also depend upon often problematic, contested estimates of domestic and foreign energy reserves and upon the accuracy of the economic and scientific models upon which policymakers often rely when attempting to anticipate future energy supply and demand. Additionally, the optimistic glow attending many predictions of future energy supply associated with new fracking technology cannot conceal the dark uncertainties about fracking's potential environmental risks yet to be accurately characterized.