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Energy Security in the United States: A Glance at the Major Issues

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Abstract

The article analyzes U.S. energy security and begins with an examination of the U.S. energy profile. The article then explores some of the major threats to U.S. energy security. Today, the U.S. is in a comfortable position in terms of its energy supply. However, great debates exist with regard to the size of hydrocarbon reserves. Disputes also continue regarding how long the U.S. will be able to use technology to extract gas and oil. While the U.S. has witnessed a boom in natural gas, hydraulic fracturing, or fracking, has caused many Americans to worry about the consequences of such practices.

The economic well-being of the United States is directly tied to its access to affordable energy. Indeed, every major economic crisis the country has traversed has been accompanied by high oil prices.[1] The connection between U.S. prosperity and access to affordable energy is so obvious, that this has in the past been used by those who supply the U.S. with energy (in the form of the "petroleum weapon") as a weapon in an attempt to force political action: this was the case during the 1973 oil shock, when OPEC members decided to punish the U.S. for its support of Israel in the Yom Kippur war by restricting oil supplies and raising the price of crude oil, resulting in a deliberate crippling of the U.S. economy.[2]

It was, of course, the 1973 oil shock that first caused political leaders in the U.S. to really consider the notion of energy security, notably with Richard Nixon's 1973 "Project Independence," which was intended to reduce U.S. reliance on imported energy, particularly crude oil from OPEC countries.[3] Equally important was the 1979 oil shock, caused by the Iranian revolution, which put President Jimmy Carter in the uncomfortable position of having to effectively beg the nation to reduce its energy consumption and contributing directly to President Carter's electoral loss to Ronald Reagan.[4]

The idea of energy security effectively revolves around the ability of the country to guarantee reliable access to affordable energy to cool, heat, and illuminate our homes, to fuel our cars, trucks, trains, and airplanes, and to keep the industrial motor humming along. Anything that has the potential to disrupt these processes thus poses a threat to our economic wellbeing and quality of life.

Given that the United States remains a net importer of energy, this means that our energy security depends at least in part on the reliability of foreign sources of crude oil and natural gas and that our focus must be on the potential for disruption of those foreign supplies. To some extent—as demonstrated in the 1973 crisis—this puts the U.S. at the mercy of producers of the energy resources upon which we depend, a fact also exploited by Hugo Chávez of Venezuela, who repeatedly threatened to cut off the U.S. from its very sizeable oil reserves.[5] Naturally, then, we must look at domestic production capacity: our dependence on foreign sources of oil and natural gas is, after all, a direct function of our inability to meet energy needs domestically.

There is, of course, more to the story of our energy security. There are consequences to our dependence on fossil fuels, given that they are non-renewable resources and that they are responsible for changes in the planetary climate, which in turn may in the intermediate to long-term produce serious threats to U.S. national security.[6] In addition, there are some other concerns which are not generally considered by the general public, but which may ultimately create more vulnerability than our dependence on foreign energy resources. In the following pages, I will discuss U.S. energy security in the context of a volatile world.

Energy Profile

Oil holds a very privileged position in the American public imagination. It is one of precious few commodities the price of which is discussed with regularity in the popular media. Just about every American can name the price of a gallon of gasoline, and more than a few will be able to tell you the current going rate for a barrel of crude oil. The same can decidedly not be said of a kilogram of uranium or indeed a ton of coal—other than perhaps in some corners of Appalachia. This is, of course, due to the fact that out of the many forms of energy we consume, gasoline happens to be the one product that Americans pay for directly at the pump. When oil prices are low, consumers not only feel it in their pocketbooks, but they

can see it while they fill up their cars. Given the direct link between the price of a barrel of crude oil and that of a gallon of gasoline, this produces an acute awareness of oil prices and one that is not matched when it comes to the other forms of energy we consume. Monthly electric bills are more difficult to interpret and are not generally read in great detail to see how much we are paying per KwH this month. Oil alone holds our fascination.

Oil is indeed important: transportation alone accounts for 28 percent of total energy consumption in the U.S., making it the second most energy-intensive sector in the country after the generation of electricity (39 percent), followed by industry (22 percent), and residential and commercial energy consumption (11 percent). Coal remains the most important fuel for our power plants (37 percent), while natural gas (26 percent), nuclear power (22 percent), and renewables (13 percent) make up the remainder: the sector consumes virtually no oil. This makes petroleum the most important source of energy in the U.S. at 36 percent of the total, followed by natural gas (29 percent), coal (16 percent), renewables (10 percent), and nuclear (9 percent).[7]

It is important to remark on the ongoing changes that are transforming the energy landscape. The most important of these has been the development of unconventional reserves of oil and gas in the form, primarily, of shale.[8] Innovations in horizontal drilling and hydraulic fracturing or fracking have allowed for a reawakening of the U.S. energy sector, especially with regard to the production of natural gas. As a result of this boom, the U.S. is now the world's leading producer of natural gas with an annual output of about 27.2 Tcf (2015).[9] This has had several effects: it has led to a reduction in the price of natural gas, which has benefited consumers. Moreover, it has caused utilities to shift away from coal and towards natural gas for the generation of electricity, which has reduced the importance of coal in energy production and has the added benefit of reducing the output of carbon dioxide by power plants.[10]

Indeed, the shale revolution has resulted in a much reduced dependence on foreign imports to meet domestic energy demands. Since 2004, total energy imports into the U.S. have dropped from 8,310 Twh to 3,586 Twh by 2013.[11] The most important energy import, crude oil, has dropped significantly as well, in part due to increased domestic production of tight oil: total petroleum imports dropped from 5.01 Bbl in 2005 to 3.43 Bbl in 2015,[12] constituting a reduction of some 32 percent in imports. Domestic production of oil—primarily due to increased tight oil production—increased from 1.89 Bbl in 2005 to 3.44 Bbl in 2015.[13]

As imports of petroleum have fallen, a shift has also taken place in the origin of imported petroleum. While OPEC still contributes a large share of imported petroleum, its share has been steadily falling in favor of exporters within the Western Hemisphere, especially Canada. Between 2010 and 2015, imports from OPEC countries fell from 1.79 Bbl to 1.05 Bbl, while imports from Canada rose from 0.93 Bbl to 1.37 Bbl. As of 2015, Canadian imports account for about 28 percent of the total, followed by Saudi Arabia (13 percent), Mexico (10 percent), and Venezuela (9 percent).[14]

These shifts have meant that even though the U.S. remains heavily dependent on imported petroleum—given that the U.S. produces only about 60 percent of its total demand—that dependence has been decreasing. At the same time, more of the demand is being met by producers in the region. The latter point is especially important when we consider U.S. vulnerability to oil shock in the framework of the extreme volatility that marks portions of the Middle East and North Africa.[15]

Threats to U.S. Energy Security

The United States is currently in a relatively comfortable position with regard to its energy supply: its dependence on imports of petroleum is significantly reduced from just a decade ago, it is currently the leading producer of natural gas, and oil is currently relatively inexpensive. When it comes to energy security, the main things to address are 1) our continued ability to produce at current levels, or even to increase domestic production, 2) the ability of certain state and non-state actors to disrupt energy supplies, 3) the possibility of regional volatility causing a spike in oil prices, and 4) the long-term effects of our reliance on fossil fuels to sustain our economic growth and overall prosperity.

It is very much in the nature of hydrocarbon reserves to be the subject of great debate when it comes to the actual size of those reserves and our ability to exploit them in an economically viable way. One of the tricky things about hydrocarbon reserves is that they are hidden deep underground, where we cannot exactly take a good close look at them. Fields holding

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great promise sometimes do not live up to that promise, while others prove more productive than expected. It is for this reason that we distinguish between proven, probable, and possible reserves with a range of caveats about what may or may not be technically recoverable.[16]

This is a continuous source of great uncertainty and allows for individuals, oft depending on their political agenda, to make statements with regard to the continued ability of the United States to supply itself with natural gas and oil. Indeed, the proven reserves in the United States are good for about 11 years of production at current levels, which does not seem like very much at all.[17]

The big question, then, is how long the United States will be able to extract oil and gas from the ground. The science behind estimating the productive capacity of known deposits is notoriously inexact, and this can be seen in the vast difference in size between our proven, probable, and possible reserves. There are those who would like to keep focused merely on the proven reserves, and in so doing can predict that we have no more than 11 years' worth of natural gas left.[18] That seems rather pessimistic: doomsday prophets have been predicting the "End of Oil" for a number of years now, not taking into account the very real effects of technological advances in petroleum engineering. Even the term "technically recoverable reserves" is a flexible one that mostly reflects the price point at which exploitation of certain reserves becomes economically viable.

Given the very real uncertainty that exists when it comes to exactly how much natural gas and tight oil the United States is likely to be able to extract from known and as yet unknown resources, any remark on the future of the domestic exploitation of hydrocarbons would be almost entirely speculative. The Energy Information Administration claims that we have resources for another 85 years of exploitation at current levels based on what it estimates current technically recoverable resources are.[19] Those estimates have been called into doubt in the past, but the predicted decline in production by those doubters has not occurred. [20] What can be said to be true is that the efficiency with which oil is extracted today from unconventional reserves is vastly superior even to that of ten years ago. Thus, the extent of existing resources—discovered and otherwise—is in effect unknowable without active exploitation. By the same token, what cannot be denied is that the position the U.S. finds itself in today with regard to the total of proven, probable, and possible reserves is vastly better than it was around the turn of the century. Will the U.S. become energy independent? Maybe.

It is important to contextualize this emphasis on the theme of energy independence as an overarching goal in and of itself, given that its importance for a society's economic prosperity is clearly overstated: Venezuela is energy independent. So are Angola, Equatorial Guinea, Ecuador, Libya, and Iraq. Singapore, Japan, Germany, and Hong-Kong, on the other hand, import virtually every last joule of energy they consume.[21] Autarky is not all it is cracked up to be—ask any North Korean.

The issue at hand is not whether a country is capable itself of producing the energy it needs to fuel its economic activity, but whether it can rely on a steady supply of that energy at a reasonable price, regardless of the origin of that energy. Here, of course, lies the rub. Dependence on foreign sources of energy does create a certain vulnerability in that it creates a reliance on the willingness of vendors to play by the rules, and history teaches us that oil producing countries—especially when they are members of OPEC—are willing to harm their economic self-interest for geopolitical reasons. Russia has also demonstrated such a willingness.[22] The concerns that exist within the United States with regard to our inability to produce domestically the energy we consume are rooted in a history of manipulation by certain energy producers upon which we have historically relied.

In addition to the deliberate manipulation by oil producing countries we witnessed in the 1970s, there is the added concern of non-state actors who might seek to disrupt supplies for religious and political reasons, as well as the disruption of supplies that occurs when oil producing regions become embroiled in political conflict, as has been the case in Libya and the Levant. On the other hand, it should be noted that organizations such as ISIS have shown themselves to be perfectly happy to sell oil to the world markets: this is, after all, how one funds the bloodshed they have wrought upon Syria, Iraq, and Libya. It seems unlikely that ISIS cares very much who consumes the oil it controls, so long as it helps them to prolong their miserable existence.[23]

At this point in time, however, the majority of our imports come from within the hemisphere and primarily from Canada, which seems particularly unlikely to

become the next Syria. Rather, it is one of the most politically stable countries in the world, and one that seems unlikely to seek to inflict economic harm on the United States. The only country in the region that has specifically sought to block exports of its energy resources to the United States has been Bolivia, and at great cost to its own economy.[24]

While there may not be great need to worry about the end of the shale gas revolution quite yet, there are serious concerns with regard to the production of natural gas from shale, which may complicate the narrative. One of the least appreciated threats to natural gas production from unconventional sources has been the effect of fracking on inhabited areas. Fears of intrusion into ground water have sparked protests against fracking in numerous communities. Meanwhile, fracking is producing significant seismic activity in areas such as northern Oklahoma, which was hit by an earthquake in September 2016 that measured 5.8 on the Richter scale and caused some minor damage to the town of Pawnee. The United States Geological Survey has warned of the potential for even bigger earthquakes as a result of waste water injection into disposal wells.[25] This constitutes a true problem for the industry, which has largely been unwilling to acknowledge the connection between seismic activity and exploitation of oil and natural gas. Until the shale gas boom, Oklahoma rarely experienced earthquake activity, whereas in recent years the number of earthquakes has risen from two per year to over 4,000 per year, including some that have caused property damage and minor injuries.[26] It seems likely that an even bigger earthquake than the most recent one would cause significant damage to a region that has no history of earthquake mitigation. There is, for now, no good answer to the resultant conundrum. Indeed, it is interesting to note that this seismic activity is posing a real threat to the largest reserves of petroleum in the U.S.—in Cushing, Oklahoma—, which may be damaged by earthquakes produced by the exploitation of natural gas.[27]

The most overlooked threat to our energy security, however, lies in the distribution of electricity: the electrical grid itself. The vast majority of disruptions that take place in the United States, and at times at a very large scale, are caused by malfunctions in that system, which is vastly overcomplicated and underfunded.[28] This has produced massive blackouts, including a recent one spanning the entire Northeast and into Canada (2003). In reality, winter storms and other weather phenomena cause more damage every year than any other circumstance. Hurricanes cause people and industries to remain without power for weeks at a time.[29] The potential for terrorism there is far greater than in other parts of the energy supply chain: it is childishly simple to cause great damage with the most primitive of tools, and there is some evidence at least that we should actually be concerned about sabotage in the grid.[30]

Conclusion

The world is not as it was in 1973. While OPEC still has a real capacity to influence the world market by either depressing or raising the price of oil, innovation in petroleum engineering has drastically altered the landscape. In terms of reliable access to oil, the United States sits in the favorable position of being able to rely on its northern neighbor: Canada is certainly a much more reliable partner than Russia, which has in the past disrupted European supplies of natural gas for geopolitical reasons. In addition, despite the rather continuous predictions of the imminent end of the shale oil and gas boom that has transformed the energy sector in the United States, proven reserves now still look healthier than they did a decade ago. There is simply no argument to be made that the United States is not at this time significantly less vulnerable to deliberate disruption of its energy supplies than it has been for most of the period between 1970 and 2005.

Nevertheless, there is reason to be concerned with regard to our continued reliance on fossil fuels as the main source of energy. While the switch from coal to gas has helped reduce greenhouse gas output in the United States, global climate change and rising sea-levels do pose a very serious threat to a number of low-lying coastal regions, while changes in weather patterns across the continent pose a real threat to agriculture.

There is also real concern about the effect of fracking on some regions of the country, and is especially true in Oklahoma, which has become one of the most seismically active places in the country. There is no clear answer to the concerns Oklahomans have: if waste water injection into disposal wells continues, then it is entirely possible that damaging earthquakes will follow.

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Notes

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