What Are the Chances The United States Becomes Energy Independent?

Some analysts argue that the shale oil/U.S. energy independence narrative is a myth. The United States cannot become energy independent even under the best of circumstances. Yet others argue that energy independence is a certainty, perhaps sooner than expected. That's because energy independence is a story that extends beyond oil and gas. Perhaps half of the credit for independence will belong to conservation and renewable energy sources.

U.S. energy independence: an inevitability or a fairy tale fantasy?

THE INTERNATIONAL ECONOMY

THE MAGAZINE OF INTERNATIONAL ECONOMIC POLICY
220 I Street, N.E.
Suite 200
Washington, D.C. 20002
Phone: 202-861-0791
Fax: 202-861-0790
www.international-economy.com
editor@international-economy.com

The views of seventeen noted thinkers.

Time to cool the "independence" enthusiasm.

JAMES R. SCHLESINGER
Chairman, MITRE Corporation, former U.S. Secretary of Energy, and former Director, Central Intelligence Agency

Energy independence? That has been the alluring cry heard for forty years. It sells well politically—despite a dearth of evidence in its support.

Shale oil production has moved the United States to production levels well beyond those of 1970. Nonetheless, we now import twice as much crude oil as we did when President Nixon announced "energy independence" in 1973. Indeed, the percentage of oil imports far exceeds the 12 percent limit that President Eisenhower set in 1958.

To be sure, the sting of oil vulnerability has been substantially alleviated by the revival of U.S. production. The United States is again a major factor in world energy markets other than being the one-time largest oil importer. We export gas and oil products and look to increasing our role.

But our transportation system remains 97 percent dependent on liquid fuels—primarily oil. As long as the vehicle fleet depends on oil, we will have some vulnerability. And the world overall will remain far more vulnerable to major disruptions in the Middle East—which would effect us directly and indirectly.

The oil exporters have learned that the use of the "oil weapon" can boomerang on them.

Shale oil is not a "myth," but commentators should not let their enthusiasm get out of hand.

Independence is a certainty. America won the global energy lottery.

PHILIP K. VERLEGER, JR.
President, PKVerleger LLC

By 2020, the United States will export more energy than it imports. In fact, by that time it may be the world's largest exporter of petroleum products. It will be one of the world's largest coal exporters. It will also have become a major natural gas exporter. Thus, as I described on these pages almost two years ago, the United States will have achieved "energy independence" as defined by President Richard Nixon.

The United States will, however, still be part of the world energy market. U.S. petroleum product prices will reflect global trends. U.S. natural gas prices, while well below world levels, will also follow global fluctuations more than they do today.

Even so, the U.S. economy will be decoupled from the global energy market's ups and downs. To be blunt, the United States has won the global energy lottery. The rest of the world has lost. This means the United States will see increasing inflows of direct foreign investment in manufacturing and other energy-intensive processes should OPEC members and other producing nations keep world crude prices at current levels. This also means that EU countries, particularly Germany but also Japan and China, will see capital flying to the United States as firms seek access to lower-priced energy.

The United States won the energy lottery thanks to hundreds of efforts. While oil and gas explorers receive most of the publicity, the nation's success comes from a wide variety of contributors.

President George W. Bush deserves credit for his 2007 call to end our addiction to oil. The renewable fuel requirements in the Energy Independence and Security

Act of 2007 that Congress passed at his behest have already cut U.S. oil imports 15 percent and trimmed world oil prices at least $15 per barrel.

Governors, legislators, and regulators in over thirty states also deserve credit for requiring electric utilities to replace power generated by fossil fuels with generation from renewables. The latter now accounts for 14 percent of electricity production and may account for 30 percent by 2020.

President Obama and the auto industry deserve credit for their 2011 agreement to dramatically increase automobile fuel economy. The resulting mileage improvements could halve U.S. gasoline use in 2020 from the 2020 levels projected in 2008.

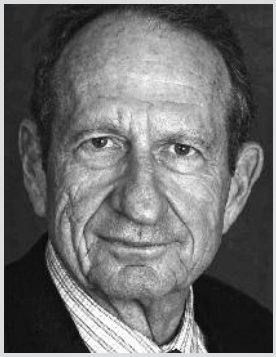
The entrepreneurs who regularly risk their own capital on new ideas deserve credit as well. They have introduced measures that reduce consumer energy costs (for example, leasing solar electric equipment for home installations). By 2020, these actions will render much fossil fuel use unnecessary.

This list can be extended almost indefinitely. Winning the energy lottery is also the result of the nation's decentralized government structure. Many of the early successes happened at the local or state level, not in Washington, D.C. Whereas leadership abroad comes from Brussels, Beijing, Tokyo, Paris, Berlin, London, and other capitals, in the United States it comes from the bottom. Leadership also comes from the smaller companies seeking to grow, not the multinationals.

Credit for the U.S. energy success also goes to average individuals rather than elites from Harvard or Johns Hopkins. It was engineers from Texas A&M and the Colorado School of Mines, not Princeton or Yale, who solved the shale oil and gas conundrum. Washington, particularly officials at the U.S. Departments of State and Energy, slowed rather than speeded progress.

The success of our decentralized approach to energy will yield larger and larger economic dividends over the next ten years, especially if other countries do not follow the U.S. example. Competition between individual states promises to drive electricity costs down even as nations such as Germany force consumers to pay higher and higher prices to amortize the costs of uneconomic renewable energy projects. In that country, electricity has become a luxury. As the president of E.ON, Germany's largest utility, warned recently, "There is a competitive advantage for America that we cannot prevent, at least for some time. It will take years and long years [sic] of innovation before we can start to shrink it."

The United States then has achieved something far greater than energy independence. Our success in weaning the nation's economy from global energy markets will reestablish our country as the world's strongest and most resilient economy.



Reduced import dependence, but not independence.

JOHN DEUTCH
Institute Professor, Massachusetts Institute of Technology, former U.S. Undersecretary of Energy, and former Director of Central Intelligence

The welcome and unexpected expansion of unconventional oil and natural gas resources and production in North America means that the region will no longer be hopelessly dependent on insecure and expensive foreign imports. It is likely that by 2015 imports of oil will fall below 10 percent of consumption and North America will export some liquefied natural gas, natural gas liquids, and oil. While there are many important economic and environmental uncertainties, this period of plenty will likely continue for several decades.

This is a genuine energy revolution that brings major economic benefits—jobs and low energy prices at home—but also significant geopolitical advantages. The United States will be a major player in global oil and gas markets, and import dependence will be less a constraint on U.S. foreign policy than in the past. Over time as low-cost unconventional oil and gas production spreads to other parts of the world, the diversity of supply increases, creating a downward pressure on oil prices and narrowing the energy equivalent price of oil and natural gas.

Beyond oil and natural gas, other energy matters to the U.S. economy and geopolitics. Global warming remains a major concern that links the United States to the world. Commercial nuclear power needs to expand worldwide while avoiding proliferation risks at the front and back end of the fuel cycle. Renewable energy also has an increasingly global character, as the recent trade controversy over the sale of Chinese-produced photovoltaic modules to the United States and the European Union illustrates.

Moreover, reduced oil and gas import dependence does not translate into energy independence. First, as the North American market will continue to be linked globally by energy prices, certainly for oil and over time for natural gas, so the U.S. economy will experience price shocks from supply interruptions that occur elsewhere. Some of our closest allies will remain dependent on oil imports;

their vulnerability will need to be taken into account by U.S. foreign policy. Sharply lower oil and natural gas prices are welcome to consumers and industry but put stress on the domestic economies of traditional major resource holders such as Saudi Arabia, Russia, and Iran, which in turn may lead to political instability and different security concerns.

The notion that the United States is energy independent implies that government and business leaders and the public no longer need to take into account energy issues in formulating economic or foreign policy. This is a false and dangerous conclusion. Energy remains a vital consideration linking U.S. prosperity and security to the rest of the world.

Americans can and will be energy independent.

DANIEL PIPES
President, Middle East Forum

Energy independence can be understood to mean different things: Being unaffected by price changes and importing no energy from outside the country; or just importing no energy whatsoever from outside the country; or not relying to a significant degree on foreign energy sources.

The U.S. economy is not autarchic and so the country will be influenced by factors that affect the price of energy elsewhere, such as by a closure of the Strait of Hormuz. It makes sense to trade in energy as in other commodities, so no commerce in energy is a foolish idea. But thanks to new technologies, the United States can become self-sufficient in the third, more restricted, meaning of the phrase.

I predict this because every effort at locating a "peak oil" moment has failed. It's time to give up this notion (along with Malthusian economics) and expect that human ingenuity will keep discovering new sources of energy. Indeed, the advanced countries are probably just at the beginning of the smart exploration of underground resources. For example, recent Japanese exploration for methane hydrate in its own surrounding waters has turned up vast supplies that could take care of Japan's energy needs for a century. Limiting our imagination to known resources is a nearly sure way to get things wrong.

So, I argue that Americans can and will be energy independent.

The prophets of scarcity have been tripped up by technological progress.

EDWARD N. LUTTWAK
Senior Associate, Center for Strategic and International Studies

What are the chances of U.S. energy independence? They are excellent, of course—"independence" being neither here nor there, but certainly the United States could soon cease to be a net importer of energy. Indeed, only perverse policies could prevent that outcome, given the vast expansion of natural gas output at prices that broaden the scope of its utilization with each passing day, at the expense of both domestic coal and imported oil. Ultimately, petroleum products would still be wanted only for those forms of propulsion (aircraft mostly) for which compressed natural gas is unsuitable—and U.S. crude oil and condensate output could entirely satisfy that remaining fraction of today's much broader demand. Moreover, the reserves already economically producible are large enough to carry the United States into the next technological era.

The prophets of scarcity have thus once again been tripped up by technological progress, all their fond predictions of ever-increasing U.S. dependence on liquefied natural gas as well as oil imports at ever-rising prices quite undone, mostly because of the advent of hydraulic fracturing, as well as many lesser innovations in exploration and extraction techniques, especially offshore.

Strangely enough, it is necessary once again to reiterate the obvious: there is nothing natural about economical access to "natural resources"—it depends on the cost-effectiveness of the relevant technologies, which keep improving.

But the prophets of inevitable, doom-laden scarcity need not be gloomy, not at all. Paul Ehrlich, whose 1968 bestseller *The Population Bomb* predicting imminent resource exhaustion turned out to be 100 percent wrong,

gloriously remained the revered prophet (inevitably receiving a MacArthur Foundation Genius Award). Meanwhile, John Paul Holdren, who joined him in the famous (losing) ten-year bet against Julian Simon (who predicted increasing abundance), is at this writing the senior advisor to President Barack Obama on all science and technology issues in his capacity as Assistant to the President for Science and Technology, Director of the White House Office of Science and Technology Policy, and Co-Chair of the President's Council of Advisors on Science and Technology.

That is where the perversion comes in. If those who desperately long for scarcity control government policies, they can make scarcity happen, in spite of the immense natural gas reserves now accessible at more than competitive prices, by invoking the danger of earthquakes, water-table contamination, earthworm trauma, and so on. In France, in April of this year the Conseil d'Etat has upheld the constitutionality of the 2011 law prohibiting *le fracking* for *gaz de schiste* (euphoniously challenged terms both). I have no doubt that many over here, and in the White House too, now agree with novelist Laurence Sterne ("They order, said I, this matter better in France"). And perversion need not be negative, for it only requires enough subsidization for wind and solar to become cheaper than gas, or even free. But absent perversion, the United States will soon export more energy than it imports, a better state than any autarchic "independence."

No chance the United States will become energy independent.

PHILIP J. DEUTCH
Managing Partner, NGP Energy Technology Partners

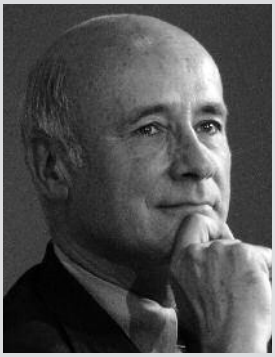
Advances in horizontal drilling and hydraulic fracturing have led to significant increases in domestic oil and gas supply. In 2011, the United States added 3.8 billion barrels of proved oil reserves, the largest increase since the Energy Information Administration began publishing estimates in 1977. Natural gas production is projected to grow from 19.18 trillion cubic feet in 2000 to 29.79 trillion cubic feet by 2030. In 2103, 4.4 gigawatts of photovoltaic installations are projected to be installed, up 30 percent from 2012. Thirteen gigawatts of wind energy were installed in 2012, up 28 percent from 2011, providing 42 percent of all U.S. new electric generating capacity. And the United States has the world's largest supply of coal (260 billion tons, an estimated 250 years of supply). It is truly a golden age of U.S. domestic energy. Notwithstanding these accomplishments, there is no chance the United States will become energy independent.

First, as an initial matter, it makes little sense to discuss the "United States" in thinking about "independence." Instead, one should focus on "North America." Reframing the question this way has the twin benefits of both reflecting reality—Mexico and Canada account for approximately 38 percent of U.S. net crude imports—and adding substantial domestic reserves to the equation (Canada has 173.6 billion barrels of proved oil reserves).

Second, even if one thinks in terms of North America, one must recognize that there is not one commodity called "energy." There are markets for electricity, crude oil, refined oil products, natural gas, CNG, LNG, biodiesel, ethanol, solar and wind power, and so forth. Instead of thinking in terms of a monolithic energy market, it is better to focus on the dozens of distinct, albeit interconnected, energy-related resources, products, and services. The differentiated nature of these sub-markets gives rise to a vastly complicated "energy" picture. A nation may have abundant oil resources, but very poor power generation, causing expensive and unreliable electricity (an issue seen in the Middle East). A country may have ample crude reserves or coal reserves, but little refining capability or prohibitive emission regulations. The interplays are complex. For example, in 2012, the United States simultaneously imported 11 million barrels per day of crude oil and refined petroleum products and exported 3.2 million barrels per day. Supply, refining, transmission, distribution, pricing, regulatory, and environmental issues all work to prevent a country from achieving independence across the totality of the energy universe.

Third, in a world of global markets, the idea of commodity "independence" does not work. Even if a country had an abundant domestic supply of a commodity, given free markets, the pricing of that commodity will be determined by worldwide supply and demand thereby causing dependence. Moreover, to the extent a nation's allies are dependent on a particular commodity, dependency also arises notwithstanding one's own domestic supply. (Japan, for example, a key U.S. ally, is the world's largest importer of liquefied natural gas, second largest of coal, and third of imported oil.)

The dramatic increase in North American energy supply will drive manufacturing, energy exports, and reshape geopolitics, but it will not make the United States energy independent.



The answer depends on the definition.

JOSEPH S. NYE, JR.
Distinguished Service Professor, Harvard University, former U.S. Assistant Secretary of Defense, and author,* The Future of Power *(2011)

Twenty years ago, in the context of surging imports, an OPEC embargo, and a quadrupling of oil prices, U.S. President Richard Nixon proclaimed a policy goal of energy independence. It was echoed by Jimmy Carter and Ronald Reagan, and has long enjoyed bipartisan appeal, but until recently, limited success.

What are the chances now of the United States becoming energy independent? The answer depends on the definition of independence. Definitions are stipulations. They are not right or wrong, but useful or less so. A useful definition of energy independence cannot be measured in terms solely of balancing supply and demand in North America, but should include political effects on the degrees of freedom that we will enjoy in our foreign policy. Let's postulate that the technological optimists are correct and supply and demand for energy can be balanced from sources within North America. Would we then be energy independent? Only in a physical, not a political sense.

The world economy will continue to rely on oil for a long time. The United States may be less directly vulnerable in the long run if it imports less energy, but oil is a fungible commodity, and the U.S. economy will remain sensitive to shocks from sudden changes in world prices. Moreover, the American economy would be affected by an oil shock that disrupts the rest of the global economy and damages our trading partners. Imagine a revolution in Saudi Arabia or a conflict with Iran that led to a blockade of the Strait of Hormuz. Such distant events in global energy markets would still inflict damage on the United States and its allies like Europe and Japan. So, even if America had no other interests in the Middle East, such as Israel or nuclear non-proliferation, a balance of energy imports and exports in North America would be unlikely to free the United States from military expenditures to protect oil routes in the region.

Under our policy of "rebalancing," East Asia has become a high foreign policy priority. American efforts to maintain a regional balance of power will depend upon global energy balances. Thus, a balance of physical supply and demand inside North America does not produce independence from energy problems in terms of foreign policy. At best, it will provide a welcome strengthening of our hand as we wrestle with those problems.

U.S. energy independence is unlikely.

DEBORAH GORDON
Senior Associate, Carnegie Endowment for International Peace

While the energy boom in the United States is increasing domestic access to oil and gas and growing exports of petroleum products, it is unlikely that this will translate into U.S. energy independence.

Factors beyond our control are likely to steer the U.S. away from independence. Some of these uncertainties include demand growth in emerging economies, future energy prices, and durable trade agreements, as well as the degree of policy intervention on climate change, water, and other societal impacts of fossil fuel use. The upsurge of tight oil, shale gas, other unconventional resources, and yet-to-be-discovered fossil fuels—in the United States and elsewhere—will only make the world more energy interdependent than ever before.

Setting politics aside, the technological push to develop different, difficult, and potentially more dangerous oil and gas resources is being driven by the unbridled power of the global marketplace. Petroleum products made from both U.S. oil and natural gas are extremely valuable and supplies to Asia, Europe, and elsewhere are on the rise. Pressure to ramp up liquefied natural gas exports is building. Direct sale of American crude oil to foreign markets could be the next energy foray.

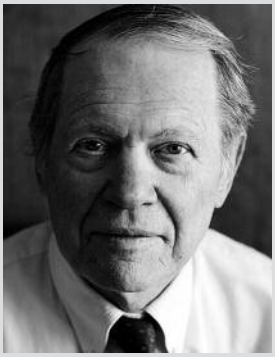
With overall fossil fuel consumption currently flat or falling in America and Western Europe, growth in energy demand is in emerging economies. These burgeoning importers therefore are gaining influence in global energy markets. Exporting countries, including America, will increasingly reorient themselves to those markets. As such, the fossil fuel commodities produced domestically

are not guaranteed to stay at home. The expanding array of fossil fuels is more likely to circumnavigate the globe. U.S. fossil fuel production could ultimately do more to trigger competition between global energy trade flows than fuel domestic independence.

If the ultimate goal is self-sufficiency, sovereignty, and security, the road to energy independence cannot be paved predominantly with fossil fuels. Energy efficiency and diversification into alternative renewable energy sources both need to play a far greater role on a worldwide scale.

Abundant fossil fuel supplies alone do not guarantee the United States and others energy independence. Just look at Saudi Arabia, Russia, and increasingly Canada. None of these countries have been able to isolate themselves from the world and avoid the economic and political struggles that oil and gas resource endowments bring.

Despite the hype and hubris, managing energy supplies will be an increasingly complex undertaking, one that needs to account for the externalities—climate change, water stresses, and various local impacts—that loom large. With the larger goal of international peace and security in mind, don't be surprised if the United States continues to struggle with managing its energy bounty, whether it attains some measure of independence or not.



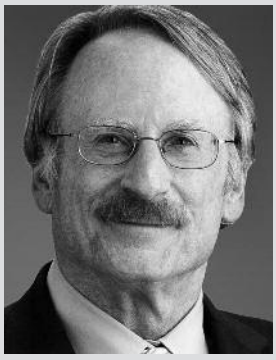
The United States could become a net exporter of energy.

RICHARD N. COOPER
Maurits C. Boas Professor of International Economics, Harvard University

There is a significant difference between "energy independence" and "oil independence." Thanks to the revolution in extracting the hitherto inaccessible natural gas from shale, the United States could in the next decade or two become independent in energy, in the specific sense that it becomes a net exporter of energy. Coal and if we allow it (as we should) natural gas could be exported, and these exports could exceed in useful energy content the energy of the oil Americans continue to import.

The same technologies that have led to greatly increased production of natural gas have also led to a significant increase in the production of petroleum and natural gas liquids. It is conceivable that within two decades the United States could become a net exporter of petroleum, although that is less likely than for natural gas. It would depend on four factors: increased domestic production of oil (including from Alaska, where oil production is declining); reduced consumption of gasoline, diesel fuel, and jet fuel for transportation (through a variety of measures to encourage conservation); conversion of vehicles to run on natural gas; and conversion of natural gas into liquid fuels, which is economically attractive if today's large price differential in the United States between oil and natural gas persists.

Even if the United States were to become independent of foreign supplies of oil, however, the Middle East and Russia would not become irrelevant as energy suppliers. U.S. market prices are linked to world prices, thus total supplies from those regions, and elsewhere, would influence the division of resource rents between U.S. producers and American consumers, high world prices favoring producers at the expense of consumers—hardly irrelevant. In addition, the United States has strong ties, even alliances, with other countries that will remain highly dependent on imported oil, such as Europe, Japan, and South Korea, among others. Our concern for, and economic interdependence with, those countries would ensure continued U.S. interest in world supplies of oil from all sources.



Greater energy security but not independence.

MICHAEL J. BOSKIN
Tully M. Friedman Professor of Economics and Hoover Institution Senior Fellow, Stanford University, and former Chairman, President's Council of Economic Advisers

The United States, North America, and, to a lesser extent, the entire world are on the cusp of a substantial improvement in energy security. The U.S. shale gas and oil boom on private land, development of Canadian tar sands, and the prospect of major expansion

through foreign investment in Mexico also promise the largest geopolitical shift to America's advantage since the Cold War ended. For development to proceed, vast private investment is necessary. Sensible science-based environmental regulation would help prevent a backlash due to sloppy development.

Fracking has made much more oil and gas development commercially and technically feasible in the United States and is now being explored by and in other countries. But it is too early to tell how much development the geology and transportation infrastructure, for example in China, can commercially support. Meanwhile, very low natural gas prices in the United States are slowing development, and the approval process for export terminals, which themselves require huge investment, is too long.

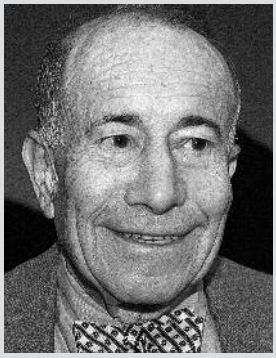
Because oil is traded in a global market and natural gas may, and should, be as well, the notion of literal energy independence is a bit misplaced. Generally, buying or selling more of a globally traded commodity is done at the margin on world markets at the world price. So in a strict sense we are not, and it would be unwise to be, completely independent of supply and demand conditions in the rest of the world. That would mean that over the long run we were paying too much for energy and our firms and workers would be denied opportunities for beneficial trade.

Over the next several decades, most projections show global energy demand growth will be driven by GDP growth, most rapidly in developing Asia, Latin America, and Africa, and primarily for transportation and electricity. It will be met by a combination of increased supply and improved energy efficiency. The supply increase will also need to offset natural field decline as well, and will require trillions of dollars of investment. It is likely that Europe and Asia will continue to be large net importers from Russia and the Middle East.

The United States on its own is still likely to consume more oil even than the expanded production and thus will continue importing, but will be in a position to export natural gas. North America as a whole is likely to be in pretty close to balance on liquids and an exporter of natural gas, particularly if improved integration proceeds via pipeline and cross-border investment with Canada and Mexico.

Another important development in recent years, likely to continue going forward, has been impressive conservation, which relieves the need to expand supply even further. An additional component of the supply and demand net balance will be the pace and net impact of regulatory changes, that is, environmental policies designed to raise the price of fossil fuels and/or promote conservation. It is unlikely that renewable technologies will be commercially feasible at enough scale to make a large impact on global energy use any time soon, but they likely will play an important niche role.

In sum, greater but not complete energy security from expanded global supplies and diversification by source, type, and geography is likely. Literal independence is not, and would be unwise.



Becoming independent from global markets is fanciful.

CHARLES WOLF, JR.
Distinguished Chair in International Economics, RAND Corporation, and Professor of Policy Analysis, Pardee RAND Graduate School

That the U.S. role in global energy markets will shift dramatically from being a large net energy importer to becoming a major net energy exporter is likely; that the United States will become "independent" of global energy markets is fanciful!

Discussion of "energy independence" is often marred by conflation of two very separate questions: whether and how much U.S. oil and gas production will increase as a result of fracking soft shale; and whether and when the United States will become "independent" of global energy markets. The answer to the first question is affirmative and large; the answer to the second is never.

Note, for example, that the United States is a major global grain exporter, although grain prices in the U.S. are heavily influenced by prices prevailing in global grain markets.The same is true for ferrous metals, as well as copper, aluminum, titanium, and other non-ferrous metals. Where relatively homogenous commodities are concerned—such as grain, oil, and metals—the one-price rule will prevail, along with local price differences arising mainly from variable costs of insurance, freight, and regulation. The United States is a major player in these markets; it is not "independent" of them.

Trying to forecast energy prices is especially hazardous in a world whose major producers include ones located in the volatile Middle East. That said, several strong trends suggest severe downward pressure on future energy prices. Sustained and increasing supplies from fracking in the United States are only one example. Another is application of the same technology in other countries with promising shale deposits, including China,

Algeria, and Argentina. Marketing efforts in these countries are already underway by several purveyors of the technology, including BP, Chevron, and perhaps others.

A third example is the increased output of energy-related supplies coming on line from China's large-scale foreign aid and investment activities in natural-resource projects in Latin America, Africa, Central Asia, Southeast Asia, and other emerging-market areas.

Economists frequently talk and teach much about price elasticity of supply (and demand): that is, how sensitive (or responsive) is supply of a product to changes in prices. Bearing in mind the numerous current and impending changes in energy supplies mentioned above, we probably should think more about the supply elasticity of prices: that is, how sensitive (responsive) are energy prices to technology-induced changes in supply.

GREG MASTEL
Senior International Trade/Tax Adviser, Kelley, Drye & Warren LLP, and former Chief Economist and Chief International Trade Adviser, U.S. Senate Finance Committee

WAYNE J. D'ANGELO
Special Counsel for Energy and Environment, Kelley, Drye & Warren LLP

The United States could soon run a trade surplus through energy exports.

After decades of increasing trade deficits, it may seem unimaginable to contemplate a world in which the United States runs a trade surplus. And a surplus driven not by increased manufacturing strength of farm output, but by exports of energy. But that scenario just might be possible.

For decades, the United States has imported an enormous amount of crude oil, which overwhelms U.S. energy exports of refined products, coal, and natural gas. In total, the deficit in energy trade makes up close to half of the U.S. trade deficit in recent years.

But all that is about to change. This May, for the first time in sixteen years, U.S. oil production surpassed imports. The Energy Information Administration recently estimated that, by the end of 2013, the United States will be the world's top producer of petroleum products and natural gas, surpassing both Saudi Arabia and Russia. For the entire history of the industry, oil and gas was produced from geological formations where hydrocarbons from source rocks migrated and became trapped. While it was well known that vast amounts of hydrocarbons were also trapped within source rocks such as shale, until recently, the technology did not exist to economically extract oil and gas from shale.

Hydraulic fracturing (or "fracking") is the technology that is typically credited with the increases in domestic production. However, those increases are more accurately the result of pairing hydraulic fracturing with horizontal drilling. According to the Energy Information Administration, use of these technologies in U.S. shale formations could unlock 58 billion barrels of oil and 665 trillion cubic feet of natural gas.

The game-changing nature of these technologies was realized quickly in the United States because of a fortuitous series of circumstances including lots of shale, private mineral rights, and a mature domestic energy industry. The expansion of shale energy has also been the result of laws and regulations favoring development. That regulatory structure, however, could be changing. The new technologies have drawn increased regulatory scrutiny. While there is arguably room for updating oil and gas regulation, there is also the possibility that regulatory missteps could stymie energy growth and the opportunity for a trade surplus. Regulatory decision points that can impact America's energy future include environmental regulations, access and permitting decisions, and export licensing. With such high stakes, one would hope that regulators make sober decisions based on the facts.

The implications of a markedly lower trade deficit or even a surplus would be far reaching. U.S. dependence on the Middle East, Russia, Venezuela, and other not-entirely-friendly countries would be reduced. The availability of cheaper natural gas has already boosted the competitiveness of U.S. industries. A strong positive change in the U.S. energy trade balance would also likely change the sources and the size of capital inflows to the United States, impact exchange rates, and inevitably have far-reaching and difficult-to-predict impacts on issues from greenhouse gas emissions to political stability in the world's current petroleum exporters. It could be a rare seismic shift in global trade patterns with impacts not fully appreciated for years to come.

The goal should be energy interdependence.

SIMON LESTER
Trade Policy Analyst, Cato Institute

Over the past several years, there has been a boom in energy production in the United States, as new technology has allowed the industry to access previously unrecoverable oil and gas reserves. Some have suggested that these new resources will allow the United States to become "energy independent." In my view, though, whether this happens—and it may—is purely an academic exercise. Energy independence should not be a policy goal, and energy interdependence actually makes us better off.

To begin, let me note that if all the world's oil and gas were located in, say, North Korea, I would be concerned with dependence on foreign energy. But this is not the case. Oil and gas production has many sources, and a significant percentage of our imports comes from long-time friends and neighbors Canada and Mexico. (Other sources are less stable and reliable, of course, but ending our trading relationship with them would not make sense).

Turning to the core issue—independence versus interdependence—the argument for trading energy is the same as the argument for trading any goods or services. Drawing on some very basic economic principles, the only way we should want the United States to be "energy independent"—that is, buying all its energy from domestic sources—is if we had a comparative advantage in producing these resources. If that were the case, then yes, we should buy only domestic energy. But if not, Americans are better off buying their energy from whomever can produce it relatively most efficiently. Sometimes that will be an American producer, but sometimes not. Trading energy in this way will bring lower prices, and, furthermore, diversifying our supply brings greater energy security and stability.

Thus, trading energy resources is not something to worry about. Rather, it is something to celebrate.

By contrast, arguments for "energy independence" can lead to dangerous proposals, such as restrictions on U.S. exports of liquefied natural gas. One argument for such policies is that we should give U.S. industry an advantage by making cheap energy available. Such a policy has two problems, however. First, it likely violates World Trade Organization rules, which prohibit export restrictions. And second, by lowering overall demand and keeping prices down, export restrictions of this kind would reduce the incentive to do more exploration and increase the supply of this energy.

There is an energy boom going on in the United States right now, and that is good for America. By all means, let's produce as much as we can. Will this make the United States energy independent? That's a difficult factual question, and I appreciate the attempts of the other contributors in this symposium to answer it. However, we should be careful not to get too caught up with this idea. If we give it too much emphasis, we run the risk of giving support to detrimental policies, like restricting liquefied natural gas exports, that are based on economic nationalism. Instead, we should let oil and gas be traded as much as the market indicates is appropriate.

America has not been as successful in promoting fossil fuel alternatives.

GARY KLEIMAN
Senior Partner, Kleiman International Consultants

According to the International Energy Agency, the United States has just passed Russia as the world's leading oil and gas producer as our imports have respectively declined 15 percent and 30 percent to slash the trade deficit the past five years. We have not been as successful as other advanced and emerging economies in promoting fossil fuel alternatives, given traditional opposition to carbon taxes as in Europe or central planning incentives as in China or India. Conservation and technology advances have already cut and diversified reliance on Mideast, African, and Latin American suppliers, contributing to the general commodity price malaise altering growth and policy prospects in these regions. Geopolitics will continue to weigh on the hydrocarbons outlook, and despite greater independence in that sector, other commercial and financial ties will affect near-term bilateral and multilateral relations as sources

also recognize the historic shift underway and embark on a range of savings, infrastructure, and human resource initiatives to reflect the new landscape. Typical features include sovereign wealth fund allocation and large-scale capital project spending, alongside educational and health reforms that now assume priority as the massive waves of industrial world energy appetite and liquidity infusion steadily recede.

Just to the south, Mexico's president has proposed opening the state oil monopoly to private participation to raise efficiency and prepare for budget reliance on other revenue forms including "green" industries. In Venezuela, where petroleum exports are 95 percent of the total, post-Chavez leader Nicolas Maduro is struggling with the socialist legacy of heavy controls, slow growth, and runaway fiscal deficits and inflation. China has already pushed back as the main creditor and importer, replacing the United States, and the decade-long currency regime may soon introduce unprecedented flexibility. Elsewhere, Russia and Saudi Arabia are imposing austerity measures as current account windfalls dwindle and also are revisiting questions of political as well as economic liberalization that were sidetracked by the boom. In sub-Saharan Africa, fresh offshore and onshore finds multiply, but longstanding OPEC member Nigeria realizes it can no longer delay privatization and anti-subsidy measures crucial to fostering a middle-class, middle-income future in a post-energy era.

Energy independence will come—and from an "all of the above" approach.

DAN MAHAFFEE
Director of Policy and Board Relations, Center for the Study of the Presidency and Congress

While October 2013 was filled with many political ironies, it was notable that on the same day that the United States surpassed Russia in oil and gas production, the headlines were instead filled with stories about a looming government shutdown. While it is worth examining the factors behind shale production and concerns about decline rates, we must also look at the long-term decisions that have to be made to achieve American energy independence.

Currently, discussions surrounding decline rates and the geology of specific formations yield more questions than answers—we see continued growth in production from the Marcellus formations despite a reduction in drilling, while the Dakotas have seen steeper decline rates than expected. Despite these contradictory trends, the American natural gas surplus has resulted in wholesale prices that are a fraction of those overseas. As the United States continues developing the infrastructure (and political attention) to export natural gas, we will see this price difference begin to disappear, and price increases will incentivize producers to renew drilling in more difficult formations. The market may provide the pressure to overcome decline rates from existing production techniques.

In the near-term we may also discuss "North American energy independence" as improved linkages with Canada and Pemex reforms in Mexico bring together greater integration of North American energy supplies and consumption. Again, this will require increased diplomatic and political efforts, as well as attention to potential disruptions, such as a Venezuelan collapse.

Energy independence will also require transitioning the transportation sector—currently the largest consumer of petroleum—towards natural gas, biofuels, and electricity as sources of energy.

Increased use of natural gas power plants, advances in nuclear technology such as Small Modular Reactors, the continued development of renewables, and technologies such as carbon sequestration will provide for cleaner domestic electricity generation and industrial production.

Finally, increased efficiency will be a determining factor in energy independence. Currently, 61 percent of all energy used in the United States is lost to heat, friction, and other inefficiencies. While we will not be able to supersede the laws of thermodynamics by act of Congress, we can reduce consumption through better efficiency. Again, the transportation sector will be a key area, as 79 percent of energy used in that sector is lost—an amount of energy almost equal to the total energy in imported petroleum.

These facts and trends tell us that energy independence will come from an "all of the above" approach that will include continued shale extraction, nuclear systems, new technologies, and increased efficiency. Driving these interlocking factors will require coordination between government, industries, and the American people.

Then again, in a few decades, we may again be having conversations about "American energy independence" based on concerns surrounding the supply of lithium, rare earth elements, and other vital building blocks of new energy technologies.

The story is positive. The United States is already self-sufficient in natural gas.

ARIEL COHEN
Senior Research Fellow in Russian and Eurasian Studies and International Energy Policy, Heritage Foundation

First of all, when it comes to energy, oil and gas are separate commodities. While oil is traded globally and the price of its different brands depends on their characteristics and transportation costs, natural gas is still mostly a regional commodity. The share of liquefied natural gas which can be traded globally is increasing, but it still constitutes a relatively small number.

The United States is inundated with shale gas, making it self-sufficient in natural gas for a long time into the future. The U.S. abundance in natural gas, and specifically in shale gas, causes the current price of natural gas to vary greatly among different markets. In the United States, one million BTUs costs $3.60–$5.80, while the same amount of gas costs $12–$14 in Europe and up to $18 in Asia.

Oil is a global commodity, though. There are several ways gas can help the United States lower its dependence on foreign oil from volatile regions. There is nothing wrong with getting oil from Canada, Mexico, Brazil, and for that matter, Africa.

For instance, some of the cheap U.S. gas can be used as liquefied natural gas and compressed natural gas to fuel automobiles. Currently, 98 percent of vehicles in the United States run on gasoline produced from oil. U.S. shale gas can be used to increase the share of automobiles that run on liquefied natural gas or compressed natural gas. It will be easier to convert truck and bus fleets to liquefied natural gas. Also, some of that gas can be converted into methanol and can then be added to conventional gasoline, or can be used as a source to generate electricity which finds its way into electric vehicles.

However, these measures alone are not solving the problem of oil self-sufficiency. And they do not have to. It is wrong to talk about "energy independence." The United States is not in serious danger due to imports of oil when we think short and even medium term.

For the past several years, oil consumption in the United States has been in decline due to growing engine efficiency, more telecommuting and online shopping, and so forth. Countries also have different efficiency of oil production, and there always will be regions where the cost of production is considerably lower than in the United States.

However, the same techniques (hydraulic fracturing, or "fracking") used for extracting of shale gas can also be used for production of oil. U.S. and North American production of oil is rising due to new technology and will continue to rise.

In the meantime, countries bordering the United States are taking steps which are likely to increase their potential to sell oil. Mexico is opening Pemex, its national oil company, for foreign investments. Canada is actively developing oil sands as well as onshore and offshore drilling. Thus, North America may become self-sufficient in oil, while completely satisfying its demand in natural gas and exporting liquefied natural gas. Even some oil exports are possible, while gasoline and other refined products are exported already.

North America is not an oil price market maker, however. That distinction still belongs to Saudi Arabia, with a low cost of production and still-large reserves. However, the United States is not substantially dependent on importing oil from the Persian/Arab Gulf, including Saudi Arabia. Today, the United States imports negligibly little from Russia; around 9 percent of our oil consumption is from the Gulf. The Gulf is a very important source of oil—but for Europe and Asia, not for the United States. Thus, the long-term U.S. energy outlook is bright. One would hope the government just is not going to make things worse by excessively regulating the market.

U.S. energy independence is a fantasy.

CLAIRE CASEY
Managing Director, Garten Rothkopf

Since Richard Nixon first coined the term in the early weeks of the 1973 oil embargo, "energy independence" has been the holy grail of U.S. energy policy. Today, it can best be described as a siren song, one that misrepresents what is achievable and threatens to distort

the political debate on everything from energy exports to the U.S. role in the world.

U.S. energy independence is a fantasy, but not because of the myriad technical, market, and regulatory variables that surround the development of our energy resources. While the pace and shape of that development are unpredictable, there is little doubt that the United States has the potential to become a net energy exporter in the foreseeable future, thanks to vast reserves of oil and gas and a revolution in efficiency and energy management technologies. But none of this, even in the best circumstances, would make the U.S. independent of global energy markets.

The U.S. economy is deeply embedded in complex global energy markets—and new supplies and suppliers increase the stability and resiliency of the entire system to shocks. More than a U.S. boom, what we are experiencing is a North American boom—the United States and Canada accounted for 69 percent of the increase in global oil production last year. In total, the U.S. Energy Information Administration projects that all non-OPEC oil production will increase by an additional two million barrels per day by the end of 2013, providing a significant cushion to offset production disruptions elsewhere and reducing the importance of OPEC spare capacity.

These are positive developments that greatly enhance U.S. energy security, but short of embracing autarky, Russia and the Middle East will never be irrelevant to the United States. To draw this out in the clearest possible example, not one drop of Iranian oil enters the U.S. market, but unplanned production disruptions there were a major driver of higher global oil prices this year. Likewise, a spike in production shortfalls in Nigeria this summer hit global (and therefore U.S.) market prices, despite Nigeria's share of U.S. imports being cut in half thanks to increased imports from Canada.

There is a risk that continuing to embrace the rhetoric of energy independence will drive isolationist sentiments and the growing perception that the United States will soon be able to wash its hands of the messy Middle East. It also could create distortions in our own economy—most clearly today in the ban of crude oil exports even as production of light sweet crude, valuable around the world, sits in the U.S. market without an infrastructure to process it. And it risks missing out on the real advantages—both economic and security. Already, U.S. gas production has changed markets and advanced U.S. interests. European allies have been able to leverage new supplies (once destined to the United States) to renegotiate supply contracts with Russia. Unprecedented access to the Japanese market may soon be opened for U.S. companies through the Trans-Pacific Partnership trade negotiations, which Japan joined largely as a path to secure U.S. gas exports. The energy boom has just begun and promises to transform global markets and geopolitics, but a necessary step in realizing its potential value is discarding the goal of independence. ◆