PERSPECTIVE

ASP
American Security Project

The Geopolitical Implications of U.S. Natural Gas Exports

March 2013

Nick Cunningham

Summary

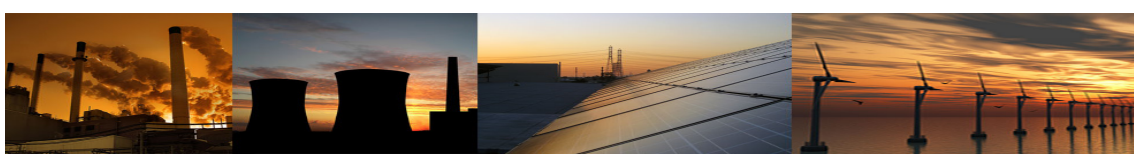
- Exporting liquefied natural gas (LNG) to American allies can improve their energy security, erode oil-indexed gas contracts in Asia, and reduce the influence of unfriendly nations using energy as a political weapon.
- Domestic natural gas production has surged 23% between 2005 and 2012, leading to a 46% decline in prices.
- The natural gas industry hopes to export LNG, but permits are required to export to countries that do not have a free-trade agreement with the United States.
- Fuel switching from coal to natural gas has had climate benefits for the U.S. – helping our allies do the same can contribute to achieving global greenhouse gas emissions reduction targets.

Introduction

In 2012, U.S. natural gas production surpassed 29 trillion cubic feet, an all-time record.[1]

The combination of horizontal drilling and hydraulic fracturing, or "fracking," has allowed American drillers to release natural gas from shale reserves that had previously been uneconomic to exploit. While the environmental effects of fracking are still under heavy debate, the effects are undeniable: the production of natural gas is booming.

The enormous production has resulted in a glut of supply and rock-bottom prices. Producers hope to relieve the glut of natural gas in the U.S. by exporting surplus production, taking advantage of higher prices around the world. However, under the Natural Gas Act, first passed in 1938 and amended several times since, the export of natural gas is illegal without approval from the Secretary of Energy.[2]



Nick Cunningham is a policy analyst at the American Security Project

The Federal Energy Regulatory Commission (FERC), the agency responsible for permitting export terminals, has a backlog of 16 LNG import and export applications, totaling 24 billion cubic feet (bcf) in capacity.[3] FERC contracted an extended review of the economic implications for allowing LNG exports, which it stated precluded permit approvals. The report was published in December, paving the way for a decision in the coming months.[4]

There are business interests on both sides of the debate. Proponents of expanding LNG exports, which includes the oil and gas industry, argue that the U.S. can create jobs and improve the trade balance by exporting energy. Opponents, including some manufacturing and petrochemical companies, raise concerns about the impact on consumer prices, preferring a scenario in which natural gas stays within U.S. borders to fuel what they term a manufacturing renaissance.

FERC's study indicated that LNG exports would only moderately raise domestic prices, even in the most aggressive scenario. In addition, the study indicated exports could contribute $10 to $47 billion to GDP by 2020, delivering net benefits to the economy.[5]

Much of the debate has focused on these economic effects. While the economics are certainly important, what is missing is a look at the geopolitical effects of American LNG exports. Only a few short years ago the U.S. was expected to be a large LNG importer. Now that the U.S. is on the cusp of exporting LNG, it is important to assess the implications of American gas abundance for both global natural gas markets and the geopolitical consequences.

LNG facility in Australia

There are geopolitical benefits from allowing LNG exports to move forward.

Permitting new LNG export capacity will provide more liquidity to the global LNG market, provide alternative sources of energy for our allies, and accelerate the trend away from the oil-linked pricing system in Asia and Europe. LNG export capacity will undermine the ability of major energy suppliers to use energy as a political weapon.

LNG exports could improve the energy security of America's closest allies. Exporting LNG can help America's allies around the world bridge from dirtier sources of energy, like coal and oil, to cleaner, carbon-free sources of energy.

In the meantime, sustained investments in next-generation clean energy are needed to for long-term energy security.

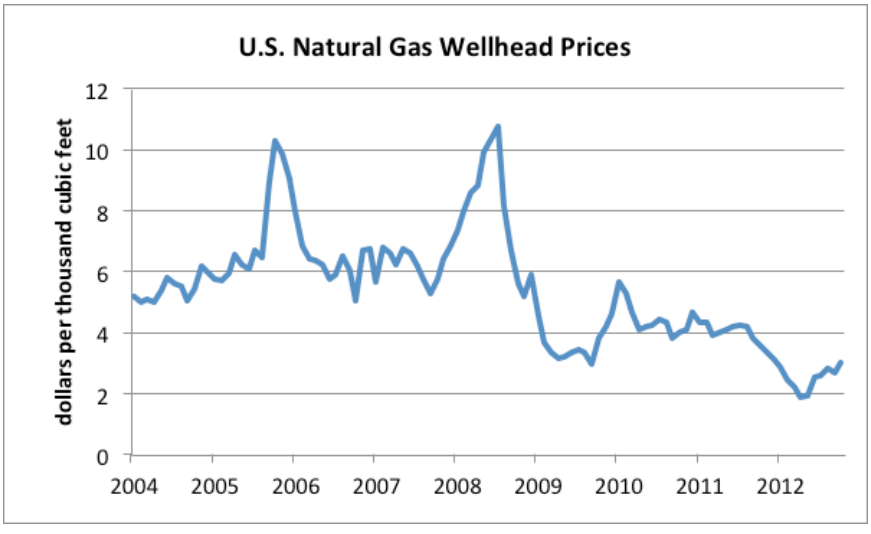
The Shale Gas Revolution

Natural gas is the second most consumed energy source in the U.S. behind oil, representing 26% of the total.[6] It is used for generating electricity for homes and businesses, heating, and as an important feedstock for a range of industrial processes and products. However, prices for natural gas have been historically volatile (see chart).

As recently as 2003, then Federal Reserve Chairman Alan Greenspan warned, "Today's tight natural gas markets have been a long time in coming, and futures prices suggest that we are not apt to return to earlier periods of relative abundance and low prices anytime soon."[7]

The shale gas revolution has proved Mr. Greenspan wrong. Advances in hydraulic fracturing and horizontal drilling, developed over decades, have borne fruit in the last five years. They have unlocked enormous quantities of natural gas across the United States, promising up to 100 years of resources.[8] As a result, prices have plummeted.

Now, instead of worrying over where to find sources of natural gas at reasonable prices, the debate has shifted towards what to do with excess capacity.



The Global LNG Market

Unlike oil, the market for natural gas is not truly global. Rather, natural gas is priced differently in different parts of the world. This is due to the nature of natural gas – it is not easily transportable.

As a result, although LNG is traded globally, natural gas markets are separate. For example, natural gas spot prices in Asia reached $15.63 mcf in December 2012, while spot prices in the U.S. were only $3.30.[11] The spread was even wider earlier in 2012, when prices in Japan reached $17.59 while U.S. spot prices were below $2.60.[12]

The huge price differential, combined with a surplus of drilling capacity and production in the U.S., has sparked calls for allowing American natural gas producers to export their surplus, taking advantage of what is seemingly an easy arbitrage opportunity.

How does LNG Work?

To turn natural gas into LNG, it must be cooled to -256 degrees Fahrenheit, turning it into a liquid.[9] The LNG is transported by ship to its destination, where it is regasified and distributed. This process is expensive and requires large capital investments in infrastructure, with some estimates saying that liquefying and transporting natural gas adds an additional $4-$5 per thousand cubic feet (mcf).[10]

To understand the opportunity that exists, we must understand why prices are so different. The advances in drilling technology in the U.S. have opened up vast new resources, pushing prices to record lows. However, why are prices so high in Asia?

LNG Ship Unloading at Terminal

To begin with, unlike in the U.S., where natural gas is largely priced on supply and demand fundamentals, in Asia and to a lesser extent in Europe, prices of natural gas are linked to the price of oil. This is because, in the past, natural gas was produced mostly as a byproduct of oil exploration, and prices have historically tracked oil. Now, since the spot price of oil is substantially more expensive than the spot price of natural gas in many markets, LNG importers operating on fixed contracts are paying a premium for their gas.

More importantly, Asian LNG prices spiked after the Fukushima nuclear crisis in March 2011 due to a spike in demand for non-nuclear energy sources. Japan decided to shut down nearly all of its 54 nuclear reactors, requiring a switch to other sources of energy to power its economy, which included LNG.

This "demand shock" has shifted the markets for LNG across Asia.[13]

In other words, LNG prices spiked in Asia after Fukushima because demand surged and supply did not.

This creates an opportunity for U.S. producers to supply Asia with some of its vast natural gas reserves, while generating excess profits.

LNG tanker off the coast of Homer, Alaska

Under the Energy Policy Act of 1992, exporting LNG to countries with which the U.S. has a free-trade agreement was deemed to be consistent with the "public interest."[14] This means LNG exports should be approved relatively easily. In the coming months, the FERC will decide on whether or not to grant permits authorizing exports of LNG to countries with which the U.S. does not have a free-trade agreement.

Currently, Cheniere Energy's Sabine Pass liquefaction facility is the only project to have received approval thus far to begin exporting LNG.[15] There are 16 other applications pending.

Geopolitical Benefits of Natural Gas Exports

If natural gas exports do in fact become economically feasible over the next few years, the additional global supply could have effects beyond energy markets. In this regard, the U.S. has national security interests at stake. Natural gas exports can support our allies around the world by helping them diversify their energy sources.

To that end, former Senator Richard Lugar (R-IN) introduced legislation in late 2012 to allow LNG exports to NATO Allies, hoping to boost energy security in Eastern Europe.[16] Building on this, a bipartisan group of Senators introduced legislation in January 2013 that includes both NATO Allies and Japan.[17]

LNG exports will help American allies in two key regions - Europe and Asia - by undercutting the political clout of dominant producer states and by expanding the quantity of total energy supplied to allies starved of energy.

European Allies

Europe remains highly dependent on Russia for natural gas, which supplies 34% of its total natural gas imports.[18] For countries in Central and Eastern Europe (like Czech Republic, Hungary, Bulgaria, Greece), that share is much higher. [19]

Russia has demonstrated its willingness to use energy as a political tool, cutting off natural gas supplies to European consumers several times over the last decade – with Eastern European countries most harmed by Russian manipulations.[20]

The reasons for such actions are disputed by the Russian government and Gazprom, but the timing of these events seem created to maximize Russia's political influence. The result is that European countries are vulnerable to a supplier that can be described as unreliable at best.

There has been moderate progress to date in loosening Russia's grip over European energy, and the role of LNG has been instrumental. Rising LNG purchases has allowed Europe to find new suppliers for its energy needs, including Nigeria, Egypt, Trinidad and Qatar. This has led to a diversification of natural gas imports, allowing Europe to cut its dependence on Russia for natural gas from 75% in 1990 down to only 34% today.[21]

The U.S. has already contributed to this trend, albeit unwittingly. The shale gas revolution in the U.S. has freed up LNG imports that were once destined for American ports. LNG shipments were essentially rerouted to Europe. This has allowed LNG supplies around the world to grow, pushing down prices.[22]

However, Russian gas will continue to play a dominant role in Europe's energy future. [23] Germany's decision to shut down its nuclear fleet is already requiring more natural gas in its place. It is unknown whether natural gas production in Europe, from shale in particular, will grow in the future.

New infrastructure, like the recently opened Nord Stream gas pipeline under the Baltic from Russia to

Germany and the beginning of the South Stream pipeline under the Black Sea, will ensure that the link between Russia as a supplier and Europe as a buyer remains strong. Finally, efforts to reduce greenhouse gas emissions will mean natural gas takes on a bigger role, displacing coal (despite the temporary uptick in coal consumption as of late).

Several European countries, including Bulgaria, Croatia, Estonia, Lithuania, Latvia, Poland, Romania, Turkey and Ukraine hope to weaken this dependence by constructing LNG import terminals.[24]

The expansion of U.S. LNG exports to Europe could help these countries reduce Russian influence – in particular, the small, heavily dependent, Eastern and Central European states.

The more these nations can diversify their energy portfolio, including more sources of imports, the less market share – and political power – Russia and Gazprom will control. This will pre-empt the incentive and ability of Gazprom and the Russian government to play games with energy supplies.

Turkey depends on Iran for 20% of its natural gas imports.[25] While the U.S. and its allies are trying to isolate Iran from international markets in an attempt to force a negotiation over its nuclear program, Iranian natural gas exports provide an economic lifeline. Iran only exports natural gas to three countries – Turkey, Armenia, and Azerbaijan – and Turkey accounts for 90% of Iran's natural gas exports, earning Iran $10.5 million per day.[26] Providing Turkey with more options to meet its energy demand can reduce their reliance on Iran – and increase the pressure of sanctions on the Iranian regime.

The U.S. could make progress in critical national security goals by allowing the export of natural gas to its allies. European countries are making efforts to reduce Russian control over their energy markets, and U.S. LNG can accelerate this trend. Increased LNG from the U.S. will provide Europe with more options, diversify the global LNG market, undermine Russia's ability to dictate terms and reduce revenues to the Iranian regime.[27]

Asian Allies

Japan lacks substantial indigenous energy resources and is thus highly dependent on maritime imports for energy. It is the world's third largest importer of crude oil, second largest importer of coal, and the top importer of LNG.[28] To generate electricity, Japan relies heavily on these imported sources of energy.

The shuttering of nearly all of its nuclear power plants created a surge in energy imports to replace the lost capacity. This included a steep rise in LNG demand, pushing up prices. The high costs of LNG are sapping the Japanese economy, putting pressure on the government to return to nuclear power. Russia has already made preliminary moves to capitalize on Japan's energy problems – it is considering building LNG export terminals in the Far East to service Japan.[29]

Japan is in desperate need of energy and is actively lobbying the U.S. government to permit new LNG exports.[30]

South Korea is in a similar situation as Japan. With few energy resources to speak of, and a dysfunctional neighbor to its north, South Korea relies upon maritime imports to meet its energy needs. This dependence makes South Korea the second largest importer of LNG.[31]

The U.S. has a free-trade agreement with South Korea, meaning permits for LNG exports to South Korea will likely not receive heavy scrutiny during the permitting process.

However, allowing U.S. LNG exports to reach Japan would benefit South Korea just the same. This would create a more liquid Asian market for LNG, and U.S. LNG would relieve the supply crunch in Asia. More LNG would allow Japan and South Korea to find alternative sources of energy at lower prices.

If the U.S. exports LNG to its Asian allies, it can help them improve their energy security and their economies in a time of stress.

LNG tanker in Singapore

Severing the Oil-Natural Gas Pricing Link

Perhaps even greater than the effect of providing new LNG supplies to European and Asian allies, the addition of U.S. LNG to global markets would accelerate the decline of natural gas contracts based on an oil-linked pricing formula.

To the extent that LNG suppliers can dictate pricing, it is the result of a market that lacks liquidity and diversity.[32] In recent years, as a result of lower demand from the global financial crisis, as well as higher LNG supplies than previously expected, an enormous gulf opened up between the price of oil and the price of natural gas in many regions. Consumers in Europe and Asia paying a premium for oil-indexed natural gas have pushed for contract renegotiations, putting the entire oil-indexation arrangement into question.[33]

As LNG markets grow, incorporating more supplies and suppliers, the market becomes more liquid. Oil-indexed prices will eventually become a thing of the past. In fact, U.S. shale gas is arguably already a major factor in forcing Russia to accept spot prices for natural gas exports to Europe, instead of oil-indexation – marking a major shift.[34]

Allowing U.S. LNG exports would accelerate this trend. U.S. LNG exports would create a more liquid market, with deliveries based on supply and demand fundamentals instead of oil-linked contracts. This would allow America's allies to diversify their energy sources, reduce the burden on their economies, and free themselves from dependence on unfriendly countries.

Narrow Economic Window of Opportunity?

However, there are reasons to believe the export opportunity is smaller than is commonly perceived. Several studies highlight the likelihood that allowing exports to proceed without any constraints will not lead to large export volumes.[35]

This is due to several reasons. First, Japan may return to nuclear power after an extensive safety review.[36] This would make the supply crunch in Asia temporary, and weaker Japanese LNG demand in the future is likely to significantly reduce Asian LNG prices.

Second, there are countries other than the United States vying for the Asian LNG market. New export facilities are expected to come online in Australia, Russia, Canada and Mozambique in the next few years.[37] The U.S. is not the lowest cost supplier, and therefore would struggle to gain large market share.[38]

Third, oil-indexed contracts will decline as natural gas markets become more liquid.[39] As a result, pricing for natural gas based on liquid markets instead of the price of oil will push prices lower.

All of these trends result in a smaller business opportunity for U.S. LNG exporters than is commonly believed.

However, this is not a justification to limit exports. Rather, it highlights the exaggerated notion surrounding the negative impact on the U.S. economy from allowing LNG exports. The evidence suggests that the market will limit the amount of LNG the U.S. will be able to profitably export.

The Effect of Natural Gas Exports on Climate Change

As a fossil fuel, burning natural gas releases greenhouse gas emissions, which contribute to climate change. However, natural gas is the cleanest fossil fuel used for electric power. When combusted, natural gas releases 44% less greenhouse gas emissions than coal and 30% less than oil.[40]

The net effect on the climate from allowing American natural gas exports to move forward is ambiguous, but there is the potential of net benefits to the climate from exports. Exporting LNG to our allies may result in the displacement of dirtier sources of energy, like coal or fuel oil. This is most apparent in Japan, where to replace lost nuclear power capacity, Japan began burning more coal and oil to meet electricity needs.[41] Importing American LNG will allow Japan to use relatively more natural gas and less coal and oil.

The climate equation is global – emissions reductions here do little if they result in higher emissions elsewhere. Allowing natural gas exports has the potential to displace dirtier sources of energy, which would have a net benefit for the climate.

On the other hand, exporting natural gas will likely result in increased natural gas production in the U.S., with an associated increase in emissions. Methane, a greenhouse gas 20 times more potent than carbon dioxide, can be released during the drilling process.[42] Studies vary on the extent to which methane emissions escape during drilling, but should this trend prove to be worse than expected, the climate benefits of exporting LNG may be erased.

Natural Gas as a Bridge

Ultimately, natural gas cannot be the long-term solution to energy security. Both the United States and its allies need to develop the next-generation energy technologies to fully transition to a cleaner economy. While the United States has abundant sources of natural gas, the resource has a history of price volatility. Moreover, it may burn cleaner than coal and oil, but it still is a non-renewable resource that contributes to climate change.

To fully shield the United States and its allies from geopolitical tension, investments in both renewable energy as well as next-generation energy technologies are critical. Exporting natural gas can serve immediate geopolitical goals, but they cannot be the answer for the long-term.

Conclusion

There are likely to be significant geopolitical benefits if exports of LNG proceed in large volumes. Many of America's closest allies are in need of reliable energy partners, while others are at the mercy of unfriendly neighbors. U.S. LNG exports can provide an alternative source.

Allowing American natural gas to reach world markets will lower the price, offer energy diversity, and undermine expensive oil-indexed contracts. This will enhance our allies' energy security, and weaken the grip of their adversaries.

There are significant and real geopolitical benefits of removing restrictions on LNG exports.

Nick Cunningham is a policy analyst at the American Security Project, a non-profit, non partisan public policy and research organization dedicated to fostering knowledge and understanding of a range of national security issues.

Further Reading

Fact Sheet: What is Energy Independence?

Cause and Effect: U.S. Gasoline Prices

Critical Energy Choices for the Next Administration

A New Discourse: Climate Change in the Face of a Shifting U.S. Energy Portfolio

America's Energy Choices: 2012 Edition

Endnotes

1. Energy Information Administration. (2013, January 31). Natural Gas. Retrieved February 4, 2013, from U.S. Natural Gas Gross Withdrawals: http://www.eia.gov/dnav/ng/hist/n9010us2a.htm

2. 15 U.S.C. 717 Natural Gas Act of 1938. http://www.fossil.energy.gov/programs/gasregulation/2011usc15.pdf

3. Department of Energy. (2013, January 4). Applications Received by DOE/FE to Export Domestically Produced LNG. Retrieved February 4, 2013, from Fossil Energy web site: http://fossil.energy.gov/programs/gasregulation/reports/summary_lng_applications.pdf

4. Montgomery, W. D., Baron, R., Bernstein, P., Tuladhar, S., Xiong, S., & Yuan, M. (2012). Macroeconomic Impacts of LNG Exports from the United States. Washington DC: Nera Economic Consulting.

5. Ibid. 77.

6. Energy Information Administration. (2013, January 31). Primary Energy Consumption by Source and Sector. http://www.eia.gov/totalenergy/data/annual/pdf/sec2_3.pdf

7. Greenspan, A. (2003, June 10). Natural gas supply and demand issues . Testimony Before the Committee on Energy and Commerce. http://www.federalreserve.gov/boarddocs/testimony/2003/20030610/default.htm

8. Government Accountability Office. (2012). Information on Shale Resources, Development, and Environmental and Public Health Risks. Washington D.C.: GAO. 19.

9. Shell. What is LNG? Retrieved January 17, 2013, from Shell web site: http://www.shell.com/global/future-energy/meeting-demand/natural-gas/liquefied-natural-gas/what-is-lng.html

10. Medlock, K. B. (2012). U.S. LNG Exports: Truth and Consequence. Houston, TX: James A. Baker III Institute for Public Policy, Rice University. 30.

11. LNG World News. (2012, December 18). Platts: Jan Asia LNG Spot Prices Climb. Retrieved January 17, 2013, from http://www.lngworldnews.com/platts-jan-asia-lng-spot-prices-climb/

12. Prices for U.S. retreived from Energy Information Administration. (2013, January 16). Natural Gas. Retrieved January 17, 2013, from Henry Hub Natural Gas Spot Price: http://www.eia.gov/dnav/ng/hist/rngwhhdd.htm Energy Information Administration. (2013, January 31). Price of Liquefied U.S. Natural Gas Exports to Japan. Washington D.C. http://www.eia.gov/dnav/ng/hist/n9133ja3m.htm

13. Medlock, K. B. (2012). U.S. LNG Exports: Truth and Consequence. Houston, TX: James A. Baker III Institute for Public Policy, Rice University. 10.

14. Department of Energy. (2013, January 4). How to Obtain Authorization to Import and/or Export Natural Gas and LNG. Retrieved February 4, 2013, from Fossil Energy web site: http://www.fossil.energy.gov/programs/gasregulation/How_to_Obtain_Authorization_to_Import_an.html#LNG%20Exports

15. Department of Energy. (2013, January 4). Applications Received by DOE/FE to Export Domestically Produced LNG. Retrieved February 4, 2013, from Fossil Energy web site: http://fossil.energy.gov/programs/gasregulation/reports/summary_lng_applications.pdf

16. Ibid.

17. S.192 Expedited LNG for American Allies Act of 2013, 113th Congress. http://thomas.loc.gov/cgi-bin/bdquery/D?d113:2:./temp/~bdp9Ur::|/bss/|

18. Ratner, M., Belkin, P., Nichol, J., & Woehrel, S. (2013). Europe's Energy Security: Options and Challenges to Natural Gas Supply Diversification. Washington, D.C.: Congressional Research Service. Summary.

19. Ebinger, C., Massy, K., & Avasarala, G. (2012). Liquid Markets: Assessing the Case for U.S. Exports of Liquefied Natural Gas. Washington D.C.: The Brookings Institution. 42.

20. BBC News. (2009, January 1). Russia Cuts off Gas to Ukraine. http://news.bbc.co.uk/2/hi/europe/7806870.stm.

21. Noel, P. (2008). Beyond Dependence: How to Deal with Russian Gas. London: European Council on Foreign Relations. 5.

22. Jaffe, A. M., & O'Sullivan, M. (2012). The Geopolitics of Natural Gas. Cambridge: Belfer Center, Harvard Kennedy School and James A Baker III Institute for Public Policy. 9. http://belfercenter.ksg.harvard.edu/files/The%20Geopolitics%20of%20Natural%20Gas.pdf

23. Ebinger, C., Massy, K., & Avasarala, G. (2012). Liquid Markets: Assessing the Case for U.S. Exports of Liquefied Natural Gas. Washington

D.C.: The Brookings Institution. 42.

24. U.S. Senate. Committee on Foreign Relations. (2012). Energy and Security from the Caspian to Europe. Washington D.C. 31. Text available at http://thehill.com/images/stories/news/2012/12_december/sfrc_report.pdf

25. Ibid.

26. Energy Information Administration. (October 9 2012). Natural Gas Exports from Iran. Washington D.C

27. Ebinger, C., Massy, K., & Avasarala, G. (2012). Liquid Markets: Assessing the Case for U.S. Exports of Liquefied Natural Gas. Washington D.C.: The Brookings Institution. 43.

28. Energy Information Administration. (2012). Country Analysis Brief: Japan. Washington D.C.

29. Herszenhorn, & David. (2012, September 8). Russia and Japan in Agreement on Natural Gas Deal. The New York Times, p. A4.

30. Belogolova, O. (2012, November 24). Japan is Eager to Tap U.S. Natural-Gas Supply. The National Journal, http://www.nationaljournal.com/domesticpolicy/japan-is-eager-to-tap-u-s-natural-gas-supply-20121124.

31. Energy Information Administration. (2012). Country Analysis Brief: South Korea. Washington D.C.

32. Medlock, K. B. (2012). U.S. LNG Exports: Truth and Consequence. Houston, TX: James A. Baker III Institute for Public Policy, Rice University. 7.

33. Melling, A. (2010). Natural Gas Pricing and Its Future. Washington D.C.: Carnegie Endowment for International Peace. 10.

34. Jaffe, A. M., & O'Sullivan, M. (2012). The Geopolitics of Natural Gas. Cambridge: Belfer Center, Harvard Kennedy School and James A Baker III Institute for Public Policy. 9. http://belfercenter.ksg.harvard.edu/files/The%20Geopolitics%20of%20Natural%20Gas.pdf

35. For a more detailed discussion see the following studies: Medlock, K. B. (2012). U.S. LNG Exports: Truth and Consequence. Houston, TX: James A. Baker III Institute for Public Policy, Rice University.; Givens, D. (May 2012). Prospects for US LNG exports . Retrieved January 22, 2013, from http://www.nwga.org/wp-content/uploads/2012/06/Givens_2012_AEC.pdf; Ebinger, C., Massy, K., & Avasarala, G. (2012). Liquid Markets: Assessing the Case for U.S. Exports of Liquefied Natural Gas. Washington D.C.: The Brookings Institution.; Montgomery, W. D., Baron, R., Bernstein, P., Tuladhar, S., Xiong, S., & Yuan, M. (2012). Macroeconomic Impacts of LNG Exports from the United States. Washington DC: Nera Economic Consulting. See also: Medlock, K. B. (2012). U.S. LNG Exports: Truth and Consequence. Houston, TX: James A. Baker III Institute for Public Policy, Rice University.

36. World Nuclear News. (2013, January 21). Japan learns nuclear restart requirements. Retrieved January 22, 2013, from http://www.world-nuclear-news.org/RS_Japan_learns_nuclear_restart_requirements_2101131.html

37. International Gas Union. (n.d.). World LNG Report 2011. Fornebu, Norway: IGU. 25.

38. Montgomery, W. D., Baron, R., Bernstein, P., Tuladhar, S., Xiong, S., & Yuan, M. (2012). Macroeconomic Impacts of LNG Exports from the United States. Washington DC: Nera Economic Consulting. 34.

39. Medlock, K. B. (2012). U.S. LNG Exports: Truth and Consequence. Houston, TX: James A. Baker III Institute for Public Policy, Rice University. 27.

40. EIA, Voluntary Reporting of Greenhouse Gases Program. Data available at: http://www.eia.gov/oiaf/1605/coefficients.html

41. Energy Information Administration. (2012). Country Analysis Brief: Japan. Washington D.C.

42. Environmental Protection Agency. (2012, June 14). Greenhouse Gas Emissions. Retrieved February 2013, from EPA web site: http://epa.gov/climatechange/ghgemissions/gases/ch4.html

43. One study estimates that 3.6% to 7.9% of methane emissions escape during the drilling process. See Howarth, R., Santoro, R., & Ingraffea, A. (2011). Methane and the greenhouse-gas footprint of natural gas from shale formations. Climate Change, 679-690. A study that counters these findings, estimates fugitive methane emissions to be much lower. See O'Sullivan, F., & Paltsev, S. (2012). Shale gas production: potential versus actual greenhouse gas emissions. Environmental Research Letters, 7 044030.

Building a New American Arsenal

The American Security Project (ASP) is a nonpartisan initiative to educate the American public about the changing nature of national security in the 21st century.

Gone are the days when a nation's strength could be measured by bombers and battleships. Security in this new era requires a New American Arsenal harnessing all of America's strengths: the force of our diplomacy; the might of our military; the vigor of our economy; and the power of our ideals.

We believe that America must lead other nations in the pursuit of our common goals and shared security. We must confront international challenges with all the tools at our disposal. We must address emerging problems before they become security crises. And to do this, we must forge a new bipartisan consensus at home.

ASP brings together prominent American leaders, current and former members of Congress, retired military officers, and former government officials. Staff direct research on a broad range of issues and engages and empowers the American public by taking its findings directly to them.

We live in a time when the threats to our security are as complex and diverse as terrorism, the spread of weapons of mass destruction, climate change, failed and failing states, disease, and pandemics. The same-old solutions and partisan bickering won't do. America needs an honest dialogue about security that is as robust as it is realistic.

ASP exists to promote that dialogue, to forge consensus, and to spur constructive action so that America meets the challenges to its security while seizing the opportunities the new century offers.

ASP
American Security Project

www.americansecurityproject.org