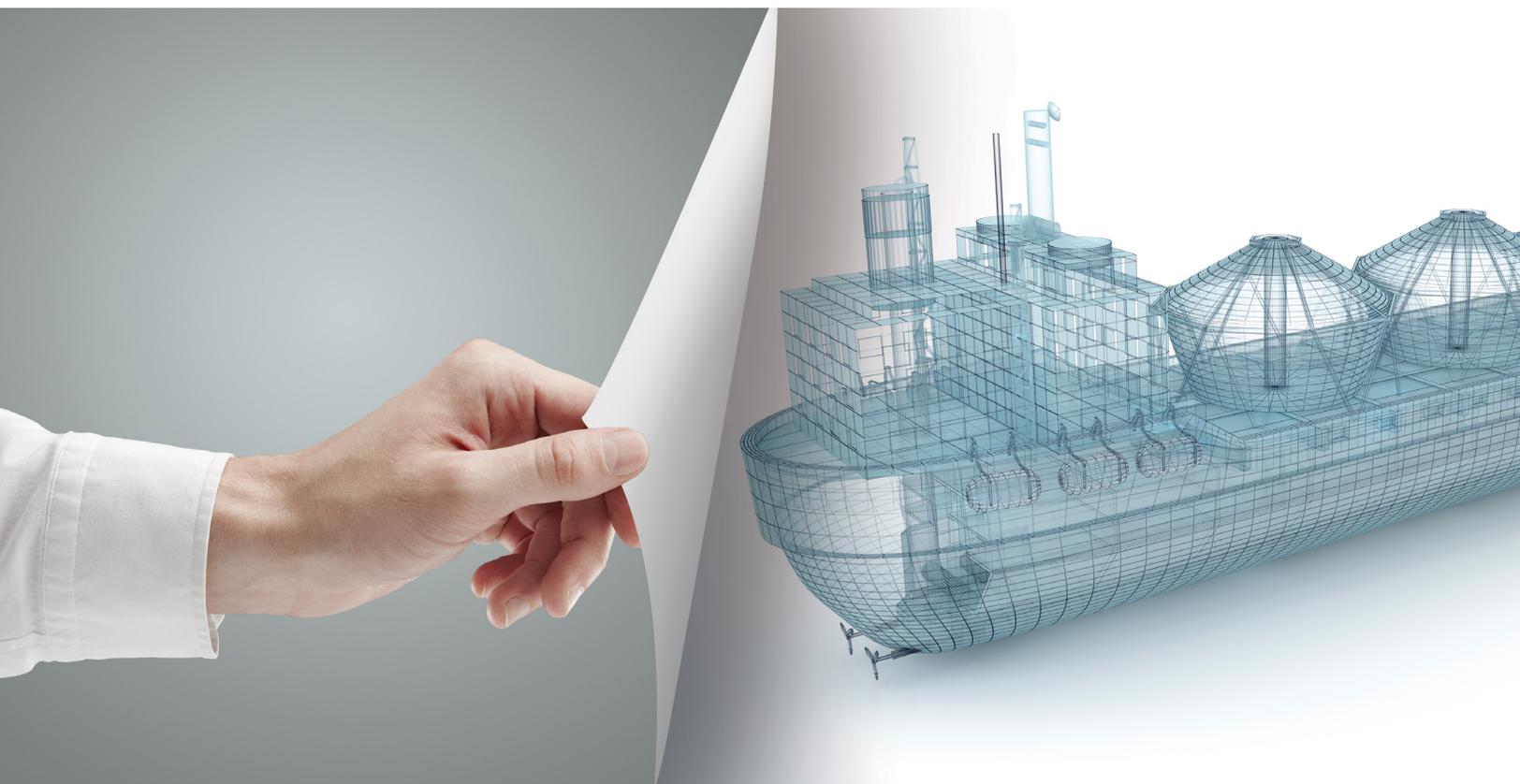


# Liquefied Natural Gas

EXPORTS - America's Opportunity and Advantage



America's Oil and Natural Gas Industry

November 2016

For the latest report, please visit [www.api.org/lng-exports](http://www.api.org/lng-exports) and [www.lngexports.com](http://www.lngexports.com)



## America's Opportunity and Advantage

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# Why Export LNG?

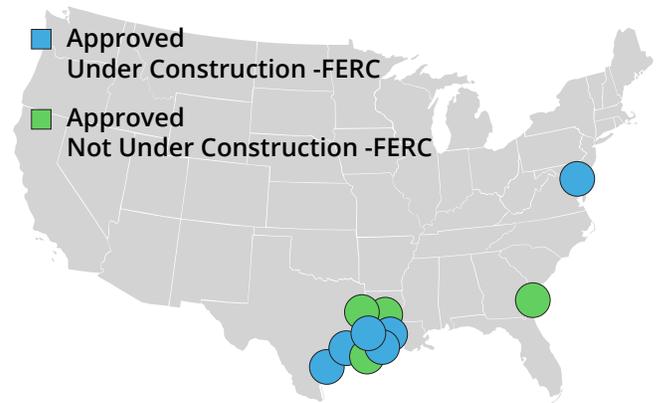


The United States is now the leading natural gas producer in the world. We have an abundant supply of this clean, affordable and reliable resource that will let us power our nation for generations to come. Just a few years ago the U.S. was expected to be a major importer of natural gas. The shale revolution has virtually eliminated our need for gas imports, and we have begun to export some of our gas. The first shipment of U.S. LNG from the lower 48 states left in February 2016 and since then the U.S. has shipped LNG to Europe, Asia and South America. Our abundant supply means that the U.S. does not have to import significant amounts of LNG for domestic use, creating greater certainty of supply and putting downward pressure on prices around the world.

The shale revolution has not occurred in a vacuum, and while the U.S. is reaping the benefits of not being tethered to other countries to meet its energy needs, in many cases our allies are growing more dependent. This abundant resource has presented an opportunity for the U.S. to become an influential global energy leader – a leader that will be a reliable and transparent trading partner in energy for allies abroad. A robust natural gas export policy will enhance our energy leadership,

and it also will help grow our economy, support our manufacturing sector, strengthen our national security interests and protect our environment. Transparent and timely permitting and licensing procedures of LNG export terminals are one way to fully realize the benefits of LNG exports.

FERC Map of Approved and Pending LNG Export Projects  
<https://www.ferc.gov/industries/gas/indus-act/lng/lng-approved.pdf>



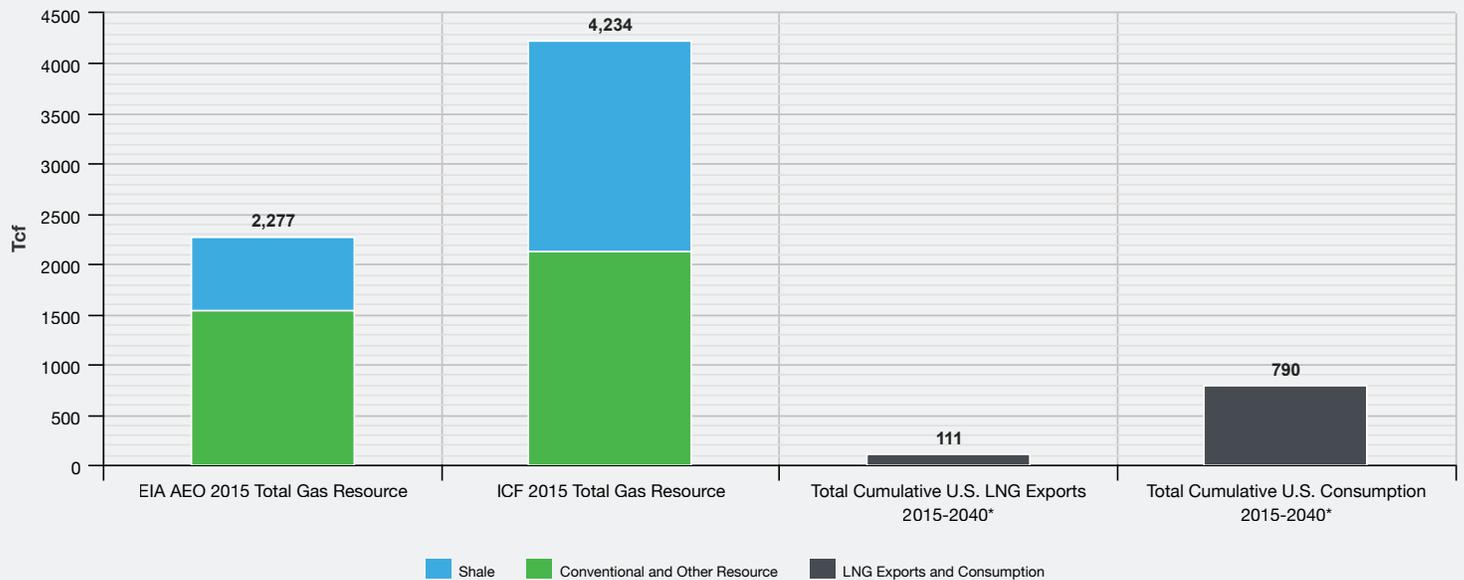
# What is LNG?



LNG, or liquefied natural gas, is a clear, odorless, noncorrosive, nontoxic liquid that is formed when natural gas is cooled to around -260 F. This shrinks the volume by about 600 times, making the resource easier to store and transport through marine shipments. LNG is not stored under pressure and is not explosive or flammable in its liquid state, and it cannot be released rapidly enough to cause overpressures associated with explosions.

LNG has been safely handled for several decades, with LNG vessels having made more than 100,000 voyages without major accidents or safety problems. The LNG industry is highly regulated by the Federal Energy Regulatory Commission, the Department of Transportation, the U.S. Coast Guard and the Department of Homeland Security, and other agencies to ensure that vessels, facilities and personnel provide and deliver safe operations and transport.

## U.S. Natural Gas Resources and Consumption



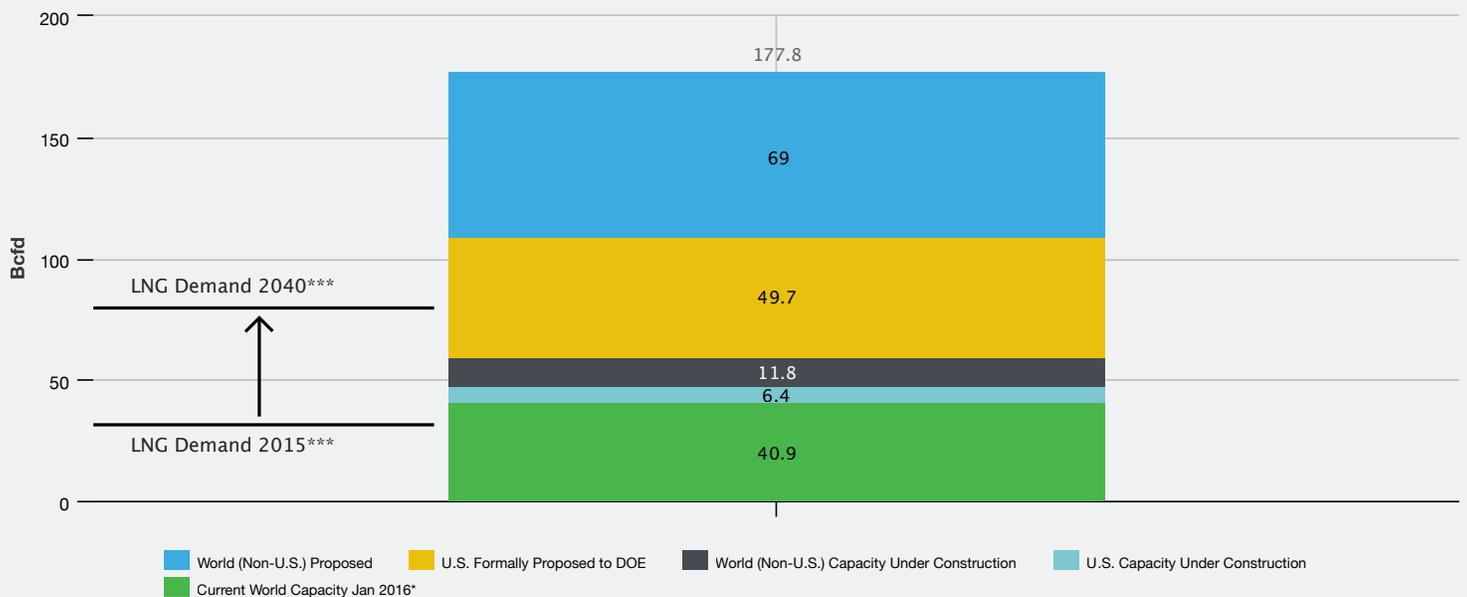
\*Source: EIA's 2016 Annual Energy Outlook Early Release June 2016.

The U.S. Energy Information Administration (EIA) estimates that total U.S. technically recoverable dry natural gas resource is 2,277 trillion cubic feet (Tcf). EIA's estimate of combined cumulative U.S. domestic consumption and LNG exports from 2015 to 2040 represent less than 40 percent of this resource.

In addition, EIA's estimate of the available resource is conservative. Industry estimates of the U.S. natural gas resource base are typically higher. The ICF International estimate of 4,234 Tcf is 85 percent greater. Also, resource base estimates assume "current recovery

technology." Future advances in extraction technology will increase the resource base. The U.S. has enough natural gas to supply both domestic consumption and LNG exports well into the future. America's supply of natural gas is not threatened by LNG export amounts projected in EIA's AEO 2016 Reference Case study.

# The World LNG Market



\*International Gas Union: 2016 World LNG Report Includes Sabine Pass Train 1(0.7Bcf/d)

\*\*BP Statistical Review \*\*\*EIA International Outlook 2016

The level of planned and proposed facilities for natural gas liquefaction – the process of cooling natural gas into liquid form to make it transportable for export – far exceeds projected global demand. And the window for the U.S. is closing rapidly – some of the planned capacity outside of the U.S. already is under construction. Further, LNG export facilities cost billions of dollars and take several years to build. To capture this economic opportunity we must act quickly.

Demand for natural gas around the world is growing in every region. And world production will increase to meet this demand. World LNG trade is expected to more than double by 2040, and most of this increase in liquefaction capacity occurs in North America and Australia. The U.S. Energy Information Agency (EIA), in its 2016 reference case, predicts total LNG exports from the U.S. to rise to more than 12 billion cubic feet per day (Bcf/d) by 2025.

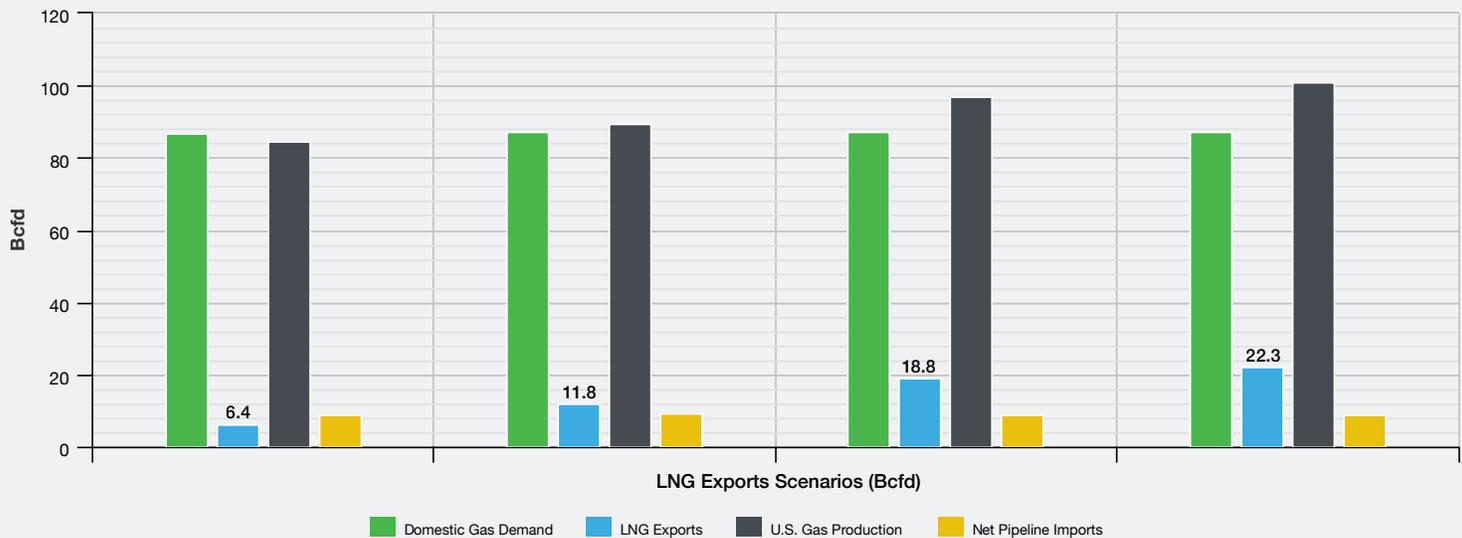
The chart above shows that current world LNG liquefaction capacity, plus capacity already under construction in the U.S. and other parts of the world, are insufficient to meet the anticipated 80 Bcf/d of global LNG demand in 2040. To meet that 2040 demand,

we will need more projects than just those now under construction. Yet, with the proposed projects in the U.S. and around the world exceeding forecasted demand by about 100 Bcf/d, early movers in adding liquefaction capacity will have the advantage in capturing this limited market.

The first shipment of U.S. LNG from the lower 48 states left in February 2016 from Cheniere Energy’s Sabine Pass Liquefaction Project, and since then the U.S. has shipped LNG to Europe, Asia and South America. There are six terminals currently under construction that are expected to come online by 2020. The sooner these facilities are up and running the better chance the U.S. will have to capture this growing demand market. Further, completion of the expansion of the Panama Canal will help to make LNG from the U.S. more marketable. The enlarged canal can handle the vast majority of the world’s LNG tankers while significantly shortening travel time and helping to reduce transportation costs for U.S. LNG suppliers to key overseas markets.

# The Benefits of LNG Exports

## Projected U.S. Domestic Demand, Production, Net Pipeline Imports and Increasing Levels of LNG Exports



Source: The Macroeconomic Impact of Increasing LNG Exports (Oct 2015). DOE-sponsored report – Rice University, Oxford Economics

Exporting natural gas produces a number of benefits to the U.S. Start with the stimulus to domestic production and the jobs that would be supported. First, the chart above, from a Rice University study, shows that under a variety of export scenarios, most of the increase in LNG exports is accommodated by expanded domestic output rather than reductions in domestic demand. Increased natural gas production here at home supports thousands of additional jobs. An IHS report estimates that for every 1 Bcf/d of shale gas production, approximately 32,000 total jobs are supported throughout the economy. Additional LNG exports could contribute as much as \$10 billion to \$31 billion per state to the economies of natural gas-producing states. Non-natural gas producing states also will benefit from increased demand for steel, cement, equipment and other goods. More broadly, various studies have found that higher levels of LNG exports will yield economic gains for the U.S.

Exports will benefit the U.S. manufacturing sector. Increased natural gas production leads to an increase in natural gas liquids (NGL), which are used as petrochemical feedstocks. ICF International examined

the impacts of LNG exports and found that NGL volumes would increase between 138,000 and 555,000 barrels per day (bpd) by 2035. An increase in NGL supply helps to preserve affordable NGL prices, according to ICF, and this benefits domestic manufacturing industries.

U.S. LNG exports offer an alternative and reliable energy source to the global marketplace, providing international consumers with greater choice of supply, helping to curb the use of energy as a political weapon.

Environmentally, U.S. energy-related carbon dioxide emissions in 2015 were 12 percent below 2005 levels, mainly due to the increased use of natural gas by power generators. Exporting U.S. LNG also will help reduce global greenhouse gas emissions (GHG). ICF estimates that exported LNG will have GHG emissions 43 to 52 percent lower than the dominant fuel. Further, an Energy Department study concluded that U.S. natural gas consumed in Europe or Asia has lower life cycle GHG emissions than power generation from regional coal.



LNG has been safely handled for several decades, more than 135,000 LNG carrier voyages have taken place without major accidents or safety or security problems, either in port or at sea. LNG history in the U.S. dates back to the 1940's and LNG tanker trade initiated with exports in 1969. LNG ships are double-hulled, with more than 6 feet of void space or water ballast between the outer and inner hulls and the cargo tanks. The double hulls help to prevent leakage or rupture in the event of an accident. LNG ships are also equipped with sophisticated leak detection technology, emergency shutdown systems, advanced radar and positioning systems and numerous other technologies designed to ensure the safe and secure transport of LNG.

The U.S. Coast Guard determines the suitability of every LNG ship that delivers cargoes into and out of the U.S. through a rigorous annual inspection. If a ship fails the inspection, all deficiencies must be fixed before it can unload its cargo or leave the country. LNG ships are issued a Certificate of Compliance by the Coast Guard to state that they are in complete compliance with U.S. regulations. In addition numerous other federal agencies regulate this industry in the United States, including the Federal Energy Regulatory Commission (FERC), the Department of Transportation (DOT) and the Department of Homeland Security (DHS).

## [U.S. Secretary of State John Kerry and U.S. Energy Secretary Ernest Moniz, joint statement at U.S.-EU Energy Council meeting – May 4, 2016](#)

“The council welcomed the lifting of U.S. crude oil export restrictions in 2015 and the commencement of U.S. LNG exports from the Gulf Coast in 2016, as they are important milestones for global energy markets that can also help improve security of supply globally and in Europe.”

## [Robin Dunnigan, U.S. State Department deputy assistant secretary for energy diplomacy – April 28, 2016](#)

“The U.S. will be a reliable, market-based supplier to global markets, and that’s not only good for our energy security, it’s good for the energy security of our partners and allies around the world. So I’m very much looking forward to U.S. LNG being part of the diversification solution in Europe and in other countries around the world.”

## [Paula Gant, U.S. Energy Department, principal deputy assistant secretary – April 28, 2016](#)

“[B]efore even the first of the seven cargos left Sabine Pass, the potential availability of U.S. LNG was already having a disruptive influence on the balance of power between producers and consumers ... and we expect that disruptive influence to continue, and that is good for our energy security and that of our trading partners and allies globally.”

## [U.S. Energy Secretary Ernest Moniz, joint statement with G7 energy ministers – May 2, 2016](#)

“The expanding role and globalization of natural gas markets, for both pipeline and liquefied natural gas (LNG) bring new opportunities and challenges. We welcome Japan’s Strategy for LNG Market Development, the EU Strategy for LNG and gas storage and LNG exports from North America and other sources.”

## [Wall Street Journal – With U.S. Gas, Europe Seeks Escape From Russia’s Energy Grip – Feb. 25, 2016](#)

“Like shale gas was a game changer in the U.S., American gas exports could be a game changer for Europe,” said Maros Sefcovic, the European Union’s energy chief. ... Many in Europe see U.S. entry into the market as part of a broader effort to challenge Russian domination of energy supplies and prices in this part of the world. Moscow has for years used its giant energy reserves as a strategic tool to influence former satellite countries ... The shale boom has reshaped the world energy market over the past decade, with the U.S. emerging as a new energy exporter, and the beginning of gas exports represents a big moment in this new world.”

## [Amos Hochstein, U.S. State Department special envoy and coordinator for International Energy Affairs – Jan. 8, 2015](#)

“The fact that we have approved exports of natural gas has already had an impact on Europe. And where the molecule actually ends up going, also doesn’t matter. ... It’s going to go into the international market that will rationalize itself, and it will therefore mean that a commodity that has different prices in different markets will start coming down and you’ll see some kind of a coalescing of the prices, as we saw when we stopped importing. Simply by the act of no longer importing the enormous amounts of natural gas/LNG we were importing, that already had an impact. ... Once our supplies come on the market, even though the first ones will go to India and Japan, it still frees up gas to go other places.”

## [David Goldwyn, Goldwyn Global Strategies and former U.S. State Department special envoy and coordinator for International Energy Affairs – July 2014](#)

“[F]rom a geopolitical perspective, increased LNG exports from the U.S. and its allies would shift rents away from traditional, autocratic suppliers, including Russia, that have used the proceeds to finance policies at odds with U.S. national security interests. U.S. supply also promotes price competition and stability in global oil and gas markets. Price stability benefits U.S. economic growth, and also better ensures that U.S. adversaries that are major oil and gas exporters are less able to enjoy higher export revenues stemming from major global supply disruptions.”

### [President Barack Obama, joint statement with European leaders – March 26, 2014](#)

“The situation in Ukraine proves the need to reinforce energy security in Europe and we are considering new collaborative efforts to achieve this goal. We welcome the prospect of U.S. LNG exports in the future since additional global supplies will benefit Europe and other strategic partners.”

### [Bill Richardson and Spence Abraham, former U.S. energy secretaries – May 14, 2014](#)

“The president has full and unquestioned authority to approve energy exports by executive action without Congress. The Natural Gas Act says the Department of Energy makes the decision on export permit approvals, and the law presumes exports are in the public interest. The administration can and should move faster on approving export permits.”

### [\(Ret.\) Gen. James L. Jones, former NATO supreme allied commander and former national security adviser – March 31, 2014](#)

“I believe that a focus on energy security can and must be a critical new element in the American strategic partnership in Central and Eastern Europe, and will benefit Poland, Europe as a whole, and the United States. ... The shale revolution in the United States has fundamentally transformed the global energy picture, as well as the debate concerning U.S. energy policy. ... I believe the United States should undo outdated regulations that prevent us from sharing our energy abundance with friendly countries. Doing so would benefit our allies, but also provide important economic and trade benefits to the United States.”

### [NERA Senior Vice President David Montgomery – July 25, 2013](#)

“In some ways the pursuit of this notion of where is the ‘sweet spot’ is a will-o-the-wisp, and I’ve gone through many efforts to try to figure out why there is so much concern about our exporting too much. ... The question is where the government is trying to make something happen that would not happen without the affirmative action of government. ... But natural gas exports are not something which are being created by government action. They’re something that will happen. The market itself will determine quite well (the proper balancing point). ... In this case all we really need to do is get out of the way.”

- 1 **U.S. Energy Information Administration (EIA) Annual Energy Outlook 2016 Early Release**  
<http://www.eia.gov/forecasts/aeo/er/>
- 2 **International Gas Union, 2016 World LNG Report** <http://www.igu.org/publications/2016-world-lng-report>
- 3 **U.S. Energy Information Administration (EIA), International Energy Outlook 2016 (PDF)**  
[http://www.eia.gov/forecasts/ieo/pdf/0484\(2016\).pdf](http://www.eia.gov/forecasts/ieo/pdf/0484(2016).pdf)
- 4 **International Energy Agency, World Energy Outlook 2015**  
<http://www.worldenergyoutlook.org/weo2015/>
- 5 **Rice University and Oxford Economics (U.S. Energy Department sponsored) “The Macroeconomic Impact of Increasing U.S. LNG Exports, October 2015**  
[http://energy.gov/sites/prod/files/2015/12/f27/20151113\\_macro\\_impact\\_of\\_lng\\_exports\\_0.pdf](http://energy.gov/sites/prod/files/2015/12/f27/20151113_macro_impact_of_lng_exports_0.pdf)
- 6 **ICF International, “U.S. LNG Exports: State-Level Impacts on Energy Markets and the Economy,” November 13, 2013 (PDF)**  
<http://www.api.org/news-and-media/news/newsitems/2013/nov-2013/~~/media/Files/Policy/LNG-Exports/API-State-Level-LNG-Export-Report-by-ICF.pdf>
- 7 **National Energy Technology Laboratory, “The Macroeconomic Impact of Increasing U.S. LNG Exports,” October 2015 (PDF)**  
[http://energy.gov/sites/prod/files/2015/12/f27/20151113\\_macro\\_impact\\_of\\_lng\\_exports\\_0.pdf](http://energy.gov/sites/prod/files/2015/12/f27/20151113_macro_impact_of_lng_exports_0.pdf)
- 8 **EIA, “Effect of Increased Levels of Liquefied Natural Gas Exports on U.S. Energy Markets,” October 2014 (PDF)** <http://www.eia.gov/analysis/requests/fe/pdf/lng.pdf>
- 9 **NERA Economic Consulting, “Macroeconomic Impacts of LNG Exports from the United States,” Department of Energy, December 2012 (PDF)**  
[http://energy.gov/sites/prod/files/2013/04/f0/nera\\_lng\\_report.pdf](http://energy.gov/sites/prod/files/2013/04/f0/nera_lng_report.pdf)
- 10 **IHS, “America’s New Energy Future: The Unconventional Oil and Gas Revolution and the Economy – Volume 3: A Manufacturing Renaissance, (2013) (PDF)**  
[http://www.energyxxi.org/sites/default/files/pdf/Americas\\_New\\_Energy\\_Future\\_Phase3.pdf](http://www.energyxxi.org/sites/default/files/pdf/Americas_New_Energy_Future_Phase3.pdf)
- 11 **EIA Today in Energy, “U.S. energy-related carbon dioxide emissions in 2015 are 12% below their 2005 levels” May 9, 2016** <http://www.eia.gov/todayinenergy/detail.cfm?id=26152>
- 12 **ICF International, “Lifecycle GHG Emissions From LNG Exports,” February 2014 (PDF)**  
<https://www.dom.com/library/domcom/pdfs/gas-transmission/cove-point/cp-icf-study.pdf>
- 13 **ICF International, “U.S. LNG Exports: Impacts on Energy Markets and the Economy,” May, 2013 (PDF)** <http://www.api.org/~~/media/files/policy/lng-exports/api-lng-export-report-by-icf.pdf>

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