Prepared Testimony of

W. David Montgomery, Ph.D.

Submitted to the

Committee on Energy and Natural Resources

United States Senate

Importing Energy, Exporting Jobs: Can It Be Reversed?

March 25, 2014

Chairman Landrieu, Ranking Member Murkowski and Members of the Committee:

Introduction:

I am honored by your invitation to testify on this very important topic. I am an economist and Senior Vice President at NERA Economic Consulting. I had the privilege of leading the study of the "Macroeconomic Impacts of U.S. LNG Exports" that was issued by the Department of Energy (DOE) in December 2012 and of the update to that study, "Updated Macroeconomic Impacts of LNG Exports from the United States," that my colleagues and I have just completed. I have provided a copy of this report along with my testimony and I request that it be entered into the record. I would like to thank Cheniere Energy, Inc. for their sponsorship of this update, and in particular to thank them for giving us the same freedom to conduct an objective and independent study that the U.S. Department of Energy gave us.

Statements in this testimony represent my own opinions and conclusions and do not necessarily represent opinions of any other consultant at NERA or any of its clients. I do not speak for Cheniere Energy, Inc. or NERA, in particular, but only for myself.

Findings of the NERA 2014 Study:

We based our updated analysis on the Energy Information Agency's (EIA) 2013 Annual Energy Outlook (AEO 2013), in order to address claims that our original study was out of date. Compared to our 2012 report, natural gas prices are lower, LNG exports are larger,

and economic benefits are greater. We again find that LNG exports provide net economic benefits in all scenarios, and the less regulators restrict U.S. exports, the greater the benefits from natural gas production.

We used AEO 2013 in this update because the preliminary release of AEO 2014 did not contain the side cases exploring high and low oil and gas resources that were needed to recapitulate the scenarios of our 2012 study. I do not expect our findings to change when we incorporate AEO 2014 scenarios because when we jumped forward two years from AEO 2011 to AEO 2013 everything became more favorable to LNG exports: lower U.S. natural gas prices, higher LNG exports and greater economic benefits in every case.

In order to address concerns about the "cumulative" impact of LNG exports above levels that DOE asked us to study, our update considers additional scenarios in which we assume no constraints on LNG exports and let the market determine their level. These scenarios of LNG exports unconstrained by government policy provided the largest net benefits.

Another goal that we had in this update was to dispel some myths that are still being retold about natural gas exports, and I will turn to them now:

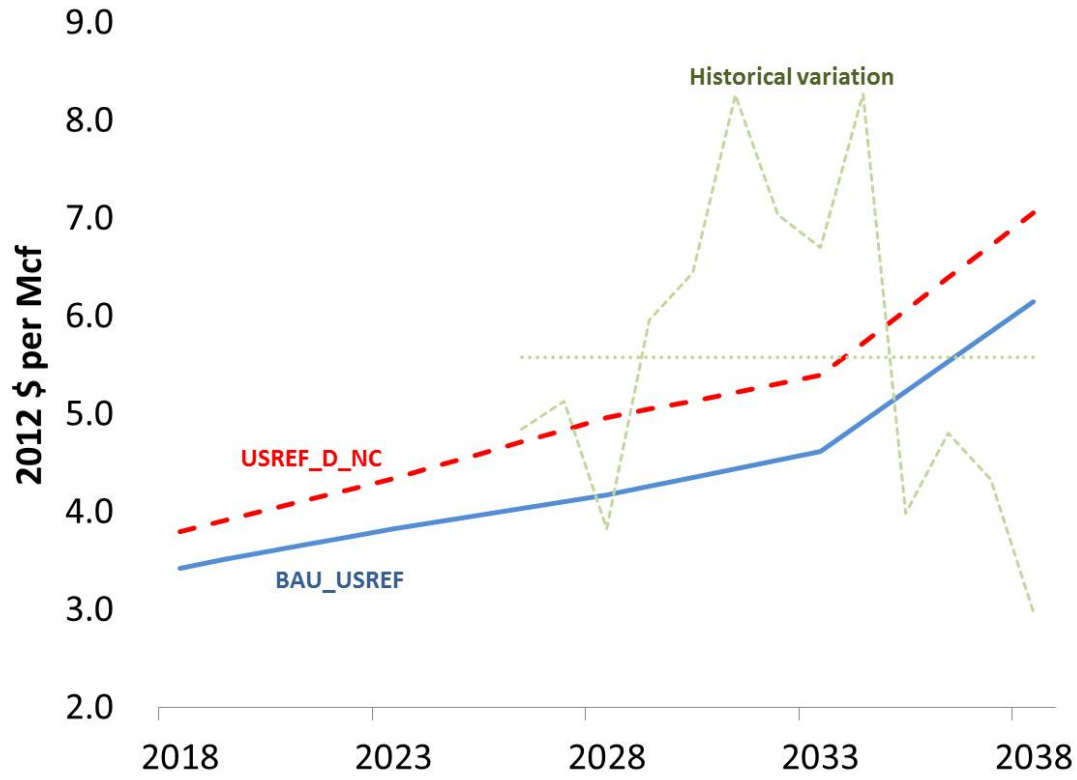
LNG exports will not cause runaway increases in natural gas prices. Both LNG export volumes and price impacts will be limited by the market, by rival exporters ready to undercut high prices, and by price-sensitive buyers. Only if natural gas prices fall and remain below today's levels will there be high levels of exports. If regulatory ham-handedness chokes off the shale revolution, not even the currently authorized LNG export projects will be running. The U.S. would not find buyers at high prices for large volumes of LNG exports, even with extraordinary global demand and supply shocks. There are too many other sellers that can beat high U.S. prices.

Exhibit 1 shows the impact of LNG exports on U.S. natural gas prices with EIA Reference Case supply assumptions and a global demand shock[1] for unconstrained

[1] The demand shock assumes greater international demand for natural gas than assumed in the 2013 International Energy Outlook.

exports. The historical variation in prices around their mean from 2000 to 2013 is superimposed on projected natural gas prices and their mean from 2025 to 2038. We can see that the difference of less than $1 is dwarfed by historical variations.

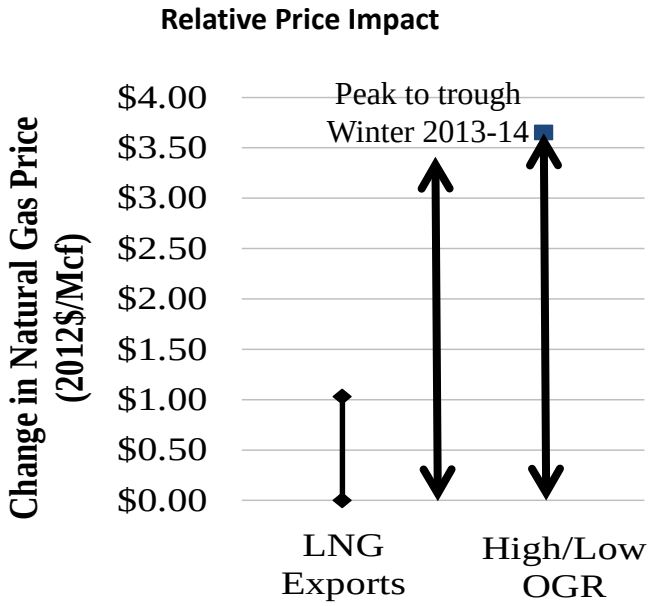
Exhibit 1: Price Impacts of LNG Exports Are Dwarfed by Historical Variation



Source: NERA Analysis

Exhibit 2 shows the maximum increase in natural gas prices that we find across all scenarios to be about $1 per Mcf. In contrast, the difference in natural gas prices between EIA's High Oil and Gas Resource (HOGR) case and its Low Oil and Gas Resource (LOGR) case is over $3.50. We find that natural gas prices as high as in the LOGR case would choke off LNG exports at levels less than what DOE has already authorized.

Exhibit 2: Price Impacts of LNG Exports, Limited Shale Development, and Winter Weather



Price spikes will not become more damaging. Returning to our own analysis, short term natural gas price spikes, as we observed last winter, have been a frequent occurrence in natural gas markets even with zero LNG exports. They are caused by unexpected weather events and problems in the pipeline system, and have always been temporary. Referring again to Exhibit 1, Henry Hub prices that rose to almost $8.00/Mcf last winter are already down to $4.50. There has always been a solution for price spikes: which is increased storage and overbuilding of the pipeline system. But neither natural gas suppliers nor their customers have found the permanent cost of this extra security worth the temporary cost of price spikes.

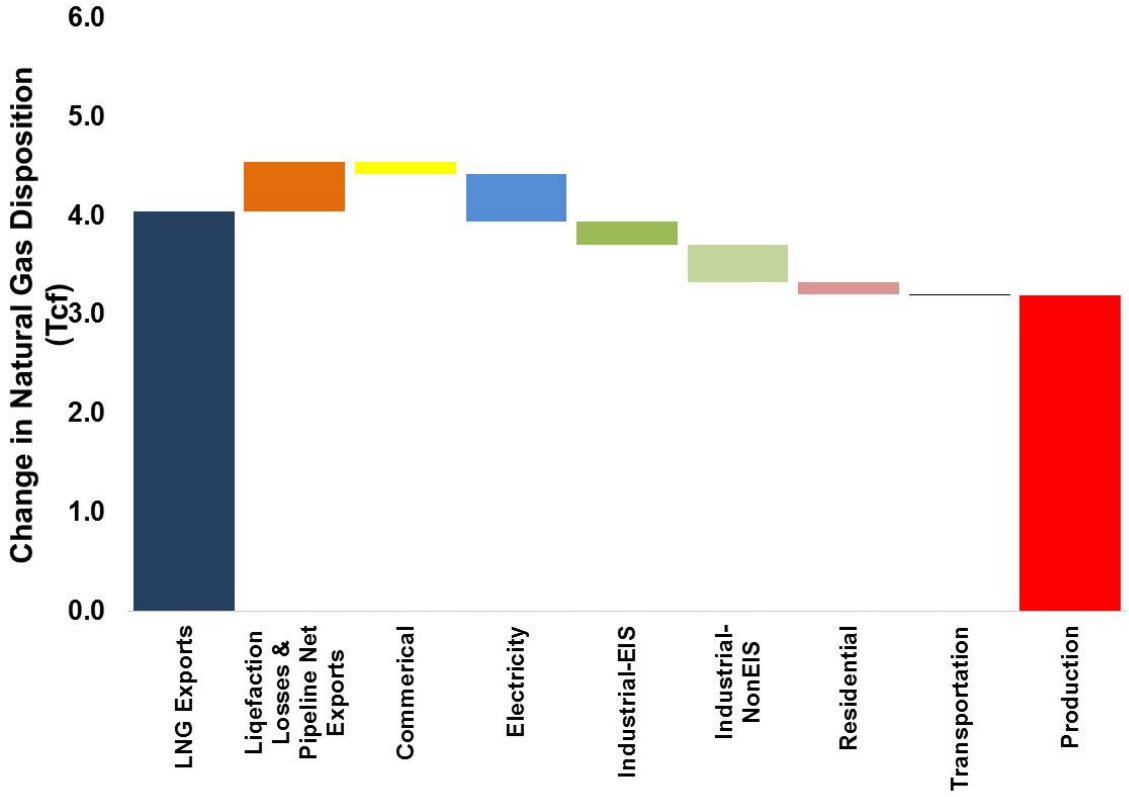
LNG exports actually provide a deliverability cushion for domestic consumers. Our analysis shows that when U.S. wellhead prices become as high as they were last winter, they would likely choke off LNG exports and free up that gas for domestic use. The additional natural gas deliverability built up to serve LNG exports would then become available to surge deliveries for domestic needs. Thus LNG exports provide a built in buffer of supply like a Strategic Petroleum Reserve.

Limiting LNG exports would take away this deliverability cushion, and the disastrous consequences of past governmental attempts to allocate supplies and control prices during price spikes should be a warning against trying again. Natural gas prices were regulated through the 1970s, and the consequence was an allocation system that cut off major users – mostly industrial customers – when shortages appeared. Decisions by government regulators and politicians about who should be awarded the benefits of price-controlled gas just made things worse for everyone. There have been no such curtailments since we created an open market for natural gas in the U.S.

Natural gas will not be taken away from U.S. manufacturing or residential consumers to supply LNG exports. LNG exports occur precisely because there is enough natural gas to satisfy needs inside and outside the U.S. We consistently find that most of the demand for increased natural gas exports is satisfied by new production, and that demand reduction is largely confined to the electric power sector (Exhibit 3).

In the electric power sector, an increased price of natural gas as a fuel for generation would lead to a small reduction in demand, but for the most part natural gas is displaced by additional generation from nuclear, renewables, and (depending on forthcoming EPA rules) possibly coal.

Exhibit 3: Where Do Exports Come From?

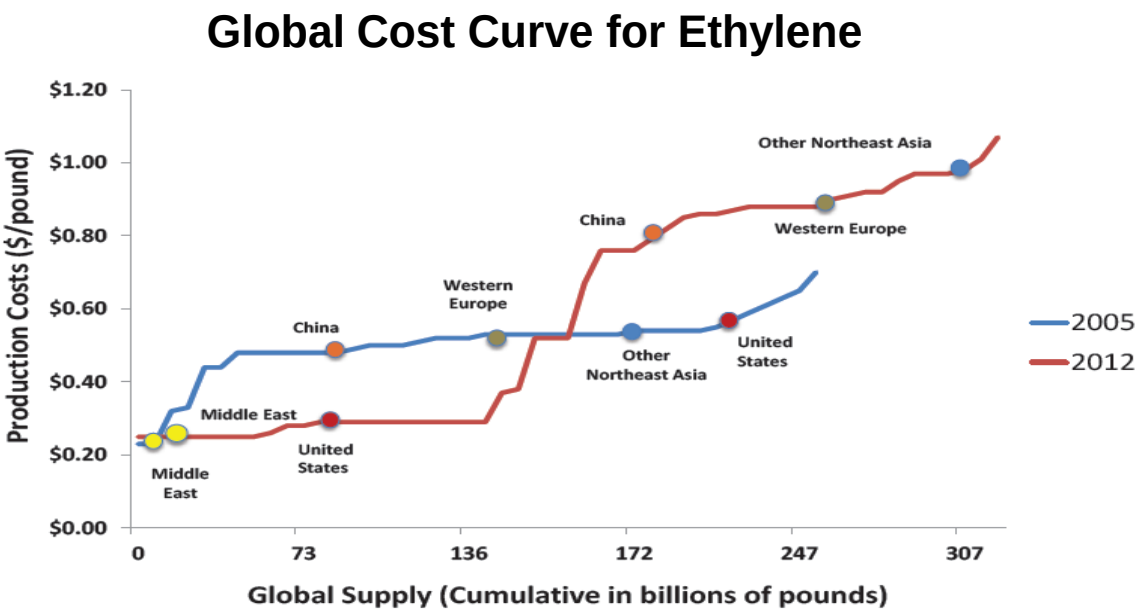


Source: NERA Analysis

2028: USREF_D_NC relative to BAU_USREF

The competitive advantage of U.S. manufacturing will not be taken away, at least not by LNG exports. Right now U.S. chemical producers enjoy about a 4 to 1 cost advantage over their rivals in Europe and Asia. Exhibit 4 from the American Chemical Council shows how the competitive position of this sector has become fundamentally invulnerable to effects of LNG exports. For ethylene, an important bulk chemical and indicator of competitiveness used by the American Chemical Council, costs in the U.S. are about 20 cents per pound and in China and Europe over 80 cents per pound. The maximum impact that LNG exports could have on U.S. natural gas prices would raise costs in the U.S. by about 5 cents per pound – still leaving a 55 cent per pound cost advantage.

Exhibit 4: Competitive Position of U.S. Chemical Industry



Source: American Chemistry Council

A $1.00/Mcf increase in natural gas prices would raise production costs by $0.05/lb

For ethylene producers, the picture is even rosier because their primary feedstock, ethane, is a natural gas liquid that is produced in large quantities along with tight gas. Ethane is so "hot" that the amount that can be mixed into natural gas in pipelines is limited, so that a glut of ethane has developed over the past two years and lowered the price of ethane relative to natural gas. And, the more LNG we export, the greater the glut of ethane will be and the greater the advantage to chemical producers.

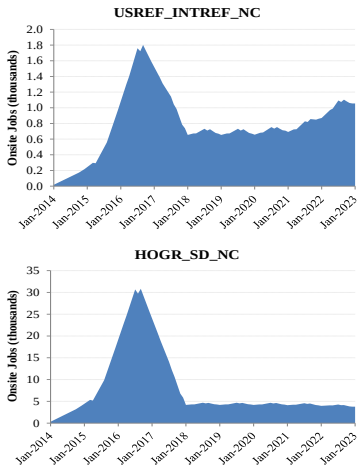
All U.S. manufacturing continues to enjoy a cushion of low natural gas costs no matter how high LNG exports go. Any importer of natural gas from the U.S. will be paying a landed price more than twice the price that U.S. manufacturers pay – because the cost of transporting gas to Europe or Asia is about equal to the price of gas in the U.S. Adding the two together means that rivals importing gas from the U.S. will be paying double the U.S. price. As a result, we find across all sectors and in all scenarios that LNG exports alter the rate of growth in U.S. manufacturing by no more than a few hundredths of a percentage point.

And at that, natural gas will be a bargain to the countries that import from the U.S. LNG imports in Asia and pipeline imports into Europe from Russia are now for the most part indexed to oil prices. That makes the current price of natural gas 3 to 4 times higher in those countries than in the U.S. That is what makes the prospect of LNG exports so attractive to both buyers and sellers, and why LNG exports from the U.S. are such a threat to Russia.

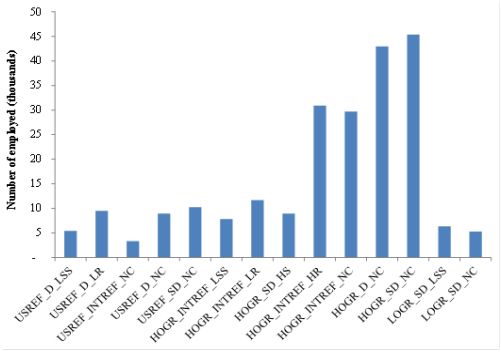
LNG exports will not cost U.S. jobs. Just the construction of liquefaction capacity sufficient to support the LNG exports projected in our study would create a peak of 2000 to 40,000 onsite jobs, largely in the Gulf Coast region and in the critical years between now and 2018 (Exhibit 5). That year is important, because it is the year when CBO forecasts that the U.S. will return to a normal state of full employment. The investment in LNG export facilities and in additional natural gas exploration and production for export would take from 3,000 to 45,000 workers off the unemployment rolls during the next four years of continued softness in the labor market, and hasten the return to full employment by as much as two months. The faster projects are authorized and the sooner they begin construction, the greater the impact on unemployment will be.

Exhibit 5: Employment Impacts

Onsite Employment Could Be Substantial

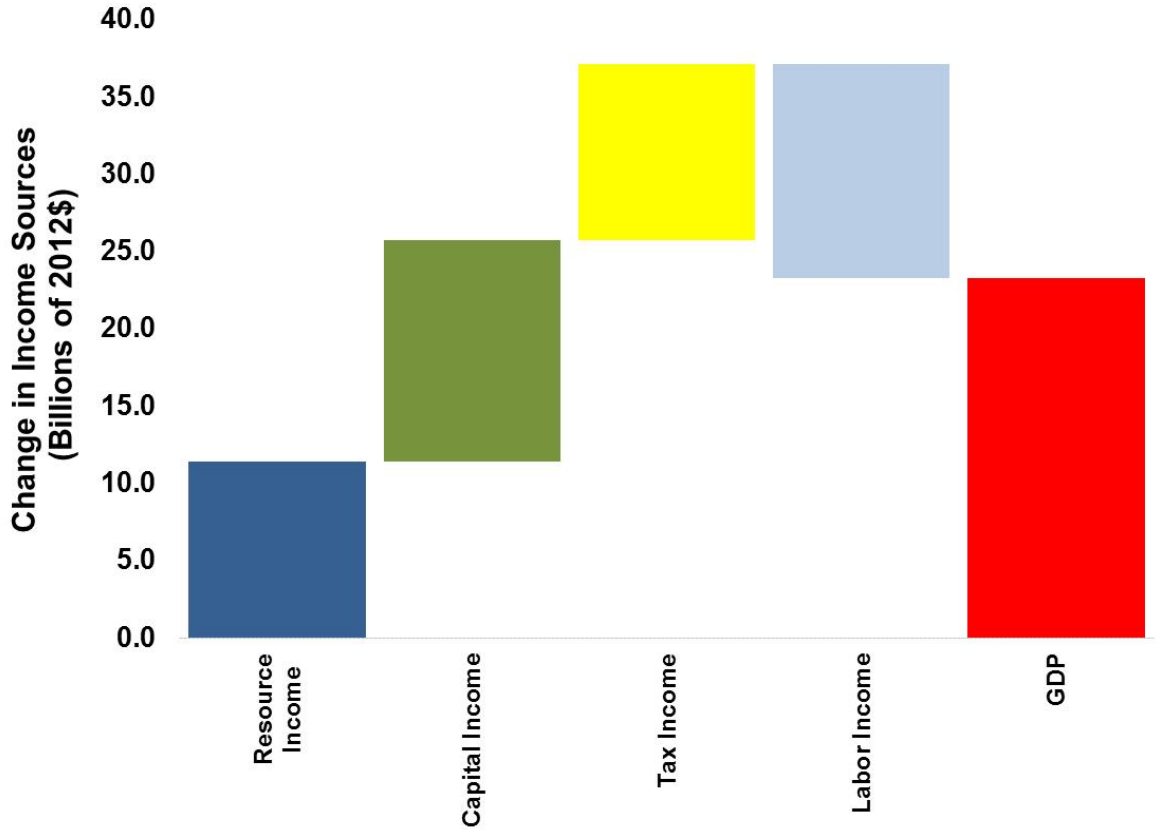


LNG Exports Contribute to Near Term Reductions in Unemployment (2013-2018)



Benefits of LNG exports will be distributed broadly. Employment, labor income and investment income will continue to grow no matter what level of LNG exports the market demands from the U.S. In the scenario with the highest level of LNG exports across all those we examined, GDP in 2038 will increase by about $25 billion compared to the no export case. In terms of the components of GDP, government revenues will increase by over $10 billion, investment income by about $15 billion, and resource income by about $10 billion, and labor income will be about $15 billion less, all compared to the no export case.

Exhibit 6: LNG Exports Lead to Higher GDP



Source: NERA Analysis

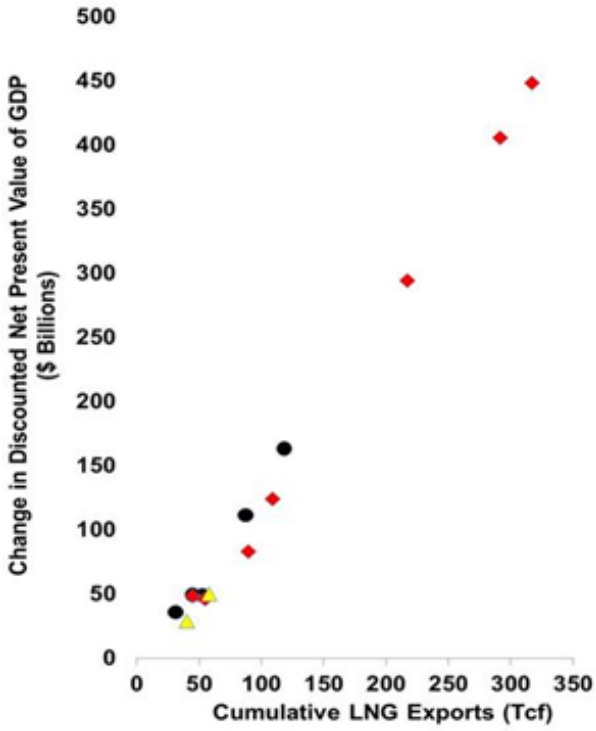
2038: USREF_D_NC relative to BAU_USREF

There is no point in turning these findings into class warfare. A considerably larger share of royalty income could accrue to the Federal government if more Federal lands were

opened up for oil and gas exploration and production, and that would in turn likely reduce resource income to private landowners. The increase in investment income more than offsets a decline in wage income, and that increase plus a share of resource income will accrue to all Americans who invest and who hold their 401k plans in a reasonably diversified portfolio of stocks.

There is no "sweet spot" lower than the market-determined level of exports: Finally, we found no sweet spot that would justify government interference with U.S. obligations under the WTO to allow free trade in commodities like natural gas. In every scenario we investigated, higher levels of LNG exports led to larger economic benefits to the U.S. (See Exhibit 7).

Exhibit 7: When the Market Decides, the More We Export, the More We Benefit



Source: NERA Analysis
Note: Colored dots represent different export scenario
Red: HOGR, Black: REF, Yellow: LOGR

We examined a range of LNG exports in our study, including market-determined levels of exports that could be expected if DOE automatically approved all applications. Even

in cases where worldwide supply and demand shocks were combined with optimistic assumptions about U.S. natural gas resources to lead to LNG exports approaching one-half of total domestic supply, the U.S. gained larger benefits by allowing unlimited LNG exports than it would have achieved in those cases with restricted exports

Strategic Energy Policy:

Now let me turn to the subject of this hearing. LNG exports from the U.S. could reduce Russia's stranglehold on energy supplies to Europe. Immediate announcement of a policy of allowing unlimited LNG exports would signal potential competition that Russia would have to meet by offering lower natural gas prices as it renegotiates its supply contracts with Europe. The power of this signal will depend on whether it is accompanied by effective action to accelerate the shale gas revolution by avoiding or removing unreasonable regulations, costs, and constraints on natural gas exploration and production.

In order to estimate the potential demand for U.S. LNG exports and the prices at which LNG exports could be sold, we analyzed supply and demand for natural gas around the world. Russia supplies about 25% of the natural gas consumed in Europe and Russian exports are projected by EIA to increase by 33 Bcfd from current levels by 2040, making Russia the largest potential rival to the U.S. in global LNG supply. Much of this gas is now supplied by Russia under long term contracts that link natural gas prices to oil prices. As these contracts come up for renewal or renegotiation, Russia's power to extract high prices will depend greatly on the competition expected to appear in the market during that contract term.

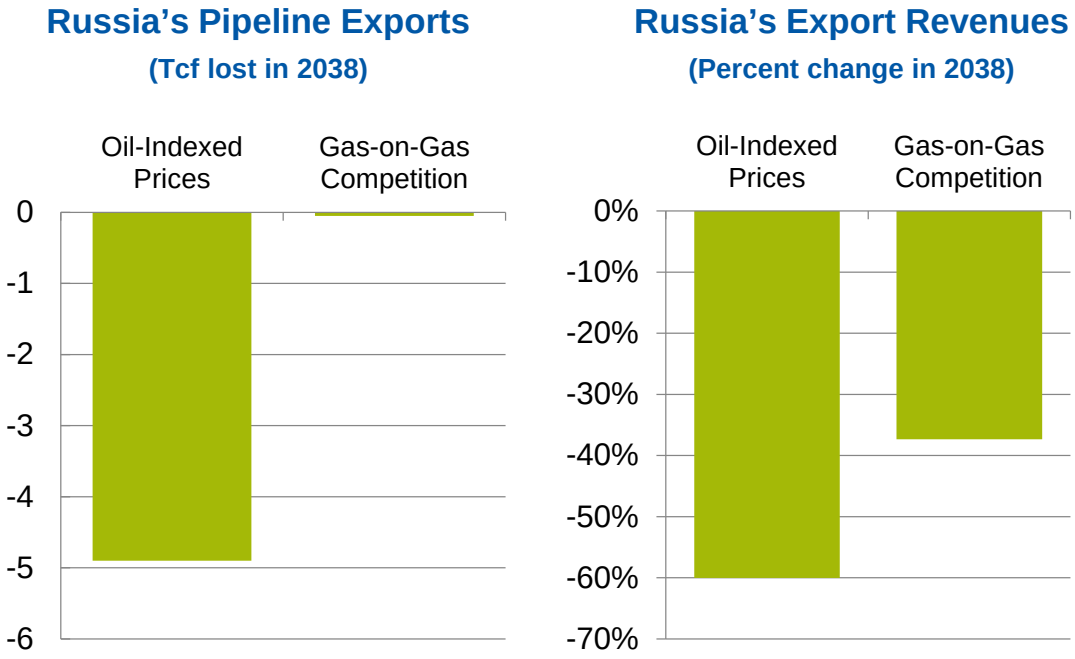
Monopolists can be restrained as effectively by potential competition as by actual production by their rivals. Eliminating any possibility of a cap on U.S. exports is necessary to create effective potential competition. The existence of a major competitor with the capacity and willingness to sell large quantities of natural gas will discipline Russia's pricing even if actual LNG exports are low. To provide such competition, it must be possible to move additional LNG exports into the market on a large enough scale

to punish any Russian effort to raise prices above competitive levels with a substantial loss of market share.

Our results show that if U.S. policies encourage growth in natural gas production and remove all limits on exports, Russia would face the choice of ceding a large share of its market to the U.S. and other rivals or lowering its prices to levels determined by gas-on-gas competition. Even if it takes 5 to 10 years for U.S. LNG exports to equal a large share of Russian natural gas exports, the effect of a clear policy to encourage domestic oil and gas production and remove obstacles to LNG exports would have an immediate effect on the pricing of natural gas and Russia's revenues.

To be specific, I would like to refer to Exhibit 8. The shows the range of impacts that a policy of unlimited U.S. LNG exports could have on Russia's natural gas export revenues if shale gas resources and regulatory policy toward drilling lead to levels of production approximating the most recent EIA High Oil and Gas Resource case. Since U.S. LNG exports will affect Russian pipeline as well as LNG exports, these estimates of Russia's revenues include both pipeline and waterborne shipments. The U.S. need not be competing directly with Russia for U.S. exports to have the effect of reducing Russia's exports and revenues. Even if U.S. exports move to Asia, they would divert LNG to Europe and thus take away Russia's sales and revenues.

Exhibit 8: Effective U.S. Competition Would Force Russia to Cut Prices or Lose Sales



Source: NERA Analysis, HOGR Case with International Demand Shock and No Export Limits

Thus, we estimate that in the next 5 years, U.S. competition could drive Russia's revenues from natural gas exports down by as much as 30%, and in the longer term could cut those revenues by as much as 60%. Since energy exports are the mainstay of the still inefficient and lagging Russian economy, this is a penalty with teeth. LNG exports will not alone be sufficient to discipline Russian aggression, but it is a step in the right direction.

A likely consequence of high levels of U.S. LNG exports based on Henry Hub prices lower than today is that they could break the system of oil-linked pricing by which Russia has enriched itself at Europe's expense. This outbreak of gas-on-gas competition is a major part of the erosion of Russia's export revenues found in our results, and it would limit Russia's energy and economic power.

Gas-on-gas competition will also benefit U.S. consumers by lowering costs of manufacturing in countries that import natural gas, and thereby lowering the cost of

consumer goods imported from those regions. This reduction in costs of our trade partners can only benefit the U.S. consumer, but it may be opposed by some manufacturing interests. The outbreak of gas-on-gas competition may erode further the profits of U.S. chemical producers that I discussed earlier, by bringing their rivals' costs for feedstocks down closer to U.S. levels. The competitive advantage of the U.S. will not disappear because the U.S. as an exporter will have natural gas prices half those that importers must pay to obtain LNG plus shipping. But the profits of some of those U.S. chemical producers could be eroded, by the same events that provide U.S. consumers with the benefit of lower prices of many other imported goods and the world with a meaningful counter to Russian aggression.

Since oil, natural gas, and coal markets in Europe are linked, exports of any of the three energy forms could contribute to weakening Russia's power over Europe and eroding its export revenues. By increasing coal exports to Europe, the U.S. would likely displace natural gas used for power generation in Europe and thereby allow either more rapid refilling of European storage or directly cut back needs for Russian natural gas. Crude oil exports might not directly compete with Russian supplies to Europe, but to the extent that crude oil exports make greater U.S. production possible they would shift the global supply-demand balance toward excess supply and put downward pressure globally on oil prices. This would then reduce Russia's oil export revenues. The combined loss of oil and natural gas export revenue would further weaken the Russian economy and its ability to finance military expansion, and uneconomic withholding of energy supplies to blackmail its neighbors. Much as the efforts of the Soviet Union to match U.S. military strength in the 1980s broke its centrally planned economy and led to the downfall of communism, U.S. energy strength fostered by a strategic commitment to production and exports could ultimately break Russia's energy dominance and restrain its revanchist ambitions.

Like the victory over Communism, these changes will take years. The FERC process for approving export terminals will remain, and market conditions and financing will stretch out construction. The fears promoted by some that the entire 8 Bcf/day of capacity approved by DOE to date to non-FTA countries will appear overnight and suddenly drain

the U.S. of natural gas are entirely unfounded. There will be an immediate effect on Russia's ability to hold up European customers for oil linked prices in long term contracts, because of the potential competition of U.S. exporters and the expectation that U.S. entry into the global market could wreck the oil-based pricing system. It is also true that Russia's exports to Europe will not be replaced overnight, but countering the Russian *Anschluss* is not the only reason for removing limits on LNG exports.

However rapidly LNG exports actually grow over the next few years, a strategy of maximizing U.S. oil and natural gas production by removing unreasonable constraints and obstacles and of pre-authorizing exports without any quantitative cap will have a long run effect of weakening the Russian economy. The Cold War lasted for 50 years before the economic superiority of the Free World defeated Communism, and a long view is necessary to resist what appears to be resurgent Russian nationalism and territorial expansion. Fortunately, that long strategic view is in this case in line with U.S. immediate economic interests, which are served best by removing limits on LNG exports.