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LIQUID MARKETS: ASSESSING THE CASE FOR U.S. EXPORTS OF LIQUEFIED
NATURAL GAS

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ANDERSON COURT REPORTING
706 Duke Street, Suite 100
Alexandria, VA 22314
Phone (703) 519-7180 Fax (703) 519-7190

PARTICIPANTS:

Introduction and Moderator:

CHARLES EBINGER
Senior Fellow and Director, Energy Security Initiative
The Brookings Institution

Panelists:

KEVIN BOOK
Managing Director, Research
Clearview Energy Partners, LLC

MELANIE KENDERDINE
Executive Director, MIT Energy Initiative
Massachusetts Institute of Technology

MICHAEL LEVI
Director, Program on Energy Security and Climate Change
David M. Rubenstein Senior Fellow for Energy and the Environment
Council on Foreign Relations

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P R O C E E D I N G S

MR. EBINGER: Good afternoon, ladies and gentlemen. Thank you all for coming today. And judging by the number of people in the room, it's clear that this topic is a hot one in Washington today and on the radar of many people, both in the nation's capital and around the world. Hopefully, we'll have a few more seats for those of you that don't have them yet, coming.

My name is Charlie Ebinger, and I'm the Director of the Energy Security Initiative at Brookings. And since May 2001, my team, in association with a study group that we put together, of distinguished natural gas experts, has been working on a year-long study examining the feasibility and implications of increased exports of liquefied natural gas from the United States.

This past January, we released an interim report that looked at the feasibility of LNG exports. In other words, can we export natural gas?

Since then, we have been researching the implications of exporting natural gas, and today, we release the final study which I hope you all received outside. If anyone didn't get one, let us know after the event, and we'll be glad to try to get you one. You can also find a copy online on the Brookings web site.

In this study, the Brookings team sought to answer the question: Should we export increasing quantities of natural gas, and if so, how should we do it?

After a brief presentation, I will sit down with three distinguished panelists who were all members of our Natural Gas Task Force -- Kevin Book, the Managing Director for Research at Clearview Energy Partners; Melanie Kenderdine, the Executive Director of the MIT Energy Institute; and Michael Levi, the director of the energy and environmental program at the Council on Foreign Relations.

And after a brief discussion with the panel, we will open up the floor to questions from the audience. We only ask that you ask your questions as succinctly as possible, state your name, please, first, but please make a question and not an extended comment.

I think it is clear to nearly everyone in the room that in the past seven years the domestic energy sector has changed dramatically. For that reason, I will not spend much time explaining why and how we arrived at where we are today. Needless to say, it was unthinkable less than a decade ago that there would be a legitimate policy debate in Washington over the merits of exporting LNG in large quantities.

The shale gas revolution has helped shape an energy landscape, both domestically and internationally, that I think few people would have bet on even five or six years ago when the United States was planning to accelerate a build-out of LNG import facilities. The rapid advances in unconventional production techniques that have unlocked vast amounts of new economic resources have changed the energy landscape beyond recognition.

Today, we have some companies that are looking to export natural gas in the form of LNG. This has drawn the ire of some major consumers of natural gas, such as the industrial and electricity sectors, as well as some politicians who object to exporting what they see as a valuable domestic resource.

Our goal with this report was to provide some clear-eyed analysis of the facts as we believe they currently stand with regard to the U.S. and international natural gas sectors and to come up with conclusions and recommendations for our policymakers in government on the potential of U.S. LNG exports.

I'll begin today's presentation with an overview of how the study was

organized, its methodology and how the Brookings team went about its research. After this, I will go into two major themes that guided the research -- the feasibility of LNG exports as well as their implications. Finally, I will lay out the study's key conclusions as well as some recommendations for policymakers.

Central to our research was the assembly of a Natural Gas Task Force -- 17 independent natural gas experts, some of whom we are delighted to have with us today in addition to the 3 people who will be joining us as panelists. The task force met on a regular basis to discuss major issues relating to domestic natural gas supply, domestic demand, what's going on in international gas markets and the implications of LNG exports on domestic and international natural gas prices, on potential price volatility, the impact on the domestic economy as well as geopolitical concerns.

The task force insights and opinions were conducted in the Brookings research but were not the only factors in our conclusions. Along those lines, the task force itself did not, nor was it asked to, reach a consensus verdict on any issue.

At these meetings, the Brookings team invited individual subject area experts to present their views on specific topics to the task force. For instance, we had electricity modelers present on the impact of EPA regulations on the coal sector, presentations from government departments and regulators, and presentations from private sector companies, but none of these people were formal members of the task force.

Taking the output from the task force discussions, the report's authors conducted additional research and interviews to arrive at our conclusions. And I would like, in that context, to thank my two colleagues, the two other authors of the report, Kevin Massy and Govinda Avasarala, for their very wonderful and extremely hard work on the

project.

And I would also, before continuing, like to acknowledge and thank David Goldwyn who served, who is a Nonresident Senior Fellow at Brookings and served along with me as the Co-Chairman of the task force.

The study is structured in two major sections.

The first part of the study looked extensively at the feasibility of increasing LNG exports from the U.S. We asked the question: Can we export LNG? We examined a range of factors that will have a bearing on the ability of our nation to have requisite volumes of gas available for exports. We also looked at the volumes of gas -- I'm sorry. We also looked at the markets in which exports would have to compete in the international market.

The second part of our report was outlined -- I'm sorry.

These initial findings were in the feasibility, the first stage, of our report which was released in December.

The second part of our report looked at the implications of increased LNG exports. In this endeavor, the Brookings team took as our analytical framework the issue of the public interest, which is how the federal government is legislatively required to look at the issue of LNG exports. Public interest, according to the law, is considered to include a range of issues including questions of adequate supply and competing domestic end uses, the economic and pricing impacts of exports, implications for U.S. energy security, job creation, the U.S. balance of trade, geopolitical considerations and the impact on the environment.

Lastly, the report makes a number of conclusions and recommendations as to how policymakers should approach the subject.

First, let me quickly go over the feasibility of LNG exports.

We found that the technical and logistical feasibility of exports was dependent on the domestic supply which we defined as the availability of resources, the sustainability of those resources, or production, and the policy and regulations that will shape domestic production. We also looked at the issue of domestic demand and the international gas market. In other words, we asked the fundamental question: Do we have enough gas to export, and if so, is production sustainable?

We looked at who else could consume the gas in our domestic economy before we export any and are there markets for the gas abroad because, clearly, even if we can export, there are other people who are also exporting and are we competitive in that market.

Before getting into the feasibility of domestic supply, you will notice that it is centered on the feasibility of shale gas production and particularly as opposed to natural gas production in general, and this is because of the centrality of shale gas to the future of the U.S. natural gas sector. Much of the discussion over potential exports hinges on the prospects for sustained shale gas development. And based on the existing knowledge of the resource base and on current data on well productivity, the production of shale gas was found by both our study group and by the authors to be sustainable.

As you can see, the estimates for shale gas in the United States are large and vary widely. It is safe to say that under the current policy and regulatory framework the U.S. has significant reserves of natural gas.

The report also finds that two concerns over the producibility of shale gas -- namely, the steep production decline curves that affected some well and infrastructure

or capacity constraints to get the shale gas, which is often in remote locations, to market - we believe are either nonissues or surmountable, short-term constraints. And I believe that is a significant finding of our report.

Domestic supply will also depend heavily on the environmental and regulatory landscape for shale gas production, and obviously, this is an area of strong contention between pro-shale gas developers and people who are opposed to such activities. The environmental considerations of shale gas production focus primarily on three main issues -- water, emissions and flaring, and seismic activity.

The first and, arguably, the most prevalent issue surrounding the environmental impact of shale gas production has to do with water usage. Water is a key component in shale gas production, and whether legitimate or not, some fear that the hydraulic fracturing can result in methane leakages that could contaminate water aquifers. Further, the treatment or disposal of wastewater that emerges as a byproduct of the fracking process is an issue that is under continued scrutiny. However, there has been no conclusive evidence that we believe that has been found to date that links the practice of fracking to groundwater contamination.

There have been other environmental concerns regarding shale development, this time, surrounding the producibility of shale oil. In shale oil-rich places, such as the Bakken field along the North Dakota-Montana border and the Niobrara field in Colorado and Wyoming, natural gas pipeline infrastructure has not been developed as quickly as oil production has grown. Therefore -- oil and gas production. Therefore, large volumes of natural gas have been flared from these fields. Conserving the gas flared at the Bakken field alone and shipping it to market would add roughly three billion cubic feet a month to gas supplies.

Some studies have also suggested that the fugitive emissions from shale gas production render natural gas generation in the electricity sector even more environmentally taxing on a life cycle basis than coal although there are other studies that dispute it. And I would note that these studies that have found this have been widely disputed by other academic studies and, most importantly, by reports coming out of our major national federal laboratories.

Lastly, while the issue is relatively new in the United States, it is worth mentioning that there are concerns that the injection of post-frack wastewater -- this is wastewater after it comes to the surface -- has resulted in minor earthquakes. The United States Geological Survey, however, has investigated this issue and has found that any seismic activity resulting from the fracking process does not pose a public safety concern. The seismic activity caused by the injection of wastewater from fracking into deep wells is nonetheless the subject of further investigation, and with some people, it's a deal-breaker in terms of pursuing shale gas.

As mentioned, regulators at the federal, state and local level will clearly have an influence on the speed of development of our shale gas resources. Currently, most of the existing regulations for fracking are at the state and local level. The EPA, in point of fact, has little jurisdiction over the process. However, as mandated by Congress, the EPA is looking into the consumption of water during the fracking process and has announced recently that it will utilize the Clean Water Act to regulate the disposal of wastewater produced from fracking, and the EPA will announce a proposed rule based on this investigation but, unfortunately, not until 2014.

Much of the existing regulation has been promulgated at the state and regional levels around the country. Texas, Pennsylvania, West Virginia, Colorado and

Wyoming are just a few examples of states that have already introduced additional regulations on shale gas production.

The demand side of the equation will also have an impact, obviously, on the feasibility of exports. While there are four sectors that consume most natural gas demand -- electric power, industrial use, transportation, and commercial and resident sectors -- natural gas demand for exports, we believe, will most compete with the electricity sector and the industrial sector. In the near term, natural gas consumption will most likely come from the power sector.

The Energy Information Administration, the EIA, estimates that natural gas power plants will account for 60 percent of new electricity capacity additions between 2010 and 2035. Much of this additional natural gas demand will be the result of replacing around 40,000 megawatts of coal-fired generation, as the chart on the right illustrates. While many old coal-fired plants were expected to be retired, the promulgation of new EPA regulations may likely accelerate the phase-out of other inefficient coal-fired power plants, putting additional demand on natural gas.

The industrial sector likely will be a significant beneficiary of the newfound natural gas reserves. Natural gas is the primary feedstock for industrial producers, particularly for manufacturers. Ethylene, a petrochemical product that is critical to many manufactured goods, is produced in the United States from ethane, a byproduct of natural gas. The precipitous decline in natural gas prices has now made U.S. industrial manufacturers among the lowest cost producers in the world, and clearly, they don't want to have anything happen that changes that.

In our research, we found that due to various constraints the transportation, commercial and residential sectors will not experience dramatic increases

in natural gas demand.

The most notable issue we found is that natural gas penetration into the vehicle fleet faces high up-front economic costs and financial, technical and infrastructure limitations. Increasing natural gas demand in transportation is clearly possible.

However, we conclude that this will not happen based on market forces alone and would require significant public sector support in the form of tax credits and other incentives, which we believe will be unlikely in an era of fiscal stringency.

U.S. LNG exports will not only be competing against domestic consumers of natural gas but also against international LNG producers such as Qatar, Indonesia, Australia, Malaysia and Nigeria, and in the Asian power market, against coal. Much of the advantage that exporters of U.S. LNG see is predicated upon the arbitrage opportunity that the U.S. currently would have in selling its gas which is produced and sold at floating market rates to customers in the Atlantic and Pacific markets, who generally purchase LNG at more expensive oil index prices.

We will discuss more about the global LNG market in the implications section. However, I will mention three major factors that have a significant bearing on the United States's ability to export LNG.

The first is the widening of the Panama Canal, expected to be completed in 2014. Currently, very few LNG tankers can traverse the isthmus. After its widening, however, it is estimated that 80 percent of the world's LNG tankers will be able to pass through. This will make Gulf Coast LNG exports to Asia instantly more economical.

The second is the impact of various national nuclear energy policies on gas demand. Germany's decision to accelerate the phase-out of its nuclear power plants will significantly increase the demand for natural gas. A similar decision by Japan, where

the public is clearly wary of nuclear energy in the wake of the Fukushima accident, has led to a significant boost to the country's gas demand for LNG.

Finally, the spread of the unconventional gas revolution potentially to new markets such as China, India, Ukraine and Poland could change the fortunes of the LNG market if these countries develop what some people believe are very, very high shale gas reserves.

While technical and regulatory obstacles may delay the prospect for rapid shale development in the near term, it may place demand for LNG in the decades to come. And this is a very difficult fact when you consider that when you sign one of these contracts to export LNG to your buyers you have to make assumptions about what your competitive position is for 25 years down the road.

Taking into account the various factors that have an impact on the feasibility of natural gas exports, the study concludes that based on our existing knowledge, and the existing and proposed policy and regulatory landscape, exports are technically and logistically feasible. In other words, there are no insurmountable barriers to the U.S. going ahead with exports of LNG.

And it is important to note that while we highlight some of the issues that are likely to affect the economics of LNG exports, such as securing financing and the fixed costs of liquefaction and transportation, it was not our study's objective to come to a conclusion on the economic feasibility of exports for those companies considering doing so. Rather, we believe that the market will determine which of the proposed projects move ahead or don't.

Having determined that there are no technical or logistical reasons why LNG exports cannot go ahead, we looked at the likely implications of such exports were

they to happen for the country. The big question is what impact exports will have on domestic natural gas prices, and this is one of the major issues of concern to some members of Congress.

A large part of the implications part of the study looked at the leading, existing price impact models published to date. We got analysts from each of the companies behind these reports to come in and discuss their models and assumptions so we could better understand some of the variations in the conclusions of these very fine studies.

As reflected in the different results from each study, the models and assumptions varied quite widely. The much quoted EIA study, for example, considered what we found to be unrealistic assumptions about the scale and pace of LNG exports in most of its scenarios. We understand that the motivation behind such scenarios was to set a boundary case for exports, but even so, we conclude that such boundaries which are set in the EIA study at 12 bcf per day by 2021 are beyond the realm of probability.

The table here shows a comparison of the various models, assuming 6 bcf a day of exports, which we believe is a more feasible number. The EIA figure used in this table is what we see to be the most realistic case and reflects EIA's baseline low growth scenario.

The notable thing is the modest impact. I want to highlight this -- the modest impact that exports have on price. In all of the studies, especially in the context of recent historical gas price fluctuations, as you can see, or hopefully see, the range is extremely small and is in the mid single digits.

As well as the price impacts, we examined the impacts of LNG exports on the principal domestic sectors for gas use -- again, power generation, petrochemical

production.

On the left, you can see the modest increase in price. You can see that the modest increase in price will likely translate to a modest price increase on the cost of electricity. The highest impact on electricity prices is projected to be just under \$5 per megawatt hour, which translates into roughly a half a cent per kilowatt hour.

The chart on the right illustrates why the impact of a price increase in natural gas from LNG exports will likely have a minimal impact on the industrial sector and petrochemical producers. It shows the ratio between Brent Crude oil prices and natural gas at Henry Hub, the U.S. market price.

According to the American Chemistry Council, the ratio at which U.S. Gulf Coast petrochemical companies are competitive in the international market is a ratio in the price of gas to oil of 7:1. This threshold is shown on the dotted line at the bottom of the chart. As you can see, we are now many multiples above this level.

Obviously, it is not likely that Henry Hub prices will remain in the \$2 range indefinitely, but this shows the huge margin of opportunity that exists for U.S. petrochemical producers. Exports are not likely to have a significant impact on this highly competitive position.

Moreover, given that most petrochemical projects, such as crackers, are capital-intensive projects -- it is highly capital-intensive projects -- it is unlikely that investment decisions on building new petrochemical production facilities will hinge on a marginal price increase resulting from LNG exports when the feedstock cost advantage is so many more times higher than that of its major other competitors.

There is also a lot of concern surrounding the impact of LNG exports on gas market volatility, with some opponents concerned that the U.S. natural gas market

might return to the volatility experienced during the 2000s.

This chart demonstrates the historic volatility of natural gas prices. The light and dark blue lines represent the price of natural gas through the 1980s and 1990s, respectively. The black line represents the price of natural gas during the decade of the early 2000s and shows considerably greater volatility. This was because demand for natural gas was increasing in a tightening domestic natural gas market. Today, the market is oversupplied, and volatility has responded in kind.

The extent to which volatility occurs as a result of exports, we recognize, is still underresearched, but we found that the technical constraints of natural gas exports will limit the impact of price volatility. This is a very important point.

LNG exports are naturally capped by the capacity limitations of LNG export facilities. In other words, if company X builds a facility to export 1 bcf a day of natural gas, it cannot export more than 1 bcf from that facility without sizeable additional financial investments.

This means that unlike oil trade, in which barrel of oil theoretically can be exported to the highest bidder on the global market, there is a fixed amount of LNG that can be exported at any given moment.

This puts an upper bound on demand for natural gas from exporters. As long as LNG exporters have contracted out nearly all of their capacity, which is probably required if they're going to get financing to build these facilities, then export-induced volatility, we believe, will be extremely limited.

The study also looked at the impact of exports on the domestic economy and jobs. In this case, the study did not come to a quantitative conclusion. Assessing the macroeconomic and job impacts of LNG exports requires a comprehensive general

equilibrium model that can incorporate all the effects of LNG exports. The problem with such models is their assumptions on different kinds of job creation -- whether direct, indirect or induced -- and their estimates of the multiplier effect that higher natural gas prices and increased domestic natural gas production will have on the job market.

The Brookings team had hesitations about the very existing multiplier assumptions in several of the studies. However, the team did make a qualitative assessment of both issues, concluding that the impact of exports on the domestic economy is likely to be modest.

While the inevitable natural gas price increase stemming from exports will have a small negative impact at the margin, on the job creation prospects for some domestic consumers, it is balanced and likely outweighed in our view by the increased production and the ancillary jobs that will accrue by building new pipeline networks in order to get the gas to market. And we also note that it's generally assumed that all the LNG facilities will be fueled by new gas production. Nearly 65 percent will come from new gas production currently not in the pipeline.

Similarly, the trade and exchange rate impact of LNG exports are hard to quantify. Given the comparative advantage that U.S. natural gas has on the global market, there are gains from trade to be accrued from LNG exports. From a trade balance and exchange rate perspective, Citigroup estimates that all petroleum product and gas exports will cause a very marginal appreciation in the value of the dollar, between 1 and 5 percent by 2020, and within this range LNG exports are likely to be a small, if not negligible, factor.

U.S. LNG exports are likely to enter into a tight LNG market, as demonstrated by this chart which shows the supply and demand balance of the global

LNG market between 2015 and 2020. The chart aggregates current data and planned production of LNG export and import facilities as well as other factors that will have an impact on LNG supply and demand. The chart illustrates that by 2020 there will likely be a 5 bcf a day shortfall in the global market. And, as I mentioned earlier, U.S. LNG will be competing principally against LNG being sold at oil index prices.

As the U.S. becomes an alternative supplier of gas to these customers, its gas is likely to put pressure on the structure of these contracts, forcing prices down albeit probably not dramatically.

We predict that U.S. LNG will soften, but not break, the oil index pricing regimes prevailing in both the Atlantic and Pacific basins. In the Pacific basin, particularly, this will have a salutary effect on U.S. foreign policy and relations. It will provide supply relief and diversity to our strategic allies, an issue that is particularly important in light of the President's recent U.S. "Pivot to Asia" policy.

Diversions of LNG cargoes originally intended for the U.S. to Europe have already begun to bring price pressure on Gazprom's oil index contracts, putting pressure on Russia's budget, which gets about 50 percent of its overall revenue from oil and gas exports.

LNG exports can also help our friends in the Caribbean and Central America to reduce their dependence on high cost fuel oil in the power sector.

We're getting near the end.

While the opportunity for U.S. LNG exports will exist, it will be limited by market realities. The fixed costs of LNG infrastructure -- namely, liquefaction and shipping -- mean there will need to be a margin between U.S. natural gas prices and the price of LNG imports in the export market. The Brookings study uses a \$3.40 figure for

these costs, a figure derived from MIT's excellent study on natural gas.

So, essentially, what we're saying, whatever the Henry Hub price is, you will have to add \$3.40 and be competitive with those 2 figures against other alternatives. However, this number can vary, depending on the shipping distance and the varying costs of liquefaction.

As these projects are highly capital-intensive and financed on a project finance basis to attract the necessary financing, these projects will have to demonstrate their economic viability over their lifetimes.

In other words, LNG exports will depend on a positive arbitrage opportunity for the life of a project. As domestic demand for natural gas increases and as early volumes of U.S. LNG soften international market prices, there will be a economically determined upper bound on the economic feasibility and, therefore, the volumes of U.S. LNG that can be exported.

The eroding of the arbitrage opportunity is evident in this chart, which shows the impact -- I'm sorry.

The eroding of the arbitrage opportunity is evident in this chart, which shows the margin between U.S. LNG exports from the Gulf Coast and the import price in Japan in 2020. It shows an arbitrage opportunity that is smaller than what exists today.

And when you look at your own copy, where you can read this better, one thing you'll see that is quite interesting is over these two charts are relating to potential projects in Alaska, not projects that exist today, and you'll see that a significantly large export from Alaska would be one of the most competitive opportunities in the Japanese market in particular.

So what does this all mean? I'm not sure.

The Brookings team distilled the findings of the feasibility and implications of LNG exports and came to several conclusions and recommendations.

The first conclusion reached was that given our existing knowledge, exports are technically and logistically feasible.

While exports will result in an increase in domestic natural gas prices, the increase will be modest. Because the price increase will only be modest, there is a negligible impact on the price of electricity and the competitiveness of our industrial sectors.

The volumes of natural gas to be exported as LNG mean that there will be limited macroeconomic or job impacts -- a view that is somewhat at odds with the White House's previous statements. The volumes of natural gas to be exported as LNG means that there will be limited macroeconomic or job impact.

Similarly, we found that the environmental implications of LNG exports are negligible.

But what do LNG exports do? For starters, they will erode, but not dramatically alter, oil-linked long-term contracts in Asia and in Europe. This will have positive geopolitical benefits as strategic allies in both regions will benefit from an increase in LNG supply as well as supply diversity.

Finally, there is a limit to the amount of LNG that the U.S. will actually export because market considerations, both domestic and international, we believe, will limit the arbitrage opportunity and economic feasibility, potentially, of some exports projects.

So what should government do? It is our conclusion that they should do nothing beyond requiring the current approval process to be followed. We argue that the

U.S. Government should neither prohibit nor promote LNG exports.

Capping exports artificially will distort markets and likely have unintended consequences. A policy that either promotes or prohibits exports would be an implicit subsidy to either consumers or producers at the expense of the other. And history suggests that governments are less efficient than the market at allocating and distributing rents. Moreover, capping exports will likely weaken the position of the United States as a supporter of a global trading system characterized by the free flow of goods and capital.

We conclude that the effects of exports on domestic gas prices will be modest for the power sector, likely in the single digit percentage range for a commodity that has seen a price drop of nearly 50 percent since the beginning of the year; for industrial producers, a similar modest price rise on a percentage basis against the backdrop of a new energy landscape in which they have a price advantage many times higher than that of their competitors; and we believe that the shale gas can lead to a revitalization of the U.S. industrial economy.

These are the likely effects, but our conclusion is not based solely on these considerations. Exports will be bound by the realities of gas demand in both domestic and international markets.

We don't see why the government that espouses free trade should intervene to disadvantage those who want to take a risk on using gas for exports relative to those who want to use it for other ends.

We believe government should refrain from intervention in the gas market, and the government will ensure that U.S. gas is allocated to the most efficient end uses, many of which will bring ancillary political and economic benefits to the United States and its partners around the world.

Thank you very much.

(Applause.)

MR. EBINGER: I would like now to invite our three panelists up to the podium, and we'll get some discussion going.

I've got a couple questions for each of the panelists. And what I think I'll do, I'll address it to a particular panelist, and then after that question is answered the other panelists, if they wish to add anything or to challenge anything, we'll let them do so.

Let me first start with you, Melanie.

And Melanie is under some kind of time constraints. So we recognize when she has to flee to get an airplane I have asked Kevin Massy, my Deputy Director, to come up and take her place.

Melanie, the report finds that natural gas is not going to see meaningful penetration in the transportation sector, absent major policy support, but in recent weeks the President himself has made some positive comments about the possibility of natural gas use in the transportation sector.

What, in your view, is the potential for gas in the vehicle fleet or trucking fleet, and do you think there is the possibility that large-scale adoption of natural gas vehicles would have a sufficient effect to put upward pressure on prices and, therefore, have an effect on the economics of exports?

MS. KENDERDINE: Thanks, Charlie, for the question.

Charlie mentioned that MIT did a "Future of Natural Gas" study. We released it last June. I think we were here in July and rolled it out here as well. And we looked at natural gas in transportation in a couple of chapters of the study.

The big macro look at gas in transportation in our epi-modeling of the

world and the impacts of a climate policy on U.S. -- and the scenario was 50 percent reduction in CO2 emissions from developed countries by 2050; a 50 percent reduction by developing countries, 2070; nothing from the least developed countries. So that was the scenario for the model.

And the results of that model, when you looked at the various technologies, showed by 2050 a 20 percent penetration of CNG vehicles in the U.S. market.

Okay. So that was climate, CO2 limitation-driven. But then we took a very specific look at natural gas in transportation, had a large section of a chapter on that, and we looked at CNG vehicles. We did not see large penetration in the near term, absent some policy changes that Charlie mentioned, or policy support. Only for commercial vehicles that drive long distances over the course of a year do you see any kind of penetration in CNG.

There's also, we found, a real price penalty in the U.S. I want to get these numbers right. The incremental cost for factory-produced CNG vehicles in the U.S. is \$7,000. In Europe, it's \$3,700. So there's a big difference in the incremental cost in those vehicles.

And for after-market it's even more substantial. In the U.S., it's \$10,000. In Singapore, it's \$2,500.

So we have a significant price penalty on CNG vehicles in the U.S. Some of that is regulatory-driven. A lot of it is just economies of scale.

And then finally, we looked at flex-fuel vehicles -- ethanol, methanol, gasoline. We kind of like that, not from a climate perspective but from an energy security perspective where you could get arbitrage between fuels.

So that's a long way of answering. We didn't see huge penetration. We saw much more gas consumption in the power sector than transportation. There are some niche markets where you would see gas in transportation.

MR. EBINGER: Do either of you gentlemen have anything to add?

MR. LEVI: I want to just add one small thing. I agree with everything Melanie said.

There is a wild card out there that would see companies put significant investment into converting natural gas into liquid fuels which, would require some of the same infrastructure changes. That's typically been something that folks have hesitated to do. It's quite risky. You need to put up a lot of capital. You're exposed to price risks on both sides. But to the extent perhaps that producers see this as a way to actually diversify their exposure rather than as a way to take on new risks, you could see some movement in that direction.

But anyone who tells you they can predict which way that will go, I think, is a little bit overconfident.

MR. EBINGER: Okay, let's turn to our next question.

Kevin, the study suggests that in the existing regulatory climate, shale gas production will likely continue to grow. However, environmental concerns over the fracking process have encouraged the EPA and state regulators to assess the environmental impact of fracking and possibly put forth corrective regulations.

How do you see the regulatory environment for fracking to develop, and what do you see as the balance between appropriate state and federal regulation?

MR. BOOK: Thank you, Charlie, and congratulations on the study.

I've been invited to do a number of studies in D.C., and they tend to run

the gamut from you sit in the room and say things that are ignored to you do all the work as part of the study team. This was actually a pleasure because it was a real discussion. They were all enjoyable discussions. Brookings did the thinking and concluding and, blissfully, the writing.

And so, it's a tremendous work, and I am going to recommend it to all of my clients because I think it may be the best primer on the issue out there right now.

The environmental regulation wild card is a big one. We tried to estimate what we think the costs of regulation will be at the well head, where the cost decisions are being made by producers. And just pending federal rules right now, including the NSPS for oil and gas that came out on the 17th of April, they're looking like something between -- it doesn't sound like a lot -- 31 and 76 cents per mcf. But that's a lot, particularly at a marginal decision-making point where if you have to commit capital and you are going to take a risk that may change your behavior.

That doesn't include states, potentially in some states where there are concerns that are being escalated through the regulatory process, imposing their own rules.

And so, this is a big deal because at \$2 per mcf there are a lot of questions about why gas is being produced at all. Separate discussion -- have that one at the bar sometime.

But the real issue here is going to be at the marginal profitability point where regulation can change the decision from go to no-go.

Will shale gas be able to respond to the demand that's being expected of it? Our contention is it probably will, but it won't necessarily come from all the current producers who are producing today.

The problem with regulation that standardizes environmental rules, whether it be at the state or the national level, is that it means nonmaintenance capex for some of the people who maybe should have been doing that capex before -- they may be out of business. You may see consolidation in the profile of producers across the industry. It's not necessarily bad, though, if the result is prudent development, as the NPC is fond of saying.

MR. EBINGER: Do either of you have -- okay.

Michael, the domestic shale gas revolution has the potential, clearly, to go global. The report acknowledges that large shale gas reserves in many parts of the world and that the pace of shale gas development places an economic uncertainty on the feasibility of U.S. LNG exports.

How fast do you think international shale gas can be developed, and what has to happen for it to do so?

MR. LEVI: I'm skeptical of large-scale rapid growth in international shale gas production.

Let me first, though, add my compliments to Kevin's. I think he stressed the process, and that's extremely important. I think beyond the report and everyone who reads it, this process has left a really well informed, thoughtful community of folks in Washington who have been spending a year talking and debating the issue, which is actually an unusual situation for such a rapidly emerging subject. So that in itself was incredibly valuable. And, I know I looked forward to every meeting.

The reason I'm skeptical on significant near-term growth in international shale gas production just comes from a country-by-country look. So if you look first at the three top potential sources, one is the United States; the second is Argentina, which is

not going to be getting international capital and, with it, technology anytime soon; and the third is China, which is really an unknown quantity.

There are big questions regarding the cost of extraction in China. A lot of infrastructure to bring water to the fracking sites, to bring gas away from it, would need to be put in place. It's difficult to precisely understand the incentives facing the heads of the various energy companies there that would drive development. So you could see a lot, but you could also see more limited amounts. I'd also add to that the subsurface isn't as well understood there as it is here, and so you'd need to sort of build the knowledge base in general.

You hear discussion about development in Europe, and I think Poland may be one place that happens though there are now questions about the actual resource. I think it's the early days. But in Western Europe -- in the U.K., in France -- the reality is that these are very densely populated places that make the environmental stresses from fracking even more difficult to manage than here. It doesn't mean that they can't be managed, but there's been a lot of resistance so far.

And then, you'll see processes underway in South Africa and in Australia to look at this, but again, a slower timeline.

Now that doesn't mean that I would conclude that this price difference is protected. I think there are other potential reasons that prices could converge and take away some export opportunities.

You could see -- I think you could see a delinking, a greater delinking of oil and gas prices overseas, and a relinking of gas to coal prices, without U.S. exports driving that. We're seeing a bit of that in Europe already, and since Europe and Asia share some common producers, you could see that move over to Asia.

Again, this is in the realm of unknowns, but if you're putting in a lot of capital on an LNG export facility, you've got to worry about the unknowns and your financiers certainly have to worry about them.

MR. EBINGER: Thank you. Anybody want to --

MS. KENDERDINE: I, fundamentally, agree with Michael.

I've been looking at kind of the lack of infrastructure, the lack of drilling rigs, for example, in Europe. I was just speaking in Rome, trying to get the number of gas rigs in Europe before I walked onto this stage, and there were a lot of European producers there, and they said there are 120 total rigs and only maybe 20 to 30 of them were gas rigs.

So if you're talking about producing shale gas there, I think that there are a lot of infrastructure issues that are going to be limiting.

And that's true around the world, and true -- more True -- in some places than in Europe. So I think that that's limiting.

There is a lot of gas out there. There are financial incentives for doing it. And the only thing I would say on that is that in our discussions in the study group I found myself saying one day, I cannot believe I'm sitting here talking about exporting U.S. gas.

And I just remind people where we were 10 years ago in the U.S. on the development of shale gas and what it did to the LNG import market in the U.S. As a word of caution, if we undervalue and don't fully appreciate what could happen to that if other countries develop their shale gas.

MR. BOOK: Just a very short rejoinder, I think Charlie made the point that one of the factors of production is water. There has been some very good work done looking at the resource potential in overseas destination production zones. There has been less

work done connecting it to the water that you need to have to produce it.

MS. KENDERDINE: Right.

MR. BOOK: The one place that we know would be very promising on both counts is France, and the Paris Basin is off limits. Essentially, them that's got is them that's not. If they're going to take that kind of step, given the resource they have, it does call into question just exactly how feasible it is politically from an above-ground perspective.

MR. EBINGER: Melanie.

MS. KENDERDINE: Yes.

MR. EBINGER: I know you may have to go, so.

MS. KENDERDINE: I'm fine. I've got 15 more minutes. Then, I disappear.

MR. EBINGER: We say in the report that U.S. LNG exports are likely to erode but not break the oil-linked structure of LNG in the global market and move the market toward global price convergence over the long term, which we were just touching on.

What are your views about the prospects for a global gas price, and what are the factors other than U.S. LNG that would accelerate the move to the convergence, and what do you see as the principal costs and benefits of a global gas market?

MS. KENDERDINE: Well, the recent events in the world, I think, suggest that we're thinking more about a global gas market. You have Fukushima increasing gas demand, this whole shale gas revolution -- people are looking at the impacts of that on global markets and investment decisions, et cetera -- the Arab Spring, Germany wanting to shut down its nuclear plants. There are a whole lot of things that are occurring in the

world that could increase demand for gas and increase supply of gas.

And I think that typically you see the delinking of prices when there's a lot of gas supply, delinking from gas from oil when there's a lot of gas supply. And the opposite when gas supply gets tight, you'll see more linking. So one way to accelerate the delinking, and that helps develop your global market, is to produce more gas. Okay.

So the other thing I would say is that we looked at -- in the MIT gas study, again, we looked at the price impacts of maintaining basically the three gas markets that we have now -- Europe, Asia and the U.S. -- maintaining those gas markets, those distinct gas markets in 2030, with limited trade between them. And then, we modeled lifting the restrictions and looking at a global gas market like a global oil market and what the impacts were in the U.S. on price.

And this is for 2030. Okay.

Assume this happens by 2030, and we successfully import gas and start delinking gas and oil, and all the impacts associated with that. And in 2030, in a regional market, the price of natural gas in the U.S. was \$7.50 per mcf; in a global market, it was \$5.70.

So there's a substantial reduction in the cost of gas and substantial benefit to the consumer in the U.S. if you have a global market -- much lower prices.

What we also saw in that scenario, however -- and this upset some people that we briefed on the Hill, for example. You saw an increase in imports in the U.S., but you also saw steady domestic production in the U.S. What happened was those lower prices increased demand for natural gas in the U.S.

So you imported more gas, your domestic production was not hurt, and you had lower prices. So that's a benefit you could see in the long term of a global gas market,

and that's what we saw in 2030.

MR. EBINGER: Do you want to add something, Michael?

MR. LEVI: I think this is tricky territory. If you're theorizing that U.S. exports will prompt the creation of a global gas market, which will then erase all U.S. exports and make the United States import-dependent, someone is going to lose a lot of money. And that's just worth keeping in mind.

And often, these things are -- this is actually how the world works. You got a big oil spot market only emerging in the mid-1980s out of a series of mistakes, where a lot of people put in money and you created a lot of oversupply and the public benefited and the particular investors didn't necessarily.

The other thing worth keeping in mind, though, is when we talk about a global gas market we're not talking about a common price. If it costs 4 or 5 bucks to ship natural gas from point A to point B you preserve a difference between those markets.

The only case with a sort of global market where you have a common price is one where essentially you have a set of producers and a set of consumers. So if it's all coming out of the Middle East and all going into the three big consuming markets, you can have common prices and global trade. But if the United States is involved as a seller, it's hard to think of a global market with a common case.

And that's actually important when you think about the competitiveness impacts, for example, of having a common price. Or, sorry, of having a globally integrated market. Even if you have robust trade from the United States to others, you still have permanently lower natural gas prices than in the consuming markets, and that has implications for your manufacturing sector.

MS. KENDERDINE: Could I say something, Charlie?

As Michael said, in the scenario I described, where in 2030 you start importing gas into the U.S. and it has great consumer benefits -- and Michael is right. A lot of people will lose a lot of money. We seem to do that a lot in the gas industry in the U.S. Okay.

We've lost a lot of money on importing, import facilities and natural gas. Before that, in the mid-nineties, we had a huge build of NGCC merchant plants, and they're operating at 42 percent capacity factors right now. So we seem to get it wrong a lot in terms of our investing in natural gas.

I'm agnostic about it. It just happens all the time, which is if I were an LNG investing in LNG exports I might be questioning my judgment at some point, watching our past history. But --

MR. EBINGER: I would only anecdotally add that my family was in the natural gas distribution business in Indiana for many years, and we were captive to one pipeline, Panhandle Eastern. And when they did their first LNG deal with Algeria, our load was 85 percent industrial and all our customers had tri-fired capacity. So you can imagine when a high cost LNG came into our market, what happened to our industrial load, and we got creamed.

MS. KENDERDINE: One more point on screwing up the policy of natural gas -- we outlawed the use of natural gas in power generation in 1978, which seems bizarre today. But we have a long history of kind of misfires on gas policy.

MR. EBINGER: Okay, Kevin, then we'll try to move to the floor.

The reports suggest that the competitiveness of industrial sector consumers of natural gas will not be significantly affected by LNG exports as the price increases following exports will be modest and the U.S. industrial sector is competing

against petrochemical producers abroad who often use oil-based products as feedstock. Some domestic industrial firms have strongly disagreed with this analysis.

How much importance do you place on LNG exports as a determinant of the competitiveness of the domestic industrial sector?

MR. BOOK: Some firms have disagreed with the analysis -- a very tactful way of saying what you said -- and I want to compliment you for your tact in the report itself. I'm not going to be so tactful.

If you're putting up a multibillion-dollar facility and a couple of percentage points can break your margins, you probably shouldn't. This is one of the most volatile commodities that's been traded in the history of energy markets. It's broken more hearts than any Hollywood starlet you can find.

If your margins are so thin that this could break them, then there isn't much benefit to putting up plant here. Conversely, if it is so beneficial to do it here, then a small change in price probably won't undermine those benefits.

I think it's foolish to assume the price won't go up if you export natural gas. That sort of underlines all the principles of supply and demand that you study as an economist, and practice too. But it's also fair to say that the price of natural gas may go up even if you don't export it.

Again, there's this presumption that the current state of affairs is permanent and we live in this wonderful place where gas is \$2 forever. The last time we lived in that place, they overbuilt combined-cycle gas turbine plants to the tune of a couple hundred gigawatts of capacity.

So this is not a place you want to plan for your business. The price will almost certainly go up. No credible study, whether it be MIT or EIA, picks a price where

things equilibrate and flatten that's any higher than \$7 or \$8, or at the very extreme, \$9. And if you look at the history of gas prices in the U.S., that's still well below where they've been just in the last decade.

But what's your business plan? Does your business plan need it to stay below \$3 delivered? If so, I would be worried about that business too.

MR. EBINGER: Okay, let's open it up to the floor, if you would please identify yourself and ask your questions. We have some roving mics.

MR. ODI: Hi. Antony Odi, formerly with World Bank.

I wonder if you'd like to make a clearer distinction than we've made so far between the economics of gas export from Alaska versus those from the contiguous 48.

I'm looking figure 11, page 42. On the face of it, the opportunity cost of gas at the well head in Alaska is pretty low because it's so far away from domestic markets. You've got big costs to get it anywhere useful.

Footnote to the cost estimate for Alaska says "'Into Plant' reflects the opportunity cost relative to projections of Henry Hub price." I'm guessing that means we start from Henry Hub, we subtract the cost, notional or otherwise, of getting it from Alaska down to the 48, and we add back in the cost of getting it from the well head to the LNG plant, but I'm not sure of that from the footnote.

MR. EBINGER: Anybody want to --

SPEAKER: It's your footnote.

MR. EBINGER: It's actually Jim Jensen's --

MS. KENDERDINE: Right, right.

MR. EBINGER: -- who was one of our international gas consultants, model.

I think what he's saying is pretty close to what you just highlighted, but you notice that there are two very distinct prices, depending on the size of the projected LNG facility from Alaska.

We've had -- I'll be perfectly frank. We've had some criticism of those numbers. Even though the North Slope producers have, of course, recently said they want to revisit doing something with Prudhoe Bay gas, it really comes down -- I think the numbers are very suspect unless you have a pretty detailed assessment of what the gas pipeline is going to cost to get it down to the tidewater. And quite honestly, those numbers vary by billions of dollars on whose forecast is being made.

But Jim's model -- and you know he is one of the leading international natural gas experts. I think concludes -- Ben, do you have anything you can add to that?

SPEAKER: You know the -- you're right. The debate in Alaska is how to price gas because their market consists of basically five buyers and five sellers. So there is not a commodity market, and it's pretty isolated, and the way they do prices is as you've suggested and as Jim has suggested.

The quarrel we've had with the chart is not so much the high cost structure from Alaska unless a great deal of gas comes out. It's really the concept itself that this will drive decisions as to what gas will be purchased in the buyer markets.

The quarrel that we had really is that companies like Tokyo Gas and many others like them are gas utilities. They must have gas. And price considerations of the kinds that are in that chart are the second to most important thing that they are concerned with. The first thing is to get the gas.

Diversity of supply and to the extent they're willing to pay for diversity of supply in a way that drives the European onward sellers as well, the gas utilities in

Europe, they will diversify their supplies. They will welcome U.S. gas, and indeed, there's a Japanese delegation here in Washington as we speak, trying to get a better climate for exporting our LNG. We represent to these buyers for major customers a diversity of supply that they truly need.

So I'm not sure they really are real keen on the precise amounts that are shown in the chart.

MR. EBINGER: We'll try to get some additional information for you.

Yes, on the aisle here.

MR. DARMSTADTER: Joel Darmstadter, Resources for the Future.

We said very little in the last hour about the environmental stakeholders in all this. Let me just say that my intuition is that these things being equal, an expansion of the use of natural gas, including expanded LNG exports from the United States, will have a beneficial effect on the carbon footprint globally.

Now the reason for mentioning that will become clear in 10 seconds, and that is that just within the last several weeks, probably after you went to press, none other than the Sierra Club filed a hefty motion basically enjoining DOE for allowing the export of LNG on grounds that it has not complied with what the Sierra Club deemed to be the necessity for an EIS, an environmental impact statement, under NEPA.

And why did they so argue? Because the LNG -- expanded export of LNG or the export of LNG -- from the United States will have in the eyes of the Sierra Club the significant effect on the cost, on the impact, of electric power generation in the United States, which will be forced to go back to coal or to lessen the reduction of coal use in the United States.

I mean, curiously, if I read it correctly, they talked about fracking and groundwater contamination. They talked about the increased emissions from coal-burning power plants. It seemed to me a very tortured sort of argument.

And again, you would think that an environmental constituency would look at the broad picture and find that basically the environmental or the concerns over greenhouse are well served by LNG.

But I just wonder whether anybody in the room or anybody on the study looked at those environmental impacts. I mean, to me, they seem probably minimal, but I'd be happy to be -- you know.

MS. KENDERDINE: I mean, I haven't -- we didn't look at that in the study, and I didn't, but my reaction to that is by and large that LNG -- I mean, you're going to send it elsewhere in the world where you'll be using gas as opposed to coal. What we've seen and what we're concerned about in Japan post-Fukushima is them using more coal. That's basically what you're seeing happening.

Climate change is a worldwide problem, and the benefits of gas are beneficial in most places unless you're replacing no carbon. You know.

MR. LEVI: So I've spent some time with these numbers, and while I tend to agree with you, you can make an argument that it's ambiguous, not because you think that natural gas might be displacing zero carbon fuels but because you think that it might go along with increased consumption, period. Right?

So that's the real question. Is it displacing coal or is it displacing conservation, efficiency, what not? And that's actually a difficult thing to get your hands around.

This is without any bias towards what should be done with DOE

approvals and what not, just on the substantive question. I'm actually surprised that there hasn't been more effort to link this to local environmental concerns, and I would expect that to happen in the future. My guess is that telling people that someone is poisoning their water to send gas to China will sit badly.

And if industry is excited about the prospect of natural gas exports, which might come online around 2015, it ought to use the intervening time to really get its act on solid ground and to really increase public confidence because the presence of exports will make its efforts to win public acceptance, I think, more difficult than they already are today.

MR. MASSY: Charlie, would you mind?

We did in the report -- I'm Kevin Massy, one of the co-authors of the report.

We did look at this question of how much 6 bcf a day of U.S. LNG exports could displace in terms of the global power generation sector. We did a conversion of the gas, the heat content in the gas.

We took IEA's numbers that said that by 2020 we're going to have 27,000 terawatt-hours electricity generation annually.

If you take very optimistic conversion rates or efficiency rates for gas power generation and you assume no losses in the liquefaction, transportation and regasification process, you get to a figure that's 6 bcf of U.S. gas, that 6 bcf a day of U.S. gas could displace about 1 percent, or would make up 1 percent, of the global power generation capacity.

I mean not nothing but pretty negligible in terms of how -- and you would have to assume that it was backing out, as Michael says, backing out more carbon-

intensive power generation capacity and not displacing efficiency or lower carbon generation.

MR. BOOK: If I understand what Michael said, he said that people aren't psyched that they get water and gas from the same tap and only have to pay one bill, and therefore, there are some things that industry should be doing to communicate these benefits better. And, I think that is abundantly clear, but there are some interesting questions that come up here.

If you look at what happened, the opposition to LNG exports really did start. If you look at the dockets filed on all these plants, it was industrials who opposed them first and the environmentalists didn't go after them first. They're relatively late to the dance, and in fact, one of the permit applicants argued that the environmentalists were so late to the dance they shouldn't have been dancing at all because the thing was shut down and the decision was well underway.

So why were they so late? Well, probably it's worth noting that they're fighting fracking at the well head too and in the communities and in the aquifers and in the watersheds where there are areas of concern. But it's relatively recent that environmentalists have had to configure for this kind of opposition to exports of hydrocarbons in this kind of size.

But there's a precedent. The Longview export terminal from Washington State for coal was basically shut down on an environmental basis and may continue to stay shut down.

And you have another captive resource that the U.S. has -- Powder River Basin coal, which we have a lot. And with coal-fired plant shutdowns, we're going to have even more, potentially, to export.

So I think this is probably, maybe, they're late to the dance, but I think they're probably going to dance longest.

MS. KENDERDINE: That coal is much higher quality than some of the coal in India or places where it might have been destined for.

MR. BOOK: Agreed.

MR. EBINGER: Joel, if I would just make -- I'm certainly not -- I haven't digested the whole Sierra Club report, but it seemed like there was also an issue that when Cove Point was built that somehow the Sierra Club had a judgment, got an agreement that if the facility were ever used for another purpose it would have the right to intervene because the pipeline goes through a state park or something.

MR. DARMSTADTER: Yes, that's a separate statement by the Sierra Club just within the last two or three days.

MR. EBINGER: Okay.

MR. DARMSTADTER: Yes, that's separate. That's separate from the filing, from the motion against DOE which occurred, I think, about a month ago or five weeks ago.

The one that you refer to, which has to do with the conversion of the Cove Point import terminal to an export terminal apparently is a separate legal issue which also, I guess, goes back to an agreement dating from the establishment of Cove Point in connection with the import terminal. It has to do with the perimeter of the facility and whether the conversion to an export terminal would violate what the Sierra Club alleges to have been agreed upon then.

I have no -- I'm paraphrasing a two-page press release.

MR. EBINGER: Thank you for the question.

Margaret?

MS. RYAN: Thank you very much. Margaret Ryan with AOL Energy.

The other argument we've heard from the Sierra Club and from some environmentalists, more recently at FERC in connection with the Cheniere Energy Sabine Pass export terminal, is that the environmental assessment in any environmental impact study ought to reach back to fracking and include the effects of fracking so that when they're assessing a terminal they're looking all the way upstream.

I wondered if you either looked at that or if anyone has any reaction to that.

MR. EBINGER: We certainly did not look at that. I don't know if anybody has a viewpoint on that.

MR. BOOK: I would just say that lawyers manage to stay in business on both sides of these transactions pretty much no matter what gets built. So I'm sure this will be fought.

But the NEPA process provides footholds in projects that are new, which are far greater for intervention by environmental lawsuits than in projects that aren't new. So when you build a new pipeline from a new field to a new export facility, there are many more things to stop. And if you're going to connect things to the well head, connecting them to well heads that aren't currently connected to export facilities, or import terminals that can become export facilities, is going to be easier.

So to the extent that that argument has any traction, Margaret, I think it's going to stop a lot of the greenfield projects. Of course, if it doesn't have any traction, well, then it won't.

MR. LEVI: My guess is that the goal here is to put pressure on

developers in whatever ways is possible to make sure that they develop the resource safely. And while this is, I think as Kevin put it, a foothold, the goal is to make sure that development is safe regardless of where the gas is ultimately ending up, whether it's a U.S. power plant or an export terminal or a chemical, or steel, facility. That's quite reasonable.

It's going to be difficult to follow through on any of these things as part of an actual export application simply because trade law doesn't let you do that. So the United States would run into some very large problems if it tried. The reality is that the way trade law lets you restrain exports is by restraining production.

And if we want to have environmental rules that restrain production and that, in turn, does something about exports, then that's within our ambit. I'm not recommending that, but I'm saying it's a possibility. But going after it specifically because it is exported, legally, I think is a very difficult destination to get to.

MR. EBINGER: Let's go over against the wall.

MR. SULLIVAN: Sean Sullivan; I'm a reporter with SNL Energy.

DOE is putting together its own study on economic impacts of LNG exports. Have you gotten your report to DOE officials, and are you then missing -- or the unidentified third-party contractor that DOE has hired to do the study?

MR. EBINGER: We are not the unidentified third party contractor unless somehow my task force is that I'm unaware of, but we have briefed the DOE, all the requisite officials involved in this. We just did that last week as a courtesy so they wouldn't feel broadsided by anything that they might disagree with.

Lady in the black?

MS. ANNIBALI: Valeria Annibali with FERC.

With Sumitomo and Tokyo Gas recently signing up for the Cove Point LNG export capacity, would you say that the reasoning behind signing up for the capacity is more for trading LNG on the spot market rather than securing supplies as it would be less economical to ship it to Japan, and if so, how would this expedite the separation of oil linkage in Europe?

MR. EBINGER: I mean, I'll let my colleagues weigh in, but I would imagine we would probably think that the Cove Point would probably stay in the Atlantic Basin market, probably moving to Europe, rather than being shipped all the way over to Japan. But, I'll see if my colleagues agree with that.

MR. LEVI: Boats take a while, but derivatives contracts move at the speed of light. There may be a trade in ARF. There may be a second part of that play. It's outside my current knowledge.

MR. BOOK: The second part of the question isn't important. I have no view on where the gas is going, but it is much more difficult to create robust spot markets than people who stare at Econ 101 textbooks tend to imagine.

There is a chicken and egg problem. You don't want to be, particularly as a consumer, the one dependent on some small space where you can be subject to all sorts of little quirks, but until there's a critical mass of folks who wants to be involved in the spot market, it doesn't get created.

So if you do have an accumulation of individuals that decides for various reasons to do that, then I think that does start to lead you to the end you're talking about, which is to provide an alternative way of pricing to oil-gas linkage.

MR. EBINGER: Ben, can you weigh in here?

SPEAKER: It is a global market, and I would imagine Tokyo Gas would

agree with Charlie that it's probably more economical to move gas from Cove Point to Europe than it is to Tokyo Harbor. On the other hand, the Japanese do import a good deal of LNG from the Middle East as do Europeans. So in fact, this gas would, by displacement, benefit Tokyo directly as a supply, even if it's traded.

MR. EBINGER: We got started a bit late. So if you don't mind, I think maybe we'll try to go five or ten more minutes to let as many questions get answered as possible.

Gentleman on the aisle, in the white shirt.

MR. COOPER: Thank you. My name is Bill Cooper with the Center for LNG.

In the very end of your report, it states that the U.S. Government should neither act to prohibit nor to promote LNG exports. And I think in your remarks you clarified or amplified that by saying that the U.S. Government should do nothing beyond requiring that the current regulatory process be followed, and I'm just asking if I heard that correctly.

MR. EBINGER: That's correct. We're basically saying anybody that wants to get in line for exports can file their papers with the requisite DOE and FERC officials and can be evaluated.

Even after they get their permits, it may well be the case that they have financing difficulties. So we toyed with the issue of whether if that were the situation, if you got a permit, should we say by a certain period of time you have to have your financing or you go back to the queue, but on balance we decided that really didn't do anything and just let the market decide which of those projects goes forward.

This lady in the black dress here was waiting.

MS. INUM: Thanks. Joan Inum, University of Birmingham, I should probably start with.

I've got two questions. Firstly, how does the possibility of LNG exports fit with the overall U.S. energy strategy, and secondly, what do you see as the possible implications for U.S.-China relations, including ongoing U.S. shale gas projects in Eastern China.

MR. EBINGER: Well, if you can answer for me what U.S. energy strategy is --

(Laughter.)

MR. EBINGER: -- we could begin. But we'll try seriously to address your -- anybody want to take that?

Michael, do you want to?

MR. LEVI: So with the caveat that Charlie just implicitly gave, I think this question -- answering this question as a matter of policy will require some broad thinking about what the United States wants to do on energy.

There are several currents to the energy discussions right now. There's a current that has to do with growing production and creating jobs that way and also dealing with the environmental risks. There's a current that has to do with revitalizing manufacturing. There's another current that has to do with displacing coal-fired generation. And now, there is this export piece.

So if strategy is the job of squaring the different objectives that you have in front of you, then this is going to have to be something that the United States confronts.

I gave up my prediction license when I decided I knew what was going to

happen with the Keystone pipeline. So I don't know that I want to predict anything here, but my guess is since it frankly is extremely hard to block exports of natural gas when you include all the possible routes, the question will be how do you have this happen in a way that is consistent with these other objectives.

On U.S.-China relations, all I'll say is because there is a permit approval process and because there are at least notional contracts often in place before permits get approved, at a minimum, we will have misunderstandings with China. Okay.

I can't remember who, but I think this person is in the room, related to me that when Cheniere did a deal recently with, I think, a Japanese company, some Chinese officials were concerned that this was an intentional effort to freeze them out even though it was a purely private decision.

And the reality is when things like this happen in a world that is normally very politically determined and you're doing it in a very commercially driven way, as Charlie I think correctly says we should be doing, you're going to have misunderstandings and at a minimum you're going to have to handle those.

SPEAKER: If I might just pick up on this point of how relevant is this -- I don't know if my mic is on. Thanks.

How relevant is this to U.S. energy policy -- the reason that we addressed the implications section of the study the way we did, the way we took the analytical framework of the public interest, was directly related to the way that DOE makes these decisions, and the criteria that we used to determine what the implications would be were drawn directly from DOE. So we tried to speak in their language when we put this report together.

We did a cost-benefit analysis, if you like, through those criteria. But the

overriding criteria which DOE also espouses is the participation in a market characterized by free trade. That was the kind of philosophical underpinnings of our conclusion, but we did look at all of the things that DOE says it takes into consideration when looking at issues like this.

So we think -- we hope -- we're on the same frequency as the Department of Energy.

MR. EBINGER: Lady right --

MS. CARRUTH: Thank you. Reba Carruth, BMW Center, Georgetown University.

Thank you very much for this report. You've certainly put a lot of energy in it, and I think it will take us somewhere, trying to sort of put all this together.

I just want to very quickly bring up the issue of the E.U.-U.S. Energy Council, and Kevin, you know we've met and talked about this with my students.

But very quickly, are you aware that the United States is really pushing the European Union to work to put together global standards, not just environmental standards, but regulatory standards harmonizing a whole range of standards for a transparent and integrated global energy market?

And part of that is also being driven by this growing mobilization of having the global energy market increasingly be seen as a global public good. So this issue of availability and access to citizens and nations, including BRIC nations and developing nations, is growing.

So this issue of harmonization of standards and market structures is going to get more attention, not less.

So I just wanted to see if that came up at all in your discussion or if that's

something you're going to be looking at.

Thank you.

MR. EBINGER: It did not come up in our discussion. We are aware of it.

I am skeptical of the initiative because I think the fundamental problem that keeps markets from being transparent is the issue of subsidies around the world. As long as subsidies are not transparent and are given, distorting markets, we see demand skewed on the upside.

And I think part of that initiative, which is a very important initiative, but part of the initiative must deal with the issue of subsidies. If you're not familiar with it, I recall a few years ago the IEA's report on global subsidies, which was staggering in terms of the misallocation of resources.

And I don't believe you can have open markets until you get rid of them. That's why I'm against all the tax credits various industries in this country receive.

I don't know if anybody wants to add anything. But thank you for making the point.

Yes, sir, on the aisle.

MR. LEWIS: Thank you. David Lewis of Manchester Trade.

Congratulations. I graduated from Brandeis, so particularly pleased to see the power of minds from Boston area.

MR. EBINGER: Be careful.

MR. LEWIS: You mentioned the Japanese delegation in town, and I'm wondering if as part of the study there was any discussion of the increased awareness and, therefore, pressure from foreign markets to be able to have free access to U.S. exports and what that's doing.

I understand that in Cartagena two weeks ago a lot of the Latin American countries were mentioning to President Obama: You've got all these energy initiatives, but at the same time you seem to want to block energy exports. What's going on?

So has there been any discussion of that and the trade law implications, as Michael mentioned, of this?

Thank you.

MR. LEVI: Well, it's perfectly fine to review these things as a matter of proper process. If the United States started very actively discriminating among particular recipients, I think that would create a problem. It would also create a problem if we started discriminating by picking out a few favored recipients.

I'd add to that that it's actually quite lovely to be involved in trade discussions with countries where there's something that the United States has that they want, and it's not clear to me why we would just give it away. I understand that the Japanese, for example, need access to natural gas, but we're involved in a trade negotiation with them, and I'm sure there are things we'd like from them.

So I don't see the harm in continuing to go through this process of approving applications and evaluating them properly rather than somehow just sort of getting rid of it so there's absolutely zero risk that people might want to get rid of by making broader deals with the United States.

MR. EBINGER: I think one of the critical questions relating to your point is you say that they say to the President, why are you blocking exports. I'm not sure what the President's policy is on exports, and I think that's one of the big problems why we have to, I guess, await DOE. But you hear different people say different things.

I can't, for the life of me, understand why Mr. Markie and Mr. Weldon are

so adamant that this is bad. I have not heard them articulate. Other than saying it's American energy and we shouldn't send it overseas, I have not heard a viable argument put forth by either of them.

And I'll be perfectly frank. When we read DOE, you know, they said, well, there are other political considerations.

And I said, if the economics are sound and it's not going to raise prices for domestic consumers, what are the other rationales of why you wouldn't do it?

And quite honestly, we didn't get an answer.

SPEAKER: Charlie, if I might just use this way to reiterate the way that we came to our conclusions, the conclusion, as I said, was based on the philosophy that the U.S., where possible, should refrain -- the government should refrain -- from intervention in the markets.

And one of the principal pillars of that argument is that the U.S. risks losing its credibility in discussions of this nature if it is seen to intervene in these markets to its own advantage while at the same time trying to conduct dialogues in which it's encouraging increased trade. So that was one of the clear motivations for the conclusion of the report.

MR. EBINGER: One thing I just think we'd be remiss if we didn't mention -- I know everybody in this room is probably aware of it. But you know, we did this all on the basis of shale gas in the United States.

Well, if we look to our neighbor to the north, which also is sitting on a ton of shale gas and projects of which could potentially go through the United States to particularly the Northwest if it were allowed to do so, you know, shale gas in Canada is far in excess of any forecast of Canadian demand. So if it doesn't come, potentially,

down to the United States, it's going to go to the West Coast and get exported as LNG.

But for those people who say well, we're not sure if there's enough shale gas, if you factor in the Canadian supply, there's no way you can look at the numbers and come up with that there's not enough gas for both domestic manufacturers and exports.

Well, I think we have time for one more question.

MR. SWENSON: I just wanted to expand. Erik Swenson from Fulbright and Jaworski.

I think Michael was making the point that there is some danger involved with discriminating between a select few countries to export to and disfavoring others, and I wanted to point out the Natural Gas Act already does that, that there's a stark divide between if you're a free trade act country that gives national treatment to natural gas versus a non-free trade act country.

MR. LEVI: Yes, yes.

MR. SWENSON: If you're the blessed country, you can go in today, and the law says that the export application has to be -- it's basically just file the papers and it has to get approved as expeditiously as possible.

And if you're not a free trade agreement country, you're sitting around waiting for a lot of studies to be done and have no clear indication of how those things are going to come out right now.

MR. LEVI: I'm not a lawyer, but my understanding is that that kind of distinction is explicitly allowed in the United States's global trade commitments, but other ones are not.

MR. EBINGER: Well, I hate to cut it off because this has been a very fascinating discussion, particularly your questions from the floor. A few of us will stay

around if anybody wants to come privately and ask something. I apologize if anyone didn't get their question answered, but thank you all very much for coming.

(Applause.)

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ANDERSON COURT REPORTING
706 Duke Street, Suite 100
Alexandria, VA 22314
Phone (703) 519-7180 Fax (703) 519-7190