THE IMPACT OF LOW OIL PRICES ON ENERGY SECURITY IN THE AMERICAS

HEARING

BEFORE THE

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THE WESTERN HEMISPHERE

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THE IMPACT OF LOW OIL PRICES ON ENERGY SECURITY IN THE AMERICAS

THURSDAY, JUNE 9, 2016

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON THE WESTERN HEMISPHERE,
COMMITTEE ON FOREIGN AFFAIRS,
Washington, DC.

The subcommittee met, pursuant to notice, at 10:33 a.m., in room 2172, Rayburn House Office Building, Hon. Jeff Duncan (chairman of the subcommittee) presiding.

Mr. DUNCAN. A quorum being present, the subcommittee will come to order. I would now like to recognize myself for an opening statement.

First off, let me just say that I am excited about today's hearing. This is a very timely topic and I look forward to delving into it. I appreciate the witnesses being here.

Today we meet to examine the impact of low oil prices and the impact that it has on the countries of the Western Hemisphere, and to consider how the United States, with our abundance of natural resources and technical expertise, can play a more effective role in supporting regional stability and strengthening energy security, especially for our friends in the Caribbean and in Central America.

This is the third hearing on energy issues in the subcommittee in this Congress, because energy is a passion of mine, and I firmly believe that energy can be a transformational issue for the societies by providing security and independence, economic growth and jobs, and prosperity and empowerment for many people.

In fact, this subcommittee's first event of the 114th Congress included energy ministers who were in town for the 2015 Caribbean Energy Security Summit. We hosted a breakfast with conversation for Members of Congress and ministers to discuss how the U.S. and the Caribbean could build stronger energy collaboration. These conversations were very fruitful. And I am interested to hear from our witnesses today about the deliverables that resulted from last year's summit and last month's U.S.-Caribbean-Central American Energy Summit.

Specifically, I am curious about post-summit actions to continue advancing efforts to achieve greater energy security through exporting U.S. liquefied natural gas, or LNG, assisting U.S. small businesses with entering the Caribbean and Central American markets, and considering ways to effectively provide technical as-

sistance and assist with infrastructure and financing to achieve sustainable energy solutions.

The Western Hemisphere contains abundant energy resources, with over a third of the world's proven crude oil reserves and 10 percent of the world's natural gas resources. While the United States is the largest energy producer in the hemisphere, Venezuela accounts for 53 percent of the region's crude oil reserves and 28 percent of the natural gas reserves, with Argentina, Bolivia, Brazil, Colombia, Ecuador, Peru, and Trinidad and Tobago having significant oil and gas production.

In addition, the Western Hemisphere also produces the world's largest amount of hydroelectric power, Brazil and the United States are among the world's leading ethanol producers, and Uruguay has the fastest growing wind market in the region as of 2014.

Our hemisphere is greatly blessed with a diverse mix of energy resources. However, the drop in oil prices from nearly $114 a barrel in 2014 to below $30 a barrel earlier this year had a significant impact on the region. And although oil prices have increased over the past few months, since Latin America contains some of the world's largest reserves of oil, the decline in oil prices results in economic, social, and even political consequences for many, primarily what we see in Venezuela.

Last year, the region's economy contracted 0.2 percent, entering recession for the first time since 2009. Many countries have experienced severe budget cuts due to the drop in oil prices, combined with low commodity prices. Mexico, which receives one-third of its budget from oil revenues, adopted a more austere 2016 budget, but then had to go on and cut spending by an additional $7 billion earlier this year. Similarly, Brazil's state-run oil company, Petrobras, weighed down by the low oil prices and its corruption scandal, cut its planned investments for the next few years by nearly 25 percent.

And most significantly, Venezuela has been hardest hit by the drop in oil prices. Its contracting economy projects a negative 8 percent growth in 2016, its projected year-end inflation is 720 percent, and its people are suffering a severe humanitarian crisis due to the government's gross mismanagement of the economic situation, compounded by rampant corruption. I just got off the phone with our representative to the OAS today talking about some of these same issues.

The United States stands with the people of Venezuela, who are the ones suffering most from this crisis, which includes electricity and water rationing, 9 out of 10 homes not having enough to eat, and hospitals lacking basic medicines and equipment. And I am deeply worried about the Venezuelan people, the unsustainability of Venezuela's current trajectory, and the regional instability likely to result from any potential collapse of the country.

Related to this subject of oil prices, I am also gravely concerned about the resounding impact to countries in the Caribbean and Central America who are currently dependent on Venezuela's PetroCaribe program for energy. While former PetroCaribe clients Jamaica and Dominican Republic have paid off their debts to Venezuela at heavy discounts, more countries still remain reliant on PetroCaribe, which is in serious economic trouble.

Small countries in the Caribbean need energy assistance, because they do not have local fossil fuel reserves, they have limited infrastructure for delivering energy, and their energy markets are not well integrated to attract investment and financing to establish pipelines and LNG infrastructure. Similarly, Central American countries depend on oil imports and hydropower, and while some commercial natural gas projects are under development, there are very few and they have a long way to go. Countries dependent on PetroCaribe urgently need greater U.S. engagement before the crisis reaches a tipping point.

In view of the deteriorating situation in Venezuela, which may severely disrupt the region, the United States has a unique opportunity to use our strength—that is U.S. oil and gas, business expertise, technical expertise, market-oriented policies, et cetera—to begin exercising an effective disaster prevention response.

So far, the U.S. Department of Energy has taken some encouraging steps to facilitate Caribbean access to natural gas liquids by processing small-scale export applications. Why not declare all projects of a certain size and selling to Caribbean nations to be deemed in the U.S. national and public interest and have DOE approve all of them expeditiously?

The best example we have seen so far of a country successfully transitioning from PetroCaribe to energy independence is Jamaica, which has adopted LNG as an energy source. Other countries pursuing LNG projects in the region include Dominican Republic and Barbados.

While a diversified energy matrix sounds appealing to many, in the short term, given the regional developments, I am hopeful that the United States will do more to support LNG import infrastructure for countries where renewable energy alone simply cannot provide an effective energy source.

We must also keep in mind that OPEC has strategically decided to keep the oil market oversupplied, resulting in alarming effects to U.S. production, both onshore and offshore, and affecting the U.S. ability to possibly fill any void left by Venezuela in the destabilizing situation there.

That is why today I have cosponsored H.R. 4559. And H.R. 4599, if it is enacted, will be a 1-year commission of experts who would assess whether the cartel's actions are designed to disadvantage U.S. oil producers and secure market power through anticompetitive behavior, assess the impact of OPEC's policies on U.S. economic and energy security interests, including on innovation in both energy production and transportation of goods and people, and make policy recommendations that counter these problems.

That ought to be part of our discussion today, because when we look at the fact that the United States now ranks fourth in energy production according to, I believe, the U.S. Chamber, and that is down from number six, so we are improving in energy production, through 2015. That is prior to OPEC's decision and Saudi Arabia's decision to oversupply the energy markets, which has resulted, just since this reduction in our ranking to number four in the world, we have seen 100 bankruptcies in the energy market, we have seen 150,000 layoffs in the energy sector, we have seen a 78 percent re-

duction in oil rigs, and we have seen billions in deferred investment.

So as we talk about the situation in this region, we have to keep in mind the impacts of OPEC policies on the U.S.'s possibility of engaging in the region more going forward, and possibly not being able to fill the void left by a deteriorating situation in Venezuela.

So I look forward to hearing from our witnesses today on this issue. And we have a guest ranking member, a substitute ranking member today, Mr. Castro, filling in for Mr. Sires. I look forward to his comments, and I yield to him for his opening statement.

Mr. CASTRO. Thank you, Mr. Chairman, for holding this hearing.

And thank you to our witness for being here to talk about the impact of low oil prices on the energy security of the Americas.

As you know, the Western Hemisphere is home to over a third of the world's proven crude oil reserves and 10 percent of the world's natural gas reserves, with the U.S. being, by far, the largest energy producer in the region. The United States has extensive oil and natural gas trade relations with the other nations of the Western Hemisphere, particularly Canada and Mexico. At the same time, the Obama administration has made energy diversification a priority, helping to decrease our dependence on foreign oil and create jobs.

The administration's focus regarding energy policy in the region has been on promoting the adoption of renewable energy resources. In recent years, the hemisphere has made strides in shifting to more renewable and diversified resources and as a result has become the world's leading producer of hydroelectric power.

However, the drastic shifts in oil prices have greatly affected many countries in the region that are more heavily reliant on hydrocarbons. A large portion of the world's oil reserves are located in Venezuela, a country currently suffering from severe economic and political turmoil with an unstable regime at the helm.

High oil prices greatly benefitted Venezuela and other energy producers in the Western Hemisphere over the last 10 years. Bolivia, Brazil, Ecuador, and Venezuela funded vast social spending and energy subsidy programs rather than protect their proven energy reserves and diversify their economies.

For Venezuela and other energy producers in the region, such as Ecuador and Brazil, the drastic decrease in oil prices has led to substantial shortages to their revenue streams and affected their ability to provide basic services to their people and grow their economies. Countries like Mexico and Colombia have diversified their economies and are better prepared to absorb shifts in international oil prices.

In contrast to the region's energy producers, most Caribbean and Central American countries have few energy resources and depend heavily on imports from their neighbors. High oil prices during the last decade hit many Caribbean and Central American nations particularly hard, serving as a bottleneck to economic growth.

Since 2005, the impact of high oil prices was somewhat mitigated by Venezuela's establishment of PetroCaribe, which provides oil to other Caribbean Basin nations at a highly discounted rate in exchange for political influence in the region. Low oil prices are now forcing Venezuela to reduce the amount of subsidized oil it sends

to its neighbors. I am interested in hearing how the possible end of PetroCaribe may affect these small economies.

I look forward to the testimony of our witnesses as they help this committee understand how the considerable drop in oil prices since 2014 is affecting our region and as they lay out the conditions needed in order for oil prices to recover.

Thank you, and I yield back my time.

Mr. DUNCAN. I want to thank the gentleman.

Other members can provide their opening statements for the record.

And I hope I don't have to explain the lighting system. We are going to recognize all the witnesses for 5 minutes. I will have a little lenience, but not much. If you hear the tap of the gavel, please wrap up, and then you can finish your comments during the questions if you would like. But we are going to try to work expeditiously here today.

So I would like to go ahead and recognize the witnesses, and their biographies are in your notebooks, so we are not going to go through their full biographies.

But, Mr. Sieminski, you are going to be recognized first. And we thank you for being here and look forward to your testimony. You are recognized for 5 minutes.

STATEMENT OF THE HONORABLE ADAM SIEMINSKI, ADMINISTRATOR, U.S. ENERGY INFORMATION ADMINISTRATION

Mr. SIEMINSKI. Chairman Duncan, thank you very much. Mr. Castro and members of the committee, I appreciate the opportunity to be here before you today.

The Energy Information Administration is the statistical and analytical agency within the Department of Energy, and by law EIA's data analysis and projections are independent, so my views should not be construed as representing those of the Department of Energy or any other Federal agency.

My testimony will summarize some key findings from EIA's short-term energy outlook on the near-term price and supply situation. Then I am going to address some of the regional dynamics in the energy sector in the Western Hemisphere.

Crude oil prices have recently recovered from a low of $26 in January of this year. Prices for North Sea Brent, which is the global benchmark price, averaged under $47 a barrel in May. West Texas Intermediate was about the same.

Today, prices are actually up over $50 a barrel for WTI and close to $52 for Brent. EIA forecasts that Brent prices will average close to $43 a barrel this year and $52 a barrel in 2017.

I would kind of offer a warning, though, that trading markets suggest considerable uncertainty in the outlook, indicating an average WTI price in September of this year could range from anywhere between $35 and $70 a barrel.

EIA estimates that oil production in countries outside of OPEC grew by 1½ million barrels a day last year, with most of that growth occurring in the United States and Canada. EIA forecasts non-OPEC production to decline by a little over ½ million barrels a day this year and an additional 200,000 barrels a day next year, most of that in the United States. This reflects the decline that

both of you talked about in terms of the drop in drilling activity, especially in the lower 48 onshore states. This is going to be offset by some growth in the Federal Gulf of Mexico.

Within the OPEC countries, crude production increased by 800,000 barrels a day last year, mostly in Iraq and Saudi Arabia. We are forecasting almost as much this year, but it will be coming from Iran. OPEC noncrude liquids also will be up in 2016 and 2017.

EIA expects major OPEC producers to continue a strategy of market share rather than production cuts. However, EIA estimates that inventory builds of global petroleum and other liquid fuels will start to taper off. They are very large now, but they will taper off, and that should bring the markets back into some kind of balance next year.

Over time, a continued slowing of the investment that started in 2015 will make it difficult for supply to respond quickly to future growth and demand for oil. As a result, prices are expected to return to nearly $80 a barrel in the next decade.

In South America, notably Brazil, Colombia, and Peru, long-term economic expansion is expected to support growing demand for oil, primarily for transportation uses and also in the industrial sector. Brazil, with the region's largest economy, accounts for about 60 percent of the regional growth in oil demand over the period out to 2040.

Just turning to natural gas for a bit, we expect a gradual rise through the summer as demand from the electric power sector increases, but we expect prices here in the U.S. will remain below $3 a million BTU through the end of the year.

Natural gas production and consumption continues to grow fairly dramatically across the hemisphere. In addition to the U.S. natural gas pipeline trade with Canada and Mexico since the beginning of 2016, multiple cargoes from the Sabine Pass LNG export facility are delivering gas to Argentina, Brazil, and Barbados in the form of liquefied natural gas. The U.S. is going to become a net exporter of gas by 2017.

U.S. natural gas production remains high. Gas imports from Canada are coming down, growing exports of U.S. gas to Mexico. U.S. gas exports by both pipeline and LNG tanker shipments are expected to continue to go up. Mexico's electric power demand is creating an opportunity for U.S. companies in selling gas by pipeline.

EIA's International Energy Outlook Reference case projects that natural gas production in the Americas, OECD countries, grows by almost half by 2040, with the U.S. accounting for most of that. Natural gas production in the non-OECD Americas region nearly doubles in EIA's international outlook by 2040.

Argentina, the country with potentially the largest gas resource, could become South America's leading natural gas producer by 2040. YPF, the national energy company, has joint ventures with a number of international oil companies, including American companies.

Brazil's natural gas production is projected to triple by 2040. EIA projects that natural gas consumption in South America overall

will increase by 2 percent per year out to the year 2040, with electric power accounting for most of that growth.

Summing up, Mr. Chairman, the Americas are the world's second leading producer and consumer of liquid fuels, they are the leading producer and consumer of natural gas, and hemisphere crude oil and petroleum products trade is large and growing.

Lastly, I would just like to mention the successful collaboration on energy data that EIA has underway with our statistical counterparts in Canada and Mexico. This trilateral effort has already resulted in the development of maps of energy infrastructure across all of North America, a cross-reference of energy terminology in three languages, English, Spanish, and French, because of Canada, and a better understanding of the differences in trade statistics that will enable us to improve the data accuracy and transparency over time.

I would like to thank you very much for the opportunity to testify, and I would be delighted to answer your questions. Thank you.

[The prepared statement of Mr. Sieminski follows:]

STATEMENT OF ADAM SIEMINSKI

ADMINISTRATOR

U.S. ENERGY INFORMATION ADMINISTRATION

U.S. DEPARTMENT OF ENERGY

BEFORE THE

COMMITTEE ON FOREIGN AFFAIRS

SUBCOMMITTEE ON THE WESTERN HEMISPHERE

UNITED STATES HOUSE OF REPRESENTATIVES

JUNE 9, 2016

Chairman Duncan, Ranking Member Sires and Members of the Committee, I appreciate the opportunity to appear before you today to provide testimony on the U.S. energy outlook for the Western Hemisphere.

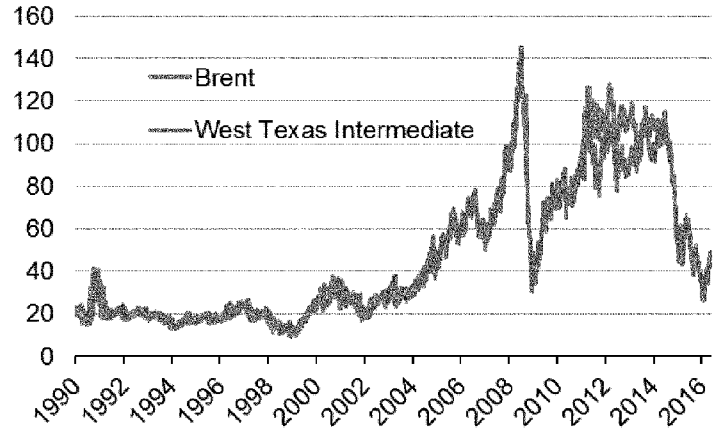
The U.S. Energy Information Administration (EIA) is the statistical and analytical agency within the U.S. Department of Energy. EIA collects, analyzes, and disseminates independent and impartial energy information to promote sound policymaking, efficient markets, and public understanding regarding energy and its interaction with the economy and the environment. EIA is the Nation's primary source of energy information and, by law, its data, analyses, and forecasts are independent of approval by any other officer or employee of the United States Government. The views expressed in our reports, therefore, should not be construed as representing those of the Department of Energy or other federal agencies.

The energy data and projections that I will discuss today are widely used by government agencies, the private sector, and academia as a starting point for their own energy analyses. For the U.S. energy sector, EIA prepares both short-term energy outlooks examining monthly trends over the next one to two years and long-term outlooks with annual projections over the next 20-to-25 years. My testimony will summarize some key findings from the June Short-Term Energy Outlook (STEO), which was released on Tuesday before addressing some of our longer-term perspectives from the Annual Energy Outlook 2016 (AEO2016) and International Energy Outlook 2016 (IEO2016).

I will start with a review of the near term price and supply situation drawn from the STEO and recent data.

Crude Oil Prices: Crude oil prices hit a low point in the first quarter of 2016. North Sea Brent (Brent), the major marker for water-borne crude oil, and West Texas Intermediate (WTI) fell to $26 per barrel (b), the lowest level for both crudes since 2003. Brent and WTI crude oil prices averaged just under $47/b in May. Improving economic data, growing supply disruptions, and falling U.S. crude oil production and rig counts contributed to the price increase (Figure 1).

Figure 1: Daily crude oil spot prices (January 1, 1990—May 23, 2016)
dollars per barrel



Source: EIA, based on Thomson Reuters

Brent crude oil prices are forecast to average $43/b in 2016 and $52/b in 2017, with WTI forecast to average slightly less than Brent in 2016 and to be the same as Brent in 2017.

However, the current values of futures and options contracts suggest high uncertainty in the price outlook. For example, EIA's forecast for the average WTI price of $46/b in September 2016 should be considered in the context of NYMEX contract values for September 2016 delivery. Prices for options and futures contracts traded during the five-day period ending June 2 suggest that the market expects that average WTI prices in September 2016 could range from $36/b to $69/b (at the 95% confidence interval).

Changes in oil prices have different impacts on the various countries in the western hemisphere. A primary differentiation is based on a country's net import or next export position. Table 1 below shows the implied exports based on production and consumption by country of petroleum and other liquids (crude oil, condensate, natural gas plant liquids, biofuels, coal-to-liquids, gas-to-liquids, and refined products). Some countries listed as importers also export crude oil, petroleum products, and/or biofuels, such as Brazil and the United States. The same applies to some countries listed as exporters that also import crude oil and/or petroleum products. Other issues to consider include the level of dependence of a country on oil revenues for meeting budgetary requirements, the level of subsidies, and other macroeconomic considerations.

Table 1: Implied exports of petroleum and other liquids in the Americas, 2014
thousand barrels per day

Country	Production	Consumption	Implied exports
Exporters			
Canada	4,383	2,395	1,988
Venezuela	2,685	794	1,890
Mexico	2,812	2,007	805
Colombia	1,016	291	725
Ecuador	556	230	326
Bolivia	67	64	3
Trinidad and Tobago	115	50	65
Suriname	14	16	(2)
Peru	181	172	10
Paraguay	2	27	(25)
Importers			
Belize	2	5	(3)
Aruba	3	6	(3)
Barbados	1	8	(7)
Martinique	(0)	19	(20)
Nicaragua	-	35	(35)
Uruguay	1	48	(47)
El Salvador	(0)	47	(48)
Costa Rica	0	56	(55)
Argentina	718	776	(59)
Guatemala	14	79	(65)
Netherlands Antilles	1	71	(70)
Jamaica	2	80	(78)
Cuba	49	171	(123)
Dominican Republic	(0)	125	(125)
Brazil	2,966	3,145	(179)
U.S Virgin Islands	-	185	(185)
Chile	15	322	(306)
United States	14,021	19,106	(5,085)

Source: EIA

Note: The consumption and implied exports are estimates that are subject to change slightly as more data becomes available.

Non OPEC Production: EIA estimates that petroleum and other liquid fuels production in countries outside of the Organization of the Petroleum Exporting Countries (OPEC) grew by 1.5 million barrels per day (b/d) in 2015, with most of the growth occurring in North

America. EIA expects non-OPEC production to decline by 0.6 million b/d in 2016 and by 0.2 million b/d in 2017, with most of the production declines occurring in the United States.

U.S. crude oil production averaged 9.4 million b/d in 2015; EIA forecasts production to average 8.6 million b/d in 2016 and 8.2 million b/d in 2017. The forecast reflects a decline in Lower 48 onshore production that is partially offset by growing production in the federal Gulf of Mexico. Over the longer term in the AEO2016 Reference case, production grows to 11.3 million b/d by 2040, reflecting higher recovery rates driven by technology advances and higher prices. The full AEO2016, which will be released later this summer, examines alternative resource and oil price cases with implications for production.

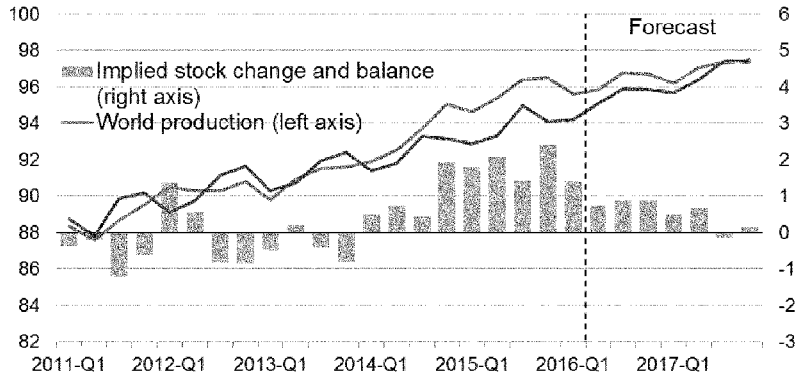
Petroleum and other liquids production, with the exception of production from U.S. tight oil plays, is relatively robust through 2017 because of investments that were committed to major projects when oil prices were higher. More generally, most of the industry's cuts have been to capital budgets that largely affect production levels beyond 2017.

OPEC Production: OPEC crude oil production averaged 31.5 million b/d in 2015, an increase of 0.8 million b/d from 2014, led by rising production in Iraq and Saudi Arabia. Forecast OPEC crude oil production rises by 0.8 million b/d in 2016, with Iran accounting for most of the increase, followed in 2017 with an additional 0.7 million b/d. OPEC noncrude liquids production averaged 6.6 million b/d in 2015, and it is forecast to increase by 0.3 million b/d in both 2016 and 2017, led by increases in Iran and Qatar.

The forecast does not assume a collaborative production cut among OPEC members and other producers over the period, as major OPEC producers are expected to continue their strategy of maintaining market share.

EIA estimates that inventory builds of global petroleum and other liquid fuels will average 1.0 million b/d in 2016 and 0.3 million b/d in 2017, bringing the market back into balance in late 2017 (Figure 2).

Figure 2: World liquid fuels production and consumption balance
million barrels per day



Source: EIA Short-Term Energy Outlook, June 2016

Natural Gas prices: The Henry Hub natural gas spot price averaged $1.92/million British thermal units (MMBtu) in May, unchanged from the April price. Henry Hub, is the main marker price for natural gas traded by pipeline across North America. Through the 2015-16 winter, prices remained relatively low because of lower demand as a result of warmer-than-normal temperatures, record inventory levels, and production growth. EIA expects prices will gradually rise through the summer, as demand from the electric power sector increases, but forecast prices remain lower than they were last summer. Monthly average Henry Hub spot prices are forecast to remain lower than $3.00/MMBtu through December 2016.

Natural gas production and trade: U.S. marketed natural gas production was 80.1 billion cubic feet per day (Bcf/d) in February 2016, which is the second-highest production level on record and an increase of 1.4% from January. Growth was strongest in the Marcellus and Utica production areas. Production in Pennsylvania increased by 3.5% from January levels, and production in Ohio and West Virginia increased by 10.7% and by 1.7%, respectively; however, preliminary data since March, including EIA's Drilling Productivity Report, indicate production growth may be slowing because of reduced drilling activity in response to low natural gas prices.

U.S. natural gas exports, by both pipeline and liquefied natural gas (LNG) tanker shipments, are expected to increase through 2017. Although overall domestic demand growth levels off, production remains high, reducing demand for natural gas imports from Canada while supporting growing exports to Mexico. Growing demand from Mexico's electric power sector coupled with flat natural gas production in Mexico creates a growth opportunity for U.S. pipeline gas. With the startup of Cheniere's Sabine Pass liquefaction plant in early 2016 and subsequent expected increases in liquefaction capacity, EIA projects LNG gross exports will increase to an average of 0.5 Bcf/d in 2016 and 1.3 Bcf/d in 2017.

Trade between the United States and the rest of the Western Hemisphere

The United States and Canada have had extensive energy trade in crude oil and refined products, natural gas and electricity for decades. The electrical grid, natural gas and liquid pipeline systems between the United States and Canada are highly integrated. Oil trade with Mexico has for decades involved U.S. imports of Mexican crude oil and U.S. exports of refined products to Mexico. In recent years, natural gas pipeline connections between the

United States and Mexico have greatly expanded, supporting rapid growth in U.S. natural gas exports to Mexico. With the exception of linkages in the San Diego area, the U.S. and Mexican electricity systems are not very well integrated.

An EIA report, *Liquid Fuels and Natural Gas in the Americas*, dated 2014 provides extensive background on the energy market interconnections across the Americas. For example, in 2012, Intra-American crude oil and petroleum products trade accounted for most of the total energy liquids trade in the region. Tables 2 and 3 show U.S. imports and exports of petroleum products other than crude within the hemisphere. By 2012 U.S. exports of distillate fuel to Central and South America had eclipsed exports to Europe.

Table 2: U.S. non-crude petroleum product exports to the Americas
thousand barrels per day

	2012	2013	2014	2015
Mexico	565	532	559	687
Canada	349	415	478	526
Brazil	166	179	217	184
Chile	148	142	146	150
Panama	126	144	177	163
Ecuador	63	84	98	126
Venezuela	85	81	76	81
Total Americas	**1986**	**2117**	**2373**	**2649**
Total World	**3137**	**3487**	**3824**	**4292**

Source: EIA, Petroleum and Other Liquids Data

Table 3: U.S. non-crude petroleum product imports from the Americas
thousand barrels per day

	2012	2013	2014	2015
Canada	521	563	505	585
Mexico	60	68	61	70
Venezuela	47	52	56	51
Brazil	37	42	15	25
Colombia	30	22	23	22
Trinidad and Tobago	40	25	21	15
Total Americas	**817**	**835**	**730**	**823**
Total World	**2071**	**2129**	**1897**	**2050**

Source: EIA, Petroleum and Other Liquids Data

In addition to the natural gas pipeline trade with Canada and Mexico, since the beginning of 2016, multiple cargoes from the Sabine Pass LNG export facility have been delivered to Argentina, Brazil, and Barbados.

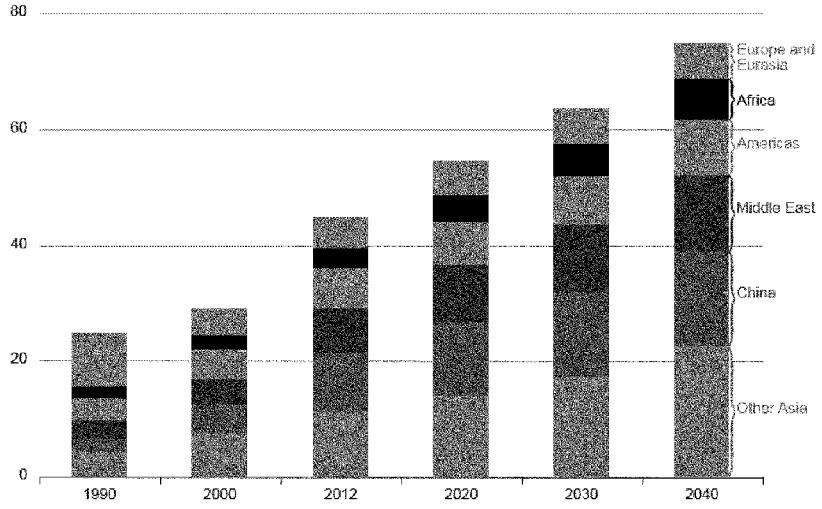
Insights from the International Energy Outlook 2016 (IEO2016)

There are vast oil and gas resources in the Western Hemisphere. By 2012, the countries of the Americas were the world's second-leading producer and consumer of liquid fuels, and leading producer and consumer of natural gas. This section refers to summary highlights from the *International Energy Outlook 2016* (IEO2016) Reference case only. For more detail refer to the complete IEO2016 at http://www.eia.gov/forecasts/ieo/. The analysis is divided by the OECD Americas (Canada, the United States, Mexico and Chile) and the non-OECD countries. The non-OECD includes the following subregions: Southern Cone (Argentina, Uruguay, Paraguay, also Chile which became an OECD member in 2010), the Andean Region, and the Northern Producers (Colombia, Venezuela, and Trinidad and Tobago). The OPEC countries in the non-OECD Americas are Venezuela and Ecuador.

Petroleum and other liquids consumption

Worldwide consumption of petroleum and other liquid fuels increases from 90 million b/d in 2012 to 100 million b/d in 2020 and 121 million b/d in 2040. Non-OECD regions account for essentially all the growth in liquid fuels consumption. In particular, non-OECD Asia and the Middle East account for about 75% of the world increase in liquids consumption from 2012 to 2040, with Africa and the non-OECD Americas each accounting for about 10% of the world increase (Figure 3).

Figure 3: Non-OECD petroleum and other liquid fuels consumption by region, 1990–2040
million barrels per day



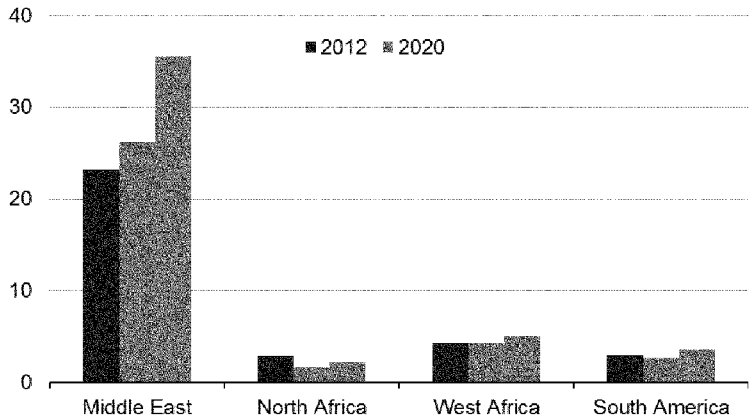
Source: EIA International Energy Outlook 2016 Reference case

In non-OECD Americas, notably Brazil, Colombia, and Peru, long-term economic expansion is expected to support growing demand for liquid fuels, primarily for transportation uses, but, also in the industrial sector. Brazil, with the region's largest economy, accounts for about 60% of the regional growth in liquid fuels demand over the period to 2040.

Petroleum and other liquids production

The IEO2016 Reference case assumes that countries in the OPEC countries will invest in incremental production capacity to maintain a 39%-43% share of total world liquids production through 2040, consistent with their share over the past 15 years. Most of the production growth occurs in the Middle East (Figure 4). The South American OPEC members, Venezuela and Ecuador, contribute very little to the growth.

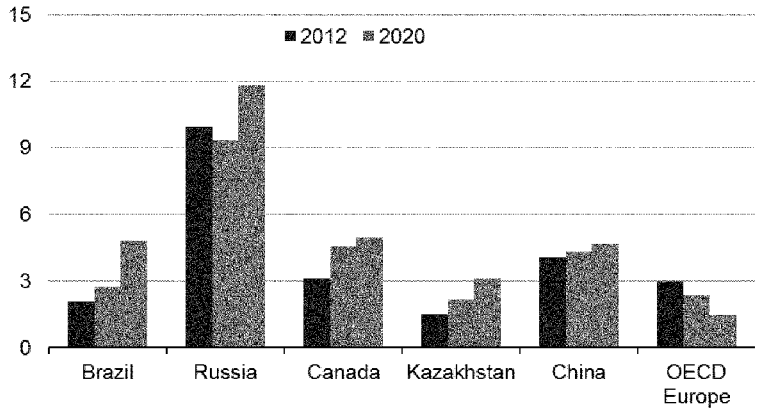
Figure 4: OPEC crude and lease condensate production
million barrels per day



Source: EIA International Energy Outlook 2016 Reference case

Increases to non-OPEC supplies outside of the United States are primarily from Brazil, Russia, Canada, and Kazakhstan (Figure 5).

Figure 5: Non-OPEC crude and lease condensate production in selected country groupings
million barrels per day



Source: EIA International Energy Outlook 2016 Reference case

Key influences on consumption and production are price trends and the reactions of consumers and producers to those trends, which in turn influence future prices. EIA has developed three price cases to examine a range of potential interactions of supply, demand, and prices in world liquid fuels markets: the IEO2016 Reference case and alternative Low Oil Price case and High Oil Price case. Table 4 reflects production based on the Reference case price path.

Table 4: Petroleum and other liquids production by region and country
million barrels per day

	2010	2015	2020	2025	2030	2035	2040	Growth (2012-2040)
OPEC	35.8	37.2	39.2	41.4	44.6	48.7	52.2	1.20%
South America	3.1	3.2	3.0	3.1	3.4	3.6	3.9	0.70%
Non-OPEC	52.3	57.9	61.1	63.1	64.4	65.9	68.7	0.90%
OECD	21.5	26.3	29.2	28.8	28.6	28.2	28.9	0.90%
OECD Americas	16.1	22.0	24.9	24.7	24.7	24.5	25.2	1.20%
United States	9.7	14.9	17.0	16.7	16.5	15.8	15.9	1.30%
Canada	3.4	4.5	5.4	5.4	5.5	5.7	6.0	1.60%
Mexico and Chile	3.0	2.7	2.5	2.6	2.6	2.9	3.3	0.40%
Non-OECD Americas	4.8	5.3	5.7	6.6	7.3	8.2	9.3	2.40%
Brazil	2.7	3.1	3.6	4.5	5.1	5.6	6.3	3.10%
Other Central and South America	2.1	2.2	2.1	2.1	2.2	2.6	3.0	1.20%
Total World	88.1	95.0	100.3	104.5	109.0	114.6	120.9	1.00%

Source: EIA International Energy Outlook 2016

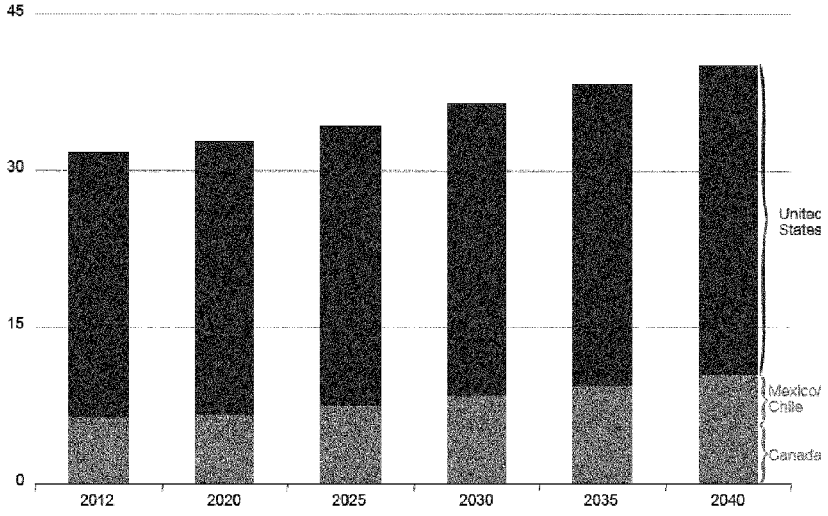
In response to recent low oil prices, capital expenditures for investment in future production potential have been delayed or canceled, though, many OPEC and non-OPEC large capital investment projects scheduled to be completed over the next several years will continue as planned. Over time, a continued slowing of investment will make it difficult for supply to respond quickly to future growth in demand for liquids. As a result, prices are expected to return to the range of $80/b within the next decade. If supply growth slows as a result of

underinvestment, a sustained period of higher prices may be required to induce additional capital back into the market. Long project development timelines may delay the reentry of some production from tight oil plays (noncontinuous resources) into the market.

Natural Gas Consumption

OECD Americas: Projected annual natural gas consumption in the OECD Americas region rises steadily to over 40 Tcf in 2040 (Figure 6). The region accounts for 41% of the total increase in natural gas use by OECD countries and 10% of the increase in total world natural gas consumption.

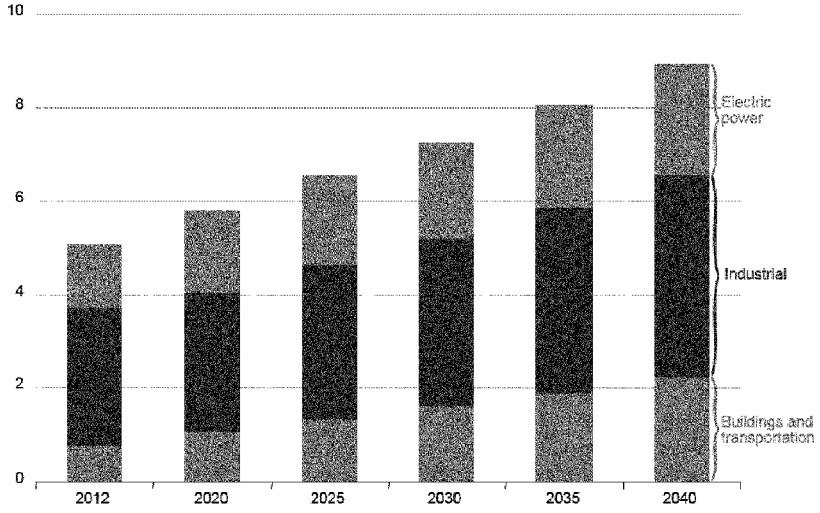
Figure 6: OECD Americas natural gas consumption by country, 2012–40
trillion cubic feet



Source: EIA International Energy Outlook 2016 Reference case

Non-OECD Americas: Natural gas consumption in the non-OECD Americas region increases by an average of 2.0% per year from 2012 to 2040 (Figure 7). The electric power sector accounts for more than one-third of the consumption growth over the period, followed by the industrial sector at approximately one-quarter. Brazil's industrial sector natural gas consumption accounts for more than 60% of the country's total increase in natural gas use.

Figure 7: Non-OECD Americas natural gas consumption by end-use sector, 2012–40
trillion cubic feet



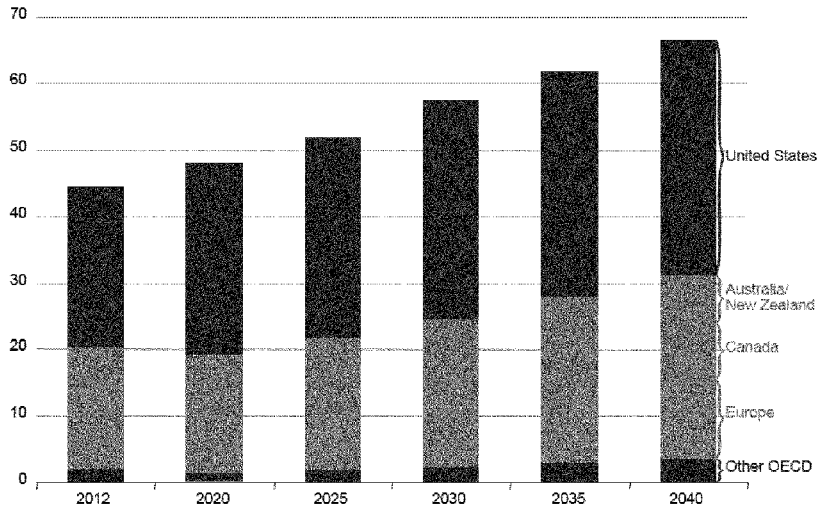
Source: EIA International Energy Outlook 2016 Reference case

Natural Gas Production

OECD Americas: Natural gas production in the OECD Americas grows by 49% from 2012 to 2040. The United States, which is the largest producer in the OECD as a whole, accounts for

more than two-thirds of the region's total production growth from 24 Tcf in 2012 to 35 Tcf in 2040 (Figure 8). Mexico's natural gas production is relatively flat in the midterm, but it more than doubles in the later years of the projection, as production from shale gas resources grows. Mexico's most prospective shale gas resources are extensions of the successful Eagle Ford Shale in the United States, but the area has not been explored as fully as that north of the border, so there is more uncertainty surrounding estimates of the size and potential for production.

Figure 8: OECD natural gas production by country and region, 2012–40
trillion cubic feet

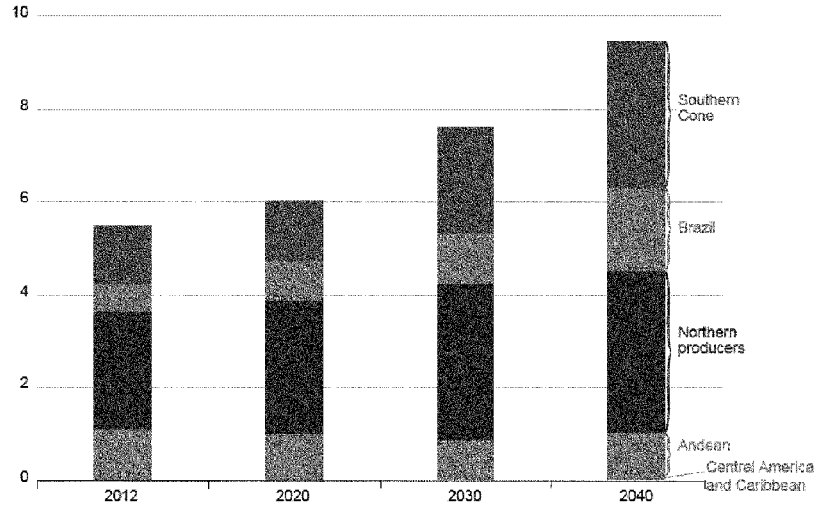


Source: EIA International Energy Outlook 2016 Reference case

Non-OECD Americas: Natural gas production in the non-OECD Americas region nearly doubles in the IEO2016 Reference case by 2040 (Figure 9). Despite recent declines, countries in the

Southern Cone (mainly, Argentina) become the region's leading natural gas producers by 2040 growing by nearly 150%.

Figure 9: Non-OECD Americas natural gas production, 2012–40
trillion cubic feet



Source: EIA International Energy Outlook 2016 Reference case

Table 5 reflects natural gas production based on the reference price assumption.

Table 5: Natural gas production by region and country
trillion cubic feet

	2010	2015	2020	2025	2030	2035	2040	Growth (2012-2040)
OECD Americas	31.3	32.9	35.7	38.6	42.1	44.6	47.3	1.40%
United States	24.0	25.8	28.7	30.4	32.9	34.0	35.3	1.40%
Canada	5.4	5.8	5.8	6.6	7.2	7.9	8.6	1.20%
Mexico	1.8	1.4	1.2	1.5	2.0	2.6	3.3	2.50%
Chile	0.1	0.0	0.0	0.0	0.0	0.0	0.1	1.50%
Non-OECD Americas	5.4	5.6	6.1	7.0	7.6	8.4	9.4	2.00%
Brazil	0.4	0.8	0.9	1.0	1.1	1.4	1.8	4.00%
Northern Producers	2.8	2.4	2.9	3.3	3.3	3.3	3.5	1.10%
Southern Cone (ex Chile)	1.4	1.2	1.3	1.9	2.3	2.8	3.1	3.30%
Andean	0.8	1.1	1.0	0.9	0.8	0.9	1.0	-0.40%
Central America and Caribbean	0.0	0.0	0.0	0.0	0.0	0.1	0.1	3.10%
Total World	114.0	124.6	134.0	149.4	167.5	185.4	202.4	1.90%

Source: EIA International Energy Outlook 2016 Reference case

The following are some highlights for some of the natural gas producers in the region with the most potential.

Brazil: Brazil's natural gas production triples by 2040, more than one-third of which comes from tight gas, shale gas, or coalbed methane production. Recent discoveries of oil and natural gas in

the offshore presalt Santos Basin are also expected to increase the country's natural gas production, particularly in the Tupi field.

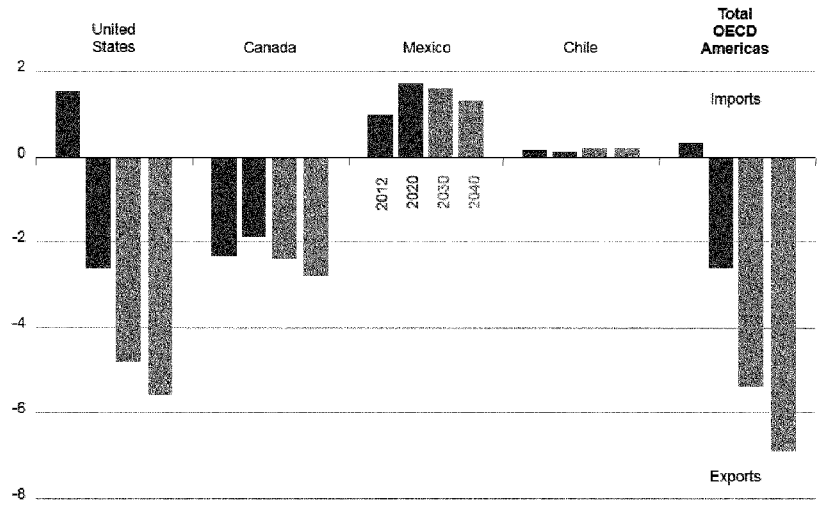
Argentina: Argentina, the country with potentially the largest gas resource, leads the non-OECD Americas region in its pursuit of tight gas and shale gas development. Many international companies hold leases and have drilled wells in shale formations. Much of the initial activity has targeted shale oil and natural gas in the Neuquen Basin's Vaca Muerta Shale formation, located in west-central Argentina. National energy company Yacimientos Petroliferos Fiscales (YPF), the largest shale operator in the country, reported production in April 2015 of 22,900 b/d of oil and 67 million cubic feet per day (MMcf/d) of natural gas from three joint ventures in Vaca Muerta: one with Chevron at the Loma Campana field, a second with Dow Chemical at the El Orejano field, and a third with Petronas at La Amarga Chica field. In addition, China's national oil company Sinopec and Russia's national oil company Gazprom have recently signed a memorandum of understanding with YPF for the joint development of shale resources from the same basin.

Venezuela: Venezuela's 198 Tcf of proved natural gas reserves are the Western Hemisphere's second-largest reserves, after the United States. An estimated 90% of Venezuela's natural gas reserves are associated, meaning that they are co-located with oil reserves. Although Venezuela has plans to increase its production of nonassociated gas, largely through the development of its offshore reserves, those plans have been delayed by a lack of capital and foreign investment.

Natural gas trade

OECD Americas: With the exception of Mexico, regional net imports among the nations of the OECD Americas trend downward through 2040 (Figure 10). In the AEO2016, the United States becomes a net exporter of natural gas in 2017. U.S. domestically sourced exports of LNG began in 2016 and grow to 5.1 Tcf in 2030.

Figure 10: OECD Americas net natural gas trade, 2012–40
trillion cubic feet



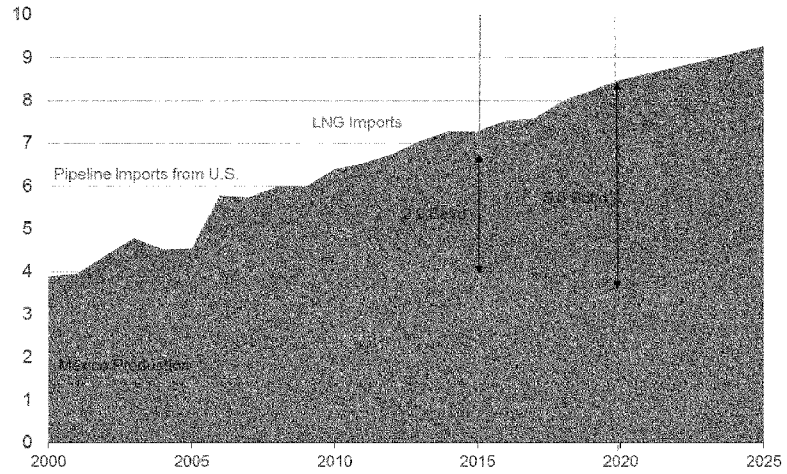
Source: EIA International Energy Outlook 2016 Reference case

Pipeline exports of natural gas from Canada to the United States continue declining as U.S. shale gas production grows; however, Canada remains a net exporter of natural gas, with LNG export volumes replacing some of the lost pipeline export volumes.

U.S. natural gas exports to Mexico

Most of the growth in U.S. net exports can be attributed to exports of LNG globally, although U.S. pipeline exports of natural to Mexico also grow steadily to fill the growing gap between production and consumption in Mexico. With new U.S. pipeline export capacity being brought online, and connecting pipelines in Mexico ramping up to full capacity, exports of natural gas by pipeline from the United States are beginning to displace Mexico's imports of LNG. Before the boom in U.S. shale gas production, Mexico had expected only limited growth in pipeline imports from the United States. With the rise of U.S. shale production and the decline in natural gas prices, Mexico's need for LNG imports has fallen, and its LNG regasification terminals have been operating below capacity. In 2012, U.S. exports to Mexico totaled 620 billion cubic feet. Mexico's net natural gas imports are expected to more than double, to 1.3 Tcf in 2040, after reaching their highest level in the mid-2020s when increases in Mexico's natural gas production slow the country's demand for imports (Figure 11).

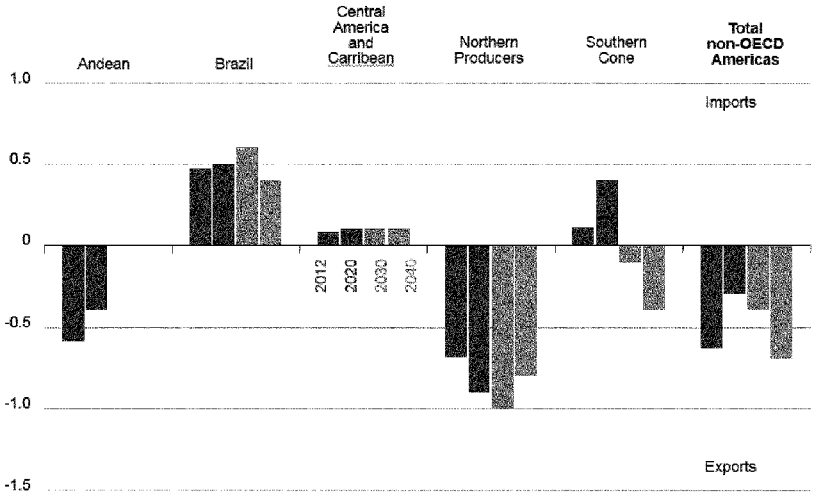
Figure 11: Mexico Natural Gas Supply, 2000-2025
billion cubic feet per day



Source: EIA Annual Energy Outlook 2016 Reference Case

Non-OECD Americas: Natural gas trade in the non-OECD Americas region has become increasingly globalized as several countries have become involved in the LNG trade. New LNG regasification capacity facilitates growth in the region's gross imports of natural gas through 2040, but the discovery of large new natural gas reserves throughout the region increases its gross exports by a larger amount. As a result, the region's overall trade balance remains relatively flat, with net exports increasing slightly over the period (Figure 12).

Figure 12: Non-OECD Americas net natural gas trade, 2012–40
trillion cubic feet



Source: EIA International Energy Outlook 2016 Reference case

Although LNG regasification facilities in Brazil and in the Southern Cone (excluding Chile) have received LNG supplies fairly consistently over the past three years, the Southern Cone becomes a net exporter of natural gas by 2030, largely as a result of the discovery of substantial shale gas reserves in Argentina's northwestern Neuquén province. Net imports to Brazil remain essentially flat from 2012 through 2040. Overall net exports from the Andean region end in 2030 and net exports from the Northern Producers increase by an average of 0.5% per year from 2012 to 2040.

Economic Uncertainties in the Region

Projected growth of real GDP in Brazil in IEO2016 averages 2.4% per year from 2012 to 2040 in the Reference case. This is a relatively slow rate of growth, especially for a developing country, reflecting both current economic weakness and questions about future growth. There is little doubt that Brazil has the consumers to generate demand for goods and services, but the supply side of its economy appears to constrain economic growth. Structural reforms, particularly to state-owned enterprises and labor markets, will be important for Brazil to generate long-term growth.

Outside Brazil, investment in the non-OECD Americas is constrained by policy uncertainty, and commodity exports are not expected to provide the level of government revenue that they have in the recent past. The proximity of the region to the United States and the trade relationships of its national economies with the U.S. economy suggest that the region's growth will be linked, in part, to that of the United States. Most countries in the region have flexible exchange rates, positive trade balances, and relatively low fiscal deficits and public debts. Regional inflation is lower than it was in the mid-1990s, and a relatively young labor force supports the region's economic growth prospects. Real GDP in the non-OECD Americas (excluding Brazil) increases by an average of 2.8%/year from 2012 to 2040.

NORTH AMERICAN COOPERATION ON ENERGY INFORMATION (NACEI)

Finally, I would like to describe the work EIA has been doing with counterparts in Canada and Mexico. In December of 2014, U.S. Energy Secretary Moniz signed a Memorandum of Understanding (MoU) with his Canadian and Mexican counterparts creating a framework for

trilateral consultation and sharing of energy information for the North American region. The agreement covers the following areas:

Energy trade statistics: understanding the sources of differences in trade (export and import) data among the three countries;

Geographical energy information: validating and sharing publicly available geospatial information related to energy infrastructure;

Outlooks for energy supply and demand: exchanging views and projections on cross-border energy flows; and

Cross reference for energy terminology: definitions used by each country for traded energy.

The work of the trilateral effort may be found at www.nacei.org. The available information includes: tables and graphs showing the differences in trade data, a number of static maps of energy infrastructure across the three countries and an interactive mapping tool for users, a cross-reference to the definitions of terms used by the three countries, as well as the International Energy Agency (IEA) and the United Nations (IRES). The glossary is available in three languages – English, French and Spanish. Participating agencies include: United States-Department of Energy (DOE): Energy Information Administration, Office of Fossil Energy (DOE), Bureau of the Census. Canada - Natural Resources of Canada, National Energy Board, Statistics Canada. Mexico - Secretariat of Energy (SENER), Centro Nacional de Control de Energia (CENACE), Centro Nacional de Control del Gas Natural, (CENAGAS), Comision Federal de Electricididad (CFE), Instituto Nacional de Estadistica y Geografia (INEGI), PEMEX, National Hydrocarbons Commission (NHC), Instituto Mexicano Del Petroleo, PMI Comercio Internacional SA

Mr. DUNCAN. Thank you so much for your testimony.

Mr. Hochstein, thank you for being here today. And you are recognized for 5 minutes.

STATEMENT OF MR. AMOS HOCHSTEIN, SPECIAL ENVOY AND COORDINATOR FOR INTERNATIONAL ENERGY AFFAIRS, BUREAU OF ENERGY RESOURCES, U.S. DEPARTMENT OF STATE

Mr. HOCHSTEIN. Thank you, Chairman Duncan, Ranking Member Castro, and members of the subcommittee.

Mr. Chairman, we are living through a global energy revolution that has established the United States as an energy superpower. When I say energy superpower, it is because the United States is a leader in the full range of energy issues. In oil, we went from producing less than 6 million barrels per day a few years ago to a peak of 9.5 barrels a day in 2015. In natural gas, we have gone from being the world's largest importer to becoming a significant exporter. When it comes to wind, solar, geothermal, in R&D, in innovation, in efficiency, in technology, the United States is the lead across the entire spectrum. However you define energy, the United States is the center of it and a position of global leadership.

In our hemisphere, Mexico has undertaken historic action to reform and modernize the structure of the oil, gas, and electricity sectors. However, the timing of the reforms was unlucky. As the reforms were being finalized, oil prices tumbled. The Mexican Government was faced with the challenge of demonstrating that the negative impacts being felt throughout the sector were not the result of reforms, but rather of the oil price decline.

Argentina, in spite of having the world's second largest reserves of shale gas and great wind potential, it saw little investment in the sector in the previous decade due to restrictive policy and a negative regulatory environment. The new Macri administration, which found itself facing a state of emergency in the electricity sector shortly after coming into office, has demonstrated an awareness of the opportunities of reform in both shale gas and electricity sectors, as well as the need to attract international investment. This is the new chapter in Argentina's history, and I will be traveling there in 2 weeks.

In Colombia, low oil prices have led to a fall in production, difficulty in stimulating the country's limited petroleum reserves, and reduced government revenues. The compounding effects of a serious drought this year further obligated Colombia to turn to more costly electricity options.

In all three of these countries, we are deeply engaged to provide technical assistance in the power and renewable sectors, as well as the conventional and unconventional hydrocarbon sectors. With their political leadership and a strong partnership, their prospects to weather the storms are quite good. However, countries that are less diversified, fiscally constrained, and less progressive in their energy governance are facing a far more severe set of consequences.

The clearest example is Venezuela, where oil generates about 95 percent of the country's total exports and contributes almost half of the government's revenue. Venezuela's crude oil production fell from 3½ million barrels a day in 1997 to below 2½ million barrels per day today. This is in spite of the fact that Venezuela has the

largest oil resources in the world. Its mismanagement of the sector, its lack of reinvestment, and corruption means that the low oil price is one blow too many for the Venezuela economy. By accepting in-kind financing deals repaid in oil, Venezuela has constrained even further its cash flow, to the detriment of its own people.

However, while the oil exporters struggle, importers in the region are hopeful. Up until 2012, the high Caribbean and Central American energy costs were frequently cited as a major impediment to economic growth. For these countries, the fall in oil prices was a blessing, but they are living on borrowed time. Without establishing meaningful reforms now, oil prices will rise and the fiscal shocks will return.

Venezuela has long used energy as a political lever through the PetroCaribe scheme, which has created not just an oil dependency, but a financial one, linking the fate of Venezuela's declining capacity with the region's energy and fiscal security. An awareness of this risk has led some countries, as you mentioned, Mr. Chairman, to take advantage of the current context to buy back debt and pursue reforms. These steps will help, but they are not enough.

This is why our level of engagement in Central America and the Caribbean has been unprecedented. Vice President Biden announced the Caribbean Energy Security Initiative, which you mentioned, in 2014, and I served as the President's U.S. chair for the Central American and Caribbean Energy Security Task Force.

Instead of depending on Venezuelan oil, the Caribbean nations can utilize 11 months of sun, wind, or geothermal, and in some cases countries have the scale for natural gas. Sitting so close to the U.S. shores, with our abundance of gas and the lowest price globally, means those countries will be less reliant on one supplier and will spend less on energy costs.

Technology is advancing quickly and the private sector is already reducing the scale and size necessary for natural gas for the Caribbean, and U.S. renewables companies are actively exploring the opportunities in the region. Already U.S. companies are announcing significant projects there.

The exciting potential for Central America is the opportunity to connect to itself. Through the SIEPAC and Connect 2022 initiatives, we are working with the region to establish a single Central America power market from Mexico in the north to Colombia in the south. This will turn eight small, isolated electricity markets into one market, boosting investment and lowering costs.

We all agree that it is time to move beyond short-term fixes and take action to establish a new energy paradigm. This is not just about economic prosperity or environmental and climate goals. It is also in the interest of a more security hemisphere and key to the national security of the United States. The 21st century, I believe, could see a shift of the energy center of the world to the Americas. U.S. engagement is helping to get us there.

Thank you, Mr. Chairman.

[The prepared statement of Mr. Hochstein follows:]

Amos J Hochstein
Special Envoy for International Energy Affairs (S/CIEA)
Bureau of Energy Resources
June 9, 2016
Testimony before the HFAC Subcommittee on the Western Hemisphere

Thank you Chairman Duncan, Ranking Member Sires, and members of the Subcommittee; I appreciate the opportunity to be here today to discuss the impact that low oil prices have had on countries in the Western Hemisphere, and the ways the United States is assisting our partners to achieve energy security.

We're living through a global energy transformation – I would go so far as to call it a revolution – that has established the United States as a global superpower in energy. And if those terms seem extreme, let us remember the beginning of 2012. The price of oil was averaging above $100 a barrel. The United States was considered the declining oil producer of the world; the once great producer had fallen below six million barrels a day. The United States was also one of the largest importer of liquefied natural gas in the world with expectations that we would continue to grow in our imports.

So much has changed in a few years, and it is not just that we have gone from producing 6.5 million barrels of crude oil per day in 2012 to 9.4 million barrels per day in 2015, or because we have gone from a significant natural gas importer to a significant exporter. It is also because the United States is a leader in innovative technologies, from research and development to implementation, across the spectrum of natural gas, renewable energy, and other advanced technologies, such as communications and IT, that underlie transformational opportunities. However you define energy, the United States is at the center of it and in a global position of leadership.

The combination of falling oil prices and the increasing viability of alternatives has complex effects, and the impacts have not been felt uniformly throughout the Western Hemisphere. We are seeing a microcosm of the U.S. experience in Latin America, as some oil-producing countries move away from nationalist models and embrace more modern approaches to energy development and reform. As a result, many oil-producing countries are facing economic challenges, but not an outright crisis. I will discuss a few examples to illustrate the diversity we are seeing throughout the hemisphere.

Mexico has undertaken historic energy reforms that enact constitutional changes to the structure of the oil, gas, and electricity sectors, with the goal of stimulating development, increasing international investment, creating jobs, generating more clean energy, and lowering energy costs for consumers. However, the timing of the reforms was unlucky; within six months after the reform's key elements were signed into law, oil prices fell by 55 percent, and the Mexican government today faces the challenge of demonstrating that the negative impacts being felt throughout the sector are not a result of the reforms but rather of the oil price decline. In fact, the reforms, combined with some strategic oil price hedging, likely cushioned the impacts of low oil prices on Mexico's economy and energy sector. Mexico's ability to weather these challenges will likely be a judgment on their reforms, both within the country and throughout the hemisphere, which is why we are working closely with them to provide support and targeted technical assistance across the power, unconventional, and traditional hydrocarbon sectors.

Argentina, in spite of having the world's second-largest reserves of shale gas, saw little investment in the gas sector in the previous decade due to a restrictive policy and regulatory environment. The Macri Administration has demonstrated an awareness of the opportunities of reform, and has the potential to radically increase previously untapped shale resources. The government, which found itself facing a state of emergency in the electricity sector shortly after coming into office, also understands it needs to attract significant investment in Argentina's electricity sector. This presents opportunities for U.S. energy companies: an estimated five gigawatts (GW) of electricity over the next 15 years is needed to keep up with demand. A tender is underway for awarding one GW of thermal generation and the government will soon seek bids for a one GW of renewable energy capacity. This is why I'll be heading to Argentina next week, and why my team at the State Department has started assistance for Argentina on topics relating to robust, responsible, and transparent development in both the unconventional and power sectors.

Colombia, which had made the establishment of a transparent, well-governed energy sector a top priority, reached its longstanding goal of producing one million barrels per day in 2013, but low oil prices have led to a fall in production and difficulty in stimulating the investments needed to increase the country's limited petroleum reserves, which currently are set to be exhausted in a little over five years. While oil extraction comprised seven percent of GDP in 2014, that number fell to five percent in 2015. Government revenue earned via taxes and royalties on the oil sector has also dropped considerably. Ecopetrol, Colombia's state-run enterprise, saw its market capitalization fall from $64 billion in 2012 to a little over

$9 billion today, and the compounding effects of a serious drought exacerbated the government's challenges, as it obliged Colombia to turn to more costly electricity options than hydropower. As the Colombian government works to increase their production and reserves, we are also working with them to establish strong regulatory and policy frameworks in both their unconventional and offshore hydrocarbon sectors.

While these countries are all facing significant economic challenges and must cut social spending, their prospects for weathering the storm are strong, given their diversified economies and thoughtful responses to the current low price environment. Countries that are less diversified, fiscally constrained, and less progressive in their energy governance are facing a far more severe set of consequences.

The clearest example is Venezuela, where oil generates about 95 percent of the country's total exports, contributes 40 percent of the central government's revenue, and accounts for nearly half of GDP – the highest level of reliance on the oil sector in the hemisphere. Venezuela's crude oil production had reached 3.25 million barrels per day in 1997; today it has fallen below 2.5 million barrels per day. In spite of Venezuela having the largest oil resources in the world, its mismanagement of the sector, high levels of corruption, poor maintenance record, and most critically, lack of reinvestment, means that today, the low oil price is one blow too many for the Venezuelan economy. By accepting in-kind financing deals, repaid in oil, Venezuela has constrained even further their cash flow, as significant amounts of oil receive no payment at all.

These cases all focus on the impacts on regional oil producers. But, there is a very different, parallel story taking place in the Hemisphere related to oil importers benefitting from low prices – primarily the smaller countries in the Caribbean and Central America, but also including others such as Chile and Uruguay. Up until 2012, Caribbean and Central American electricity costs were significantly greater than in Washington, D.C., and frequently cited as a major impediment to competitiveness. For these countries, the fall in oil prices is a blessing, not a curse, as it lowers the depletion of foreign reserves and gives governments space to make meaningful reforms. The IDB estimates that low oil prices translate to a stimulus of over $1 billion in Central America alone. But these countries are living on borrowed time; without taking advantage of low oil prices for meaningful reforms and diversification, oil prices will rise and countries' economies will go into shock once again.

Venezuela has long used energy as a political lever on its neighbors through Petrocaribe, which has created not just an oil dependency, but more critically, a financial dependency. This is why we are concerned about the linkage between the declining capacity in Venezuela, and the energy and fiscal security of the broader region. Low oil prices shield many in the region for now, but a reversion to high oil prices would again raise the risks for regional instability. An awareness of this risk has led some countries to take advantage of the current context to buy back debt and pursue reforms. These steps will help, but they are not enough.

That is a key reason why we have been deeply involved in these topics since before the oil prices fell: through the 2012 "Connecting the Americas 2022" initiative in Central America, and through the Vice President's 2014 Caribbean Energy Security Initiative, which were leveraged in the Task Force for Caribbean and Central American Energy Security. Let me describe some of the impacts of our engagement.

The Caribbean has excellent resources in solar, wind, geothermal energy, and biomass, and some islands have the size and scale needed for natural gas imports. Developing these capabilities means those countries will be less reliant on one energy supplier, will spend less on inefficient energy, and will benefit from proximity to the U.S. market and innovations. The advancement of technology means that as we sit here today, the private sector is reducing the scale and size necessary for natural gas to be used in ever-smaller markets, and U.S. technology companies – from geothermal to electric vehicles – are actively exploring the opportunities in the region. We have also seen U.S. companies in New York announcing significant projects to invest in countries like Jamaica and elsewhere. Guyana, once considered one of the most vulnerable Petrocaribe members, has become the site of what is believed to be a significant oil discovery, and we are working closely with the government to ensure this small Caribbean nation establishes a robust and transparent regulatory framework to successfully use this opportunity to change their economic future.

In Central America, the region has the potential to use electricity market integration as a transformational tool to overcome their small market sizes, and create a regional electricity market that increases economies of scale, international investment, jobs, the resiliency of their energy, and lowers costs for consumers. In part due to our engagement and technical support – including technical assistance through our Power Sector Program – regional electricity trade has tripled in the last two years, renewables reached 63 percent of electricity generation in 2014, and

several commercial natural gas projects are under development that will further reduce reliance on expensive oil and diesel.

We all agree that it is time to move beyond short-term fixes, and take action to establish a new, shared energy paradigm. This is not just about economic prosperity or environmental and climate goals, though it is an important step in those directions as well. It is also in the interest of a more secure hemisphere, which is key to the national security of the United States. With our shared borders, culture, and economic partnerships across the region, regional stability is a shared priority.

There is now a clearer vision than there has ever been for a different future – one that uses transparency, good management, thoughtful planning and preparations for the future to create energy sectors that are prosperous, competitive, clean, and that deliver concrete benefits to citizens. This avenue provides a meaningful opening for a new chapter of lasting partnership, as well as a brighter future throughout the hemisphere.

Mr. DUNCAN. Thank you so much.
Ms. Kenderdine, 5 minutes.

STATEMENT OF MS. MELANIE KENDERDINE, DIRECTOR, OFFICE OF ENERGY POLICY AND SYSTEMS ANALYSIS, U.S. DEPARTMENT OF ENERGY

Ms. KENDERDINE. Thank you, Chairman Duncan, Ranking Member Castro, and distinguished members of the subcommittee. I appreciate the opportunity to be here today to discuss the impact low oil prices have had on countries in the Western Hemisphere and ways the United States can enhance our energy security by assisting our allies and partners in the region.

I am going to focus my remarks on the changed U.S. energy profile, how we view energy security in the context of the 21st century energy marketplace, and some of DOE's initiatives in the Western Hemisphere.

Until recently, the U.S. definition of energy security has been oil-centric, a narrow view that provides an inadequate framework for U.S. energy security policy in the 21st century. In June 2014, after the Russian aggression in Ukraine, the G7 leaders and the EU noted that "Energy security is not only domestic; it is dependent on interaction in the global interconnected market."

The leaders endorsed a set of seven broad collective and modern energy security principles summarized as follows: One, development of flexible, transparent, and competitive energy markets; two, diversification of energy fuel sources and roots; three, reducing our greenhouse gas emissions and accelerating the transition to a low-carbon economy; four, enhancing energy efficiency; five, continued investment in game-changing research and innovation; six, improving energy system resilience; and seven, putting emergency response systems in place.

Within this framework, we need to consider the fact that the U.S. is now the largest liquid fuels producer in the world, the world's largest gas producer, and is also poised to be one of the largest gas exporters as well. These dramatic changes in domestic oil and gas production were both enabled by technology investments started at DOE in 1978, along with supportive tax incentives sustained for over two decades. They also have significant infrastructure and supply chain implications.

Because of these changes, DOE has been able to approve 19 liquefied natural gas export applications for non-free trade agreement countries in the last 4 years. As of March of this year, U.S. LNG producers have exported 11.5 Bcf of LNG to Barbados, Jamaica, and Brazil in the Western Hemisphere, as well as to India.

The U.S. entry into the world LNG markets, with volumes only exceeded by Qatar's, will put downward pressure on European and Asian gas prices and could constrain noncompetitive gas marketing practices, such as those of Russia.

Finally, it should be noted that the widening of the Panama Canal is taking place coincident with the growth of LNG exports from the U.S. This multibillion-dollar infrastructure improvement could help facilitate and lower transportation costs for U.S.-origin LNG trade with Asia and possibly to destinations on the west coast of South America.

Switching gears to North American energy markets, where Secretary Moniz has invested a great deal of time, I would just note that the value of energy trade between the U.S., Canada, and Mexico has exceeded $150 billion annually in recent years. We have had two trilateral ministerials in the last 3 years and are working together on a range of initiatives.

There are also major commercial markets in Central and South America, and we are collaborating with several countries—Argentina, Brazil, Chile, and the nations in the Caribbean and Central America—on a range of energy issues that will both enhance their energy security as well as our commercial opportunities.

It is also important to note that most of the countries in our hemisphere, 32 out of 37 from my rough count last night, signed the Paris Agreement in New York on Earth Day and are committed to achieving deep carbon reductions. This creates new market opportunities for clean energy technology, where the U.S. is another clear leader.

In this regard, DOE started and is a founding member of the Clean Energy Ministerial, which includes Canada, Mexico, Brazil, and 20 other countries. The new Mission Innovation initiative, where 20 countries are working to double their spending on clean energy R&D to accelerate transformation of energy systems, includes the U.S., Canada, Mexico, Brazil, and Chile. We support several other multilateral initiatives. They are in my written testimony.

Finally, the Strategic Petroleum Reserve remains an important national security asset, protecting the U.S. economy and the economy of our allies from oil disruptions. To maximize the value of the SPR, the administration recommended and the Congress authorized an investment of $2 billion for its modernization.

I note here also that Congress recently gave the Department emergency authorities to respond to cyber attacks on our grid, a new and growing energy security challenge as electricity becomes the uber infrastructure on which all other critical infrastructures rely.

The changing energy landscape in the U.S., the nature of global energy markets, and the need for accelerated innovation to transform global energy systems frame our broader, more collective approach to energy security. It is in this context that the U.S. is deeply engaged with our allies in the Western Hemisphere to promote energy security in a wide variety of ways, irrespective of short-term volatility in commodity prices, sustained by friendships and alliances and common interests over time.

Thank you very much.

[The prepared statement of Ms. Kenderdine follows:]

Testimony of Melanie Kenderdine,
Director of the Office of Energy Policy and Systems Analysis,
U.S. Department of Energy
Before the
House Committee on Foreign Affairs
Subcommittee on the Western Hemisphere
United States House of Representatives
Hearing to Examine the Impact of Low Oil Prices in the Western Hemisphere
June 9, 2016

Thank you Chairman Duncan, Ranking Member Sires, and distinguished Members of the Subcommittee. I appreciate the opportunity to be here today to discuss the impact low oil prices have had on countries in the Western Hemisphere and ways the United States (U.S.) can enhance its energy security by assisting our allies and partners in the region.

Changed Energy Profile of the United States

A discussion of how the U.S. might help enhance energy security by assisting our allies and partners in the Western hemisphere (within the confines of free market principles and statutory authorities) must be placed in the context of both the opportunities and challenges presented by the changing energy profile of the U.S. These changes are detailed in a White House report, *The All-of-the Above Energy Strategy as a Path to Sustainable Economic Growth*, (July 2014), "Rising domestic energy production has made a significant contribution to GDP growth and job creation. The increases in oil and natural gas production alone contributed more than 0.2 percentage point to real GDP growth in both 2012 and 2013, and employment in these sectors increased by 133,000 between 2010 and 2013."

At DOE, we have done additional, more granular, analysis of energy jobs to inform the development of energy policy. According to DOE's *U.S. Energy and Employment Report* released in March of this year, as of the second quarter of 2015, 3.64 million Americans work in traditional energy industries, including production, transmission, distribution, and storage. Of these, 600,000 employees contribute to the production of low-carbon electricity, including renewable energy, nuclear energy and low emission natural gas. An additional 1.9 million Americans are employed, in whole or in part, in energy efficiency.

I will let my colleagues discuss the specific impacts of low oil prices on countries in the Western Hemisphere and the geopolitical strategies these suggest. I will focus on this changed U.S. energy profile and some the related policies and initiatives on which the Department of Energy is focused, including a new definition of energy security that reflects modern energy markets, systems and needs.

Oil. The US is now the number one producer of liquid fuels in the world and within the last two years began producing more oil than it imports for the first time in decades. Crude oil production in the U.S. rose from an average of 5.1 million barrels per day in 2008 to 9.4 million barrels per day in 2015; these production increases and relatively flat consumption have resulted in the lowering of imports of oil by 3.5 million barrels per day (or about 30 percent).

In 2014, the U.S. Commerce Department clarified that when liquid hydrocarbons, including condensates, have been sufficiently "processed through a crude oil distillation tower" to become a "petroleum product," these may generally be exported without a license, except to embargoed destinations. In August of 2015, the Commerce Department approved license applications to exchange U.S. crude oil for

similar quantities of Mexican crude oil. Later in 2015, the U.S. Congress lifted the statutory ban on oil exports that has been in place since 1975.
There have been relatively small changes in the flow of oil since the ban was lifted.

Natural Gas. The U.S. is also now the number one producer of natural gas in the world. The production of natural gas climbed from 21 Tcf in 2008 to 29 Tcf in 2015, which represents more than 95 percent of domestic consumption. The U.S. became a net exporter of liquefied natural gas (LNG) in March of this year and according to EIA, the U.S. will become a net exporter of all forms of natural gas by 2017.

Abundant natural gas resources and large production increases have created significant global, regional and domestic natural gas market opportunities for U.S. producers. Indeed, U.S. exports of LNG can make a major contribution to the evolution of world gas markets. Historically there have been three regional natural gas markets: North America, Europe, and Asia. But increased production in the U.S. and the Middle East and significant investment in LNG facilities in Australia and the U.S. are re-shaping the regional nature of gas markets, creating the potential for their globalization. The share of LNG traded through shorter-term contracts is an indicator of a more competitive and financially liquid gas market, increasing from 8% in 2008 to 29% in 2015. Also, oil-linked natural gas prices in Asia fell significantly in 2015 and some LNG importers were able to successfully renegotiate their contracts with sellers—adding more flexibility to the market.

Finally, it should be noted that the widening of the Panama Canal is taking place coincident to the growth of LNG exports from the U.S. This multi-billion dollar infrastructure improvement could help facilitate and lower transportation costs for U.S origin LNG trade with Asia and possibly to destinations on the west coast of South America. Also, the Panama Canal Authority (ACP) is interested in ways that U.S. LNG trade can provide energy to the region. Last year, the U.S. Trade and Development Agency awarded a grant to the ACP that supports planning for a possible LNG import terminal and increased natural gas utilization in the area. This holds promise for additional markets for U.S. LNG in Panama and other countries in Central America.

Electricity. In 2016, natural gas is projected to surpass coal as the most-used fuel for U.S. power generation on an annual basis. Between 2005 and 2015, net generation from natural gas increased by 75 percent, while coal generation fell by 33 percent. Recent generation *capacity* additions have been dominated by natural gas and renewables. Natural gas net generation has increased from 19 percent in 2005 to 33 percent in 2015. As a percentage of net generation, wind increased more than tenfold since 2005 to 4.7 percent of net generation in 2015. Non hydro renewables grew from 2 percent in 2005 to 7 percent in 2015, surpassing hydropower for the first time. Wind generation increases have been driven by improved turbine technologies, reduced cost of electricity production, and government policies that encouraged the development of renewable energy sources. Geography and physics are inherent limitations in electricity markets. As such, the Administration has focused on the benefits of the integration of U.S., Canadian and Mexican electricity systems (the details of related actions is discussed later in my testimony). Innovation, however, is freely traded throughout the world and the U.S. is a major hub for technology development. The Department of Energy is the single largest supporter of civilian physical science R&D in the country, and our system of 17 National Laboratories is an energy innovation powerhouse. The work of our labs and programs, including those that support many public-private partnerships, has helped develop technologies to lower electricity bills, enable and enhance a modern economy that heavily relies on electricity, reduce electricity demand and decrease carbon emissions from power generation. DOE's Advanced Research Projects Agency-Energy (ARPA-E) program supports significant innovation in the electricity arena, funding, for example, technology development

for dry cooling in power generation, a critical technology in water-scarce and drought-affected regions. Our technology programs support renewable and nuclear power generation and programs to decrease the costs of carbon capture technologies from coal and gas-fired power plants.

In addition, we strongly support international collaborations for technology development that can also create commercial opportunities for U.S. companies. The Clean Energy Ministerial (CEM) and Mission Innovation initiative, discussed below, could provide major opportunities for sharing best practices and collaboration on electricity-related research and development. DOE's FY 17 budget request for Mission Innovation includes several electricity-focused projects/programs such as increased funding for ARPA-E, two advanced carbon capture pilot plants, an additional advanced manufacturing institute, and an offshore wind consortium. Grid-scale and home battery storage are also critical electricity-related technologies. These and other focus areas may be appropriate for international collaboration, including collaboration with CEM and Mission Innovation members in the Western Hemisphere.

Energy Productivity and Efficiency Improvements. U.S. primary energy use peaked in 2007 and has remained largely flat since then. Also, GDP has grown faster than primary energy use since 1970. This means that U.S. energy productivity – the ratio of GDP to total primary energy use -- has been increasing and is expected to continue to do so. Two major factors have led to this extended period of relatively flat demand: structural changes in the U.S. economy and improvements made in energy efficiency. Both technological advances and energy efficiency policies -- such as fuel economy standards, building energy codes, appliance and equipment standards and labeling, and targeted incentives -- have played a significant role in slowing the growth of energy consumption.

North American Energy Market Integration. The value of energy traded between the U.S., Canada and Mexico is growing and has exceeded $150 billion annually in recent years. The three countries also share similar resource profiles, infrastructures and some regulatory frameworks. Three of the eight regional organizations that govern our electric grid reliability are shared with Canada, and the government of Mexico has increased its engagement with the reliability region covering southern California. Also, the dramatic increases in US wind and solar generation capacity, the potential of Canadian hydro as possible storage for US intermittent renewables, COP 21, Mission Innovation, and the recent statutory commitment of Mexico to renewables suggest new pathways for intense cooperation in clean energy fields.

There are major energy markets in Central and South America for energy supply, technologies and services that could benefit from collaborative development. The US, Canada and Mexico are also uniquely positioned in the Western hemisphere; each has significant energy resources, has committed to Mission Innovation, and has an east and west coast that enables access to both European and Asian energy markets. The economic dynamism of the other countries of the Western Hemisphere – most of which committed to deep carbon reductions in the Paris agreement and many with growing populations —present new energy market opportunities for the US, Mexico and Canada in the decades ahead.

New Energy Challenges. Challenges remain, however. Many of them have direct implications for our energy security and some were simply not contemplated or understood when many of our energy laws and regulations were enacted.

The April 2015 Quadrennial Energy Review (QER) concluded that in key areas, our energy and related infrastructures have not kept pace with changes in the volume and geography of oil and gas production. We are already seeing a rise in extreme weather events that are projected to increase in frequency and

intensity, and have regional and possibly national-scale impacts. These include more heat waves, coastal flooding, regional drought, and wildfires that can have significant impacts on energy systems. For example, extreme heat reduces the efficiency of electric generation and transmission while wildfires and flooding can damage electricity infrastructure.

There are also new non-weather related vulnerabilities for our energy systems including cyber and physical attacks on infrastructure. In addition, all of our critical energy infrastructures are reliant on electricity, placing a very high premium on a reliable, modern and hardened electric grid and raising new concerns about low probability-high consequence events such as electro-magnetic pulses and geo-magnetic disturbances.

Integrated North American grids and energy markets have increased the need for joint grid security strategies. The U.S. has new responsibilities for protecting LNG export supply chains. We also remain a large oil importer, and are large oil product exporters and new crude oil exporters; this directly ties us to world oil markets and global oil price volatility. Finally, our allies and other key partners have significant energy supply and infrastructure vulnerabilities, some of which was addressed in the Third Energy Package, and a concern that was fully exposed by the 2014 Russian aggression in Ukraine.

Energy Prices and the U.S. Economy

Over the past several decades, oil and natural gas prices have changed dramatically. Real oil prices fell from over $90/bbl in the late 1970's to $30/bbl in the 1990's, rose to over $100/bbl in 2008, and have since fallen to less than $50/bbl. Similarly, real natural gas prices in the U.S., as measured by the Henry Hub spot price, rose from less than $2/MMBtu in 1999 to over $10/MMBtu between 2006 and 2008, and have since returned to levels near $2/MMBtu.

In general, economic analyses from, for example, the Congressional Budget Office (CBO), conclude that the U.S. GDP receives a boost from low energy prices. CBO noted that "the declines in oil prices for immediate and future delivery that occurred between August and December 2014 will raise real GDP in the U.S. by 0.3 percent at the end of 2015. The decline in expected future oil prices will also raise GDP during the 2016–2019 period, but by less than in 2015 because of the anticipated partial rebound in those prices."

Lower energy prices give U.S. consumers more disposable income for other goods and services, although these benefits are not uniformly distributed. In its 2015 report, CBO noted that "...the drop in oil prices has several positive effects. It has lowered the prices of petroleum products, including gasoline." I note that on June 6th, Federal Reserve Chair Janet Yellen said that low oil prices have "likely been a positive influence on the US economy overall, [but] they also have had a negative side: as energy –sector employment has been negatively impacted while the effects have also spilled over to businesses that serve the energy sector. It's worth noting, however, that benefits from lower gasoline prices are not, however, evenly distributed. Vehicle miles traveled (VMT) and the associated costs of gasoline, for example significantly vary by state. In 2013, the average VMT per capita for light duty vehicles in 14 states exceeded the national average by 15% or greater (AL, AR, MS, KY, IN, GA, MO, MT, NM, ND, OK, TN, VT and WY). The highest average VMT in Wyoming was more than double that of Rhode Island, the lowest. In June, 2013, the national average gasoline price was $3.49 per gallon; on June 4, 2016, it was $2.35. Assuming the average light duty vehicle gets 21 mpg (the figure for 2013), and the average VMT is sustained over the time period from 2013 to 2016, this dramatically lower gasoline price in 2016

would translate into savings over that period of $842 for the driver in Wyoming and only $389 for the driver in Rhode Island.

Low energy prices also contribute to boosting U.S. GDP by attracting industries that use energy commodities in the production processes. That has proven particularly true with respect to low natural gas prices. The availability of lower-cost natural gas and natural gas liquids (NGL) provides an advantage for U.S. manufacturers using natural gas or NGL for heat, power, or feedstocks. As NGL costs have decreased, process costs for U.S. petrochemical manufacturing, which commonly uses NGL as a feedstock, have also decreased. This has enabled some U.S. petrochemical facilities to gain an export advantage over other parts of the world. As a result, many expansions and additions to the U.S. petrochemical manufacturing sector have been announced.

On the cautionary side, low prices can adversely affect some investments. The previously referenced CBO report noted that there were GDP losses associated with lower investments by oil producers, particularly as low oil prices make some domestic production less economic, even though the overall impact of low oil prices on GDP was positive. Low energy prices can also reduce incentives to improve energy efficiency especially if they are expected to stay low over an extended period. Lower oil and natural gas prices might also induce households and businesses to increase their reliance on energy. In particular, if the U.S. economy becomes more reliant on oil, we increase our exposure to disruptions in the supply of oil. Serious oil supply disruptions hurt the U.S. economy by suddenly raising U.S. fuel prices (our petroleum product prices are directly affected by the world price of oil).

According to the 2014 White House report referenced earlier, "Historically, temporarily high oil price shocks arising from foreign supply disruptions have cut GDP growth and reduced employment. This link is not perfect, and not every oil price shock has led to an economic slowdown, but ... the empirical evidence points to a negative link between oil price spikes and economic activity." Consequently, it would be prudent to continue to improve energy and fuel efficiency to reduce our reliance on oil and lessen the impacts of oil price spikes though cost-effective regulations including the DOE's appliance efficiency standards and the fuel efficiency regulations administered jointly by the Environmental Protection Agency and the Department of Transportation.

Energy Security in the 21st Century

All of these trends, actions and incidents, including the Russian aggression in Ukraine, have underscored the need for a modern approach to energy security to help guide U.S. domestic and foreign policy. Until recently, the U.S. definition of energy security has been oil-centric, a narrow view that provides an inadequate framework for U.S energy security policy in the 21st century. In June, 2014, the G-7 leaders and the EU noted that "energy security is not only domestic — it is dependent on interaction in the global interconnected market." In an effort to articulate "a modern and collective definition of energy security," the leaders endorsed a set of seven energy security principles, summarized as follows:

1. Development of flexible, transparent and competitive energy markets, including gas markets.
2. Diversification of energy fuels, sources and routes, and encouragement of indigenous sources of energy supply.
3. Reducing our greenhouse gas emissions, and accelerating the transition to a low carbon economy, as a key contribution to enduring energy security.
4. Enhancing energy efficiency in demand and supply, and demand response management.

5. Promoting deployment of clean and sustainable energy technologies and continued investment in research and innovation.
6. Improving energy systems resilience by promoting infrastructure modernization and supply and demand policies that help withstand systemic shocks.
7. Putting in place emergency response systems, including reserves and fuel substitution for importing countries, in case of major energy disruptions.

Putting Energy Security Principles into Practice

These principles, with their focus on well-functioning and competitive energy markets, diverse sources of energy supply, environmental protection, efficiency and infrastructure improvements, energy innovation, emergency response, and resilience are guiding the work currently being done by the Department of Energy in cooperation with the Department of State in response to Congressional language in the FAST Act (PL 114-94). For that analysis, DOE and State are evaluating modern energy security of the U.S. and its allies with the intent of ensuring that government review of actions that affect energy security accurately capture their full benefits and costs.

These principles also have relevance to today's discussion and are guiding our approach to energy security of our allies around the world and in the Western Hemisphere. The Department of Energy has already adopted several aspects of the G7 principles in our work as a founding partner of the CEM, which includes Canada, Mexico and Brazil and 20 other countries. The CEM focuses on three global climate and energy policy goals: 1) improving energy efficiency worldwide; 2) enhancing clean energy supply; and 3) expanding clean energy access. Large energy consumers such as the U.S. and Brazil can reduce the energy security challenges associated with energy consumption by leading efforts to reduce the intensity of demand for oil by enhancing fuel economy standards, updating appliance standards, and commercializing alternative fuel vehicles.

In addition to CEM, there are other multilateral forums where DOE is working to advance modern energy security principles:

- *Mission Innovation* is a global initiative of 20 countries committed to doubling government investment in clean energy research and development over five years. The first Mission Innovation Ministerial was held in San Francisco June 1-2 and included Mexico, Brazil, and Canada;
- *The Energy Climate Partnership of the Americas* is a primary multilateral mechanism for advancing the deployment of clean energy technologies and practices across the the Western Hemisphere. Focus areas include: renewables, efficiency, efficient use of fossil fuels, energy infrastructure, energy poverty, and adaptation;
- *The International Partnership for Energy Efficiency Cooperation* (IPEEC) is an autonomous partnership of nations founded in 2009 by the Group of Eight (G8) to promote collaboration on energy efficiency. Its membership now includes 16 of the Group of 20 (G20) economies, which represent over 80% of global energy use and over 80% of global greenhouse gas emissions;
- *The Carbon Sequestration Leadership Forum* (CSLF) is a Ministerial-level international climate change initiative focused on the development of improved cost-effective technologies for the separation and capture of carbon dioxide (CO_2) for transport and long-term safe storage. CSLF member countries represent over 3.5 billion people on six continents, approximately 60% of the world's population. Collectively, CSLF member countries comprise 80% of the world's total anthropogenic CO2 emissions; and

- Through *the G-7 and G-20 Energy Ministerials,* leading up to the Leaders Summits this year, DOE and the Department of State working to secure action by our partner countries to reduce fossil fuel subsidies, counter cybersecurity threats to our energy systems, enhance the safety of civil nuclear energy activities, and assist Ukraine's efforts to establish a greater degree of energy security.

Additional U.S. Contributions to Global Energy Security

Independent of the level of oil or natural gas prices, the changing energy landscape has prompted a variety of actions from the U.S. government and industry that have contributed to increased energy security for the U.S. Those actions are uniformly aimed at eliminating market frictions to allow for a more competitive and unrestricted market for energy commodities and developing the technologies that help to reduce the use, cost and environmental impacts of energy production, transport, processing and consumption. As a result, U.S. actions have also improved the energy security of countries around the world, including those in the Western Hemisphere. Examples are included below.

Strategic Petroleum Reserve. The Strategic Petroleum Reserve is an important insurance policy for the U.S. economy in the event of serious oil supply disruptions and the associated spike in domestic petroleum product prices. In spite of the changes in the U.S. oil production profile, the U.S. economy will remain vulnerable to significant international oil supply disruptions in the future, and the SPR will remain an important aspect of our energy security strategy. At the same time, changes in the U.S. oil production profile have reduced the ability of the SPR to respond to a future disruption. The changing geography of U.S. oil production has led to major changes in the domestic oil pipeline system and eliminated the use of overseas oil by inland refineries. Those new patterns of oil supply and demand among U.S. oil producers and refineries, along with associated changes in the U.S. midstream infrastructure, have significantly reduced the ability of the SPR to distribute incremental volumes of oil during oil supply interruptions. In response to these changes, the Administration recommended and Congress authorized an investment of up to $2 billion in pipeline and marine dock infrastructure to ensure that incremental oil from the SPR can enter the global market in sufficient volumes to minimize the economic harm associated with disruption-related price spikes.

These investments will also help the United States meet our International Energy Agency (IEA) treaty obligations to provide almost half of an IEA emergency release (because of our relatively high oil consumption among IEA countries), enabling a U.S. President to act decisively in response to a serious oil supply threat to safeguard economies in the U.S., the Western Hemisphere, and around the globe.

Natural Gas Markets. As noted, the increased production of natural gas in the U.S. has contributed in several ways to a more financially liquid and competitive international natural gas market, which has improved global energy security for U.S. neighbors, partners, and allies. The Natural Gas Act of 1938 (NGA) assigns the Department of Energy regulatory responsibility for the import and export of natural gas to or from a foreign country. The NGA, as amended, requires that any company that wishes to export LNG to any foreign country must first obtain authorization from DOE. For companies seeking authorization to export to non-FTA countries, DOE considers the economic, energy security, and environmental impacts of the proposed LNG exports, among other factors in order to make a public interest determination. As of June 2016, DOE has approved 19 LNG export applications for projects to export to non-FTA countries. By law, applications to export to FTA countries must be approved without modification or delay. Six projects (with authorization to export 10.93 Bcf/d to non-FTA countries) are

currently under construction or operational in the lower 48 states. By March of this year, US LNG producers had exported 11.5 Bcf of LNG to Barbados, Brazil, and India.

U.S. LNG producers are currently using innovative long-term contracts that increase the liquidity and competitiveness of the spot market. Specifically, U.S. contracts are structured to give buyers of LNG the option of paying only the liquefaction fee if they determine, based on market conditions that they do not need to actually take delivery of the natural gas. This differs from many traditional long-term contracts for LNG on world markets that do not offer this level of flexibility for buyers or sellers. The design of the U.S. contract provides greater protection for buyers from falling natural gas prices, reduces transaction costs of reselling unneeded LNG, and enables a more active spot market. In addition, U.S. LNG contracts are supplied at Henry Hub prices, the most competitive in the world.

Physical exports of U.S. LNG started in February of this year after completion of Trains One and Two at Sabine Pass in Louisiana; four more facilities are currently under construction. In the context of today's hearing, it is worth nothing that in the first cargoes moving from Sabine Pass were purchased by Brazil's Petrobras. The U.S. entry into world LNG markets in a significant way (volumes are only exceeded by those of Qatar), will also put downward pressure on European gas prices, and the competition for customers could constrain the non-competitive practices of Russia. The U.S. entry into world LNG markets is consistent with the G7 principles for increased energy security.

Elimination of Fossil Fuel Subsidies. The United States continues to support national and multilateral efforts to eliminate fossil fuel subsidies as a means for improving countries' economic and energy security. Fossil fuel subsidies make economies less efficient and more vulnerable to increases in oil and petroleum product prices. The recent fall in oil prices has allowed India, China, and other countries to reduce or eliminate some of their price controls and government expenditures on oil. President Obama called on Western Hemisphere leaders at the 2015 Summit of the Americas to aggressively phase out inefficient fossil fuel subsidies, and the Department of Energy, Department of State, and Department of the Treasury continue to work with countries in the region and around the globe to eliminate these market-distorting subsidies.

Reducing Oil Dependence. The U.S. plays a leadership role in developing and implementing clean and efficient transportation solutions. The U.S. maintains some of the most ambitious vehicle fuel economy standards in the world, which creates a regulatory model and a market for fuel-efficient vehicles that benefit consumers around the world. In addition, the Renewable Fuel Standard supports a robust and growing market for biofuels in the Western Hemisphere. Also, through our research programs, we are catalyzing the development and deployment of electric vehicles and other alternative vehicles.

Energy Innovation for Isolated Communities. Many isolated communities, such as those in the Arctic, Caribbean, and elsewhere depend on diesel as a fuel to generate electricity. Although diesel prices are lower now than they were two years ago, concerns about rising diesel prices in the future and the availability of more affordable and readily available renewable energy have created a strong interest transitioning away from diesel in isolated communities. The U.S. has committed to partnering with Canada and the Arctic Council to improve energy security for our northern communities. Since 2002, the Department of Energy has invested over $15 million in nearly 200 isolated community projects – $5 million in the last two years alone – through grants and technical assistance for renewable energy and energy efficiency projects that aim to address many of these high energy cost issues. During Prime Minister Trudeau's visit to Washington earlier this year, the U.S. and Canada declared an intention to deploy renewable alternatives to diesel fuel among indigenous communities. Some of the best practices

developed for Arctic communities will also be valuable for isolated communities not in the Arctic but facing similar challenges.

U.S. Energy Security Contributions in the Western Hemisphere

The strong standing of the U.S. in global energy markets has enabled us to play an important role in bringing stability and security to other countries, most notably through transfer of energy innovations and access to our energy resources.

North America. As noted, there is significant energy trade between Canada, the U.S. and Mexico. The first QER found that greater coordination, data exchanges, and regulatory harmonization will improve energy system efficiency and build resiliency to disruptions of the North American energy market. Toward that end, the Quadrennial Energy Review recommended actions that would further integrate North American energy markets. To identify gaps, best practices, and inconsistencies with regulations in the U.S., Canada, and Mexico, last October, the Department of Energy hosted two workshops focused on regulatory harmonization in the electricity sector. Stakeholders at these two meetings recommended specific actions, including a call for enhanced research and analysis on the value of electricity integration between our three nations. The next installment of the QER will make additional recommendations and provide some guidance for future policy actions with respect to electricity. An additional workshop will be held later this year to continue this effort and examine regulatory harmonization issues for the North American oil and gas sector.

Earlier this year, the energy ministers of the U.S., Canada and Mexico met in Winnipeg to discuss the importance of trilateral energy cooperation in North America and to initiate a Memorandum of Understanding Concerning Climate Change and Energy Collaboration. Areas of focus and activities agreed upon include:

- *Ensuring Reliable, Resilient and Secure Electricity Grids* by undertaking analysis of actions, policies, best practices and technologies that can enhance coordinated emergency response, protection against and mitigation of cybersecurity threats to energy systems, and grid resilience in the face of more frequent and severe natural disasters associated with climate change. Work is being conducted under several auspices: the QER, the US Grid Security Strategy, and the US-Canada Grid Security Strategy. Additional engagement of Mexico in grid security activities would help enable more robust energy infrastructure integration;
- *Expanding the North American Energy Data and Mapping* platform launched in February with the addition of renewable energy resource and cross-border infrastructure information on interactive maps in three languages;
- *Supporting Industrial Energy Efficiency* setting a North American target for industry implementation of latest energy efficiency standards (ISO 50001) , announced on June 2, 2016 at the CEM;
- *Enhancing Deployment of Low-Carbon Electricity by* conducting collaborative analysis to assess the impacts of increased integration of renewable energy resources across North American through the QER and the North American Renewables Integration Study. DOE has had formal QER stakeholder meetings in Mexico and Canada and both countries are contributing resources to the NARIS;
- *Accelerating Clean Energy Innovation and Development* through technology roadmap development for select focus areas to guide collaborative research and analysis. Areas include: smart grids, energy storage, carbon capture and unconventional natural gas; and

- *Reducing Methane Emissions through* collaboration on research, technology development, and operational practices to reduce methane emissions from oil and natural gas.

Later this month, the North America Leaders' Summit will take place in Ottawa. This meeting will build on long-standing trilateral cooperation between the U.S., Canada and Mexico on increasing collective energy security and addressing climate change through increased integration of our energy systems.

Caribbean and Central America. Many Caribbean and Central American nations face high energy costs driven by dependence on imported fossil fuels, and specifically diesel fuel for electricity and transportation. The Department of Energy has worked to address this challenge through information and best practice sharing, technical exchanges, stakeholder engagement, and government and investor roundtables. In addition, the U.S. supports the diversification of energy supplies in the Caribbean, including actions that will facilitate the introduction of cleaner forms of energy and the development of resilient energy infrastructure. Regional reliance on Venezuela's PetroCaribe financing has decreased significantly in recent years, as oil shipment volumes decline. Medium-term energy vulnerabilities from oil price volatility in the region underscores the importance of U.S. efforts to work with the Caribbean and Central America, fostering cleaner and more sustainable energy sectors.

South America. In South America, the Department of Energy is working to support a regional vision for energy security. After the President's visit to Argentina earlier this year, the Department of Energy met with Argentinian counterparts to discuss cooperation on unconventional shale resource development. In context of the International Framework for Nuclear Energy Cooperation, we have supported Argentina's leadership in the region on this topic. Despite the domestic challenges faced in Brazil, last November our Deputy Secretary of Energy Dr. Elizabeth Sherwood-Randall co-chaired a Strategic Energy Dialogue with her Brazilian counterpart to discuss opportunities for technical, regulatory and policy cooperation in clean energy, oil & gas development, the energy-water nexus and civil nuclear power. Most of the countries in South America signed the Paris Agreement in New York City. We are supporting these important partners on climate change issues as we move towards ratification this year.

Conclusion

We are committed to enhancing the energy security of our key allies and partners in the Western Hemisphere. As noted in the G-7 leader's communique in 2014, "energy security must be at the center of our collective agenda". The changing energy landscape in the U.S., the nature of global energy markets, and the need for accelerated innovation to transform global energy systems underscores the need for a broader, more collective approach to energy security. In this context, the U.S. is deeply engaged with our allies in the Western Hemisphere to promote energy security in a wide variety of ways, sustained over time, and irrespective of short term volatility in commodity prices.

Mr. DUNCAN. Thank you so much. And thanks for mentioning cybersecurity as part of the energy security threat, not only to delivery systems like the grid, but also to production facilities as well. We have to keep that in mind.

For the record, I am truly an all-of-the-above energy guy. I like wind and solar. I fully support countries like Uruguay and Peru and Chile that are going for more renewables. We visited on a codel to Chile recently a $200 million investment in a solar facility just out of Santiago. And so truly like to see the private investment in those areas.

But when I was at the Summit of the Americas last year, before I went to the Summit of the Americas, we talked a lot about North American, really American energy independence and North American energy independence working with our allies to the north and south, Canada with the Keystone Pipeline and their oil fields, but also with Mexico, the expansion of natural gas pipelines from the Eagle Ford Shale into Mexico, denationalization of Pemex, and other things that were going on in North America.

But then in conversations at the summit, we really started thinking more broadly about the Western Hemisphere and thinking about hemispheric energy independence, thinking about LNG exports, thinking about the Panama Canal, thinking about the pipelines that could supply natural gas from the U.S. to Central American countries that could be a game changer for quality of life.

And when I think about renewables, I think about energy, I also think about 24/7 baseload power, always on, always available, that you don't get from some intermittent sources. Proven sources are fossil fuels, oil and gas that work to provide transportation fuels, but also for electricity.

In addition, we always think about hydroelectricity as being a prevalent source of energy. But what we see in Venezuela, due to the El Nino and weather patterns that have changed, and a drought, low water levels, they are having to ration electricity due to the hydroelectric dam not having water levels necessary to provide electricity in Venezuela.

So there are a lot of dynamics and moving pieces with regard to energy security in the hemisphere.

I do know this: That a robust U.S. energy renaissance due to the Bakken formation, due to expansion in the Gulf of Mexico, and other energy sources, new technologies, the impact of hydraulic fracturing and its impact on the natural gas production, has led to the United States' ability to export a lot of natural gas and possibly export oil. Congress lifting the decades-long oil export ban could make, and was poised to make, the United States a bigger player in the energy markets globally.

But then we see OPEC, the information I provided earlier, really increasing global supply of oil, and the impact that it has, not only on U.S. producers. I mentioned earlier 100 bankruptcies in the energy sector, 150,000 layoffs. Reduction in investment in the energy sector was mentioned earlier. But think about those OPEC policies and their impact on countries like Venezuela and the Maduro government that does not have the revenues now to artificially prop up the Socialist government and provide a lot of things to the citizens of Venezuela. The Venezuelans are the ones that are hurting.

I think we will look back at OPEC's decision as possibly being a game changer in a positive way for Venezuela—my hopes anyway—in regime change there, to lead to more democracy, more popular involvement in government, and more democratic principles applied in reality, not just on paper. So I hope that we will look back and see that.

So, Mr. Hochstein, we talk about North American energy independence. You have heard all that I said. How can North American governments work better together to promote the energy resources that we have? We know what Mexico and the U.S. are doing in the Eagle Ford, just south of Mr. Castro's district. We know what Canada and the U.S. have historically done and want to do with bringing Canadian oil to the refining capacity it will have in the U.S. We know we have lifted the decades-long oil export ban. We know that hydraulic fracturing has led to an expansion of natural gas so that we can export LNG. We know that we are trying to do all we can to expedite the permitting for LNG terminals so that we can be ready to export that. We know that Caribbean, as well as European countries, are wanting U.S. gas.

What can we do more to make sure that the U.S. plays a part in energy stability, is what I am going to call it, within the Caribbean, but also in the Western Hemisphere region? And I will let you answer.

Mr. HOCHSTEIN. Mr. Chairman, thank you for that question. I have spent a considerable amount of time thinking and working on this issue.

I think that the way you have described it correctly is about the stability and security of the region, which is why we called it in 2014, when oil prices were at $100, the Caribbean Energy Security Initiative. And it is about looking at just in our hemisphere, in the Caribbean you have islands that are dependent on fuel oil from Venezuela, where the dependency is not really on the oil, you can replace the oil with a different supplier, but the PetroCaribe scheme has indebted them and, through some additional aspects of corruption, has made an untenable situation for most of these countries to be able to sustain their economies long-term with this kind of debt structure. And we saw recently, you were in Paraguay recently, where PetroCaribe Venezuela tried to call the debt on Paraguay as a political leverage.

So we have to get away from that paradigm. And we are in an era where, I think that you are right, that we have to have a mix, whether it is some renewables and natural gas. But none of that has been taken advantage of. And if you look at the case that you mentioned in Jamaica, where it has been renewables and natural gas, we are starting to see a real change in what we can do.

And the leadership of the United States is necessary, not only in the permitting process, but the innovation on the corporate side, on the private sector, in addressing the smaller-scale capability to deliver gas, LNG, from the United States to the Caribbean islands is advancing very quickly. We are now talking about companies putting barges as a floating gas terminal so that you lower both the cost and the ability for the scale size of it.

The first LNG cooperation between the United States and Jamaica started because an American company met with the Jamai-

can Prime Minister at the first Caribbean Energy Security Summit last year, a year and a half go. They met there, and we encouraged it through there. We have to expand that, but we have to do it not—we can't be the sole answer. It cannot be just about the United States. We have to bring in Canada and Mexico and the EU and other member states from the EU individually that will support us both financially, in working with the IDB, the World Bank, and others to create the kind of financial environment that will allow investment.

We have a problem. We can find solutions to the energy security in the Caribbean. But as long as you don't have a regulatory environment, a legal structure that American companies can trust, you are not going to have the investment, no matter what the price of gas is, no matter what the price of renewals are.

Mr. DUNCAN. Talking about the rule of law, legal structure in the countries in the Caribbean and also in other Latin American countries that would make American companies feel comfortable doing best there.

Mr. HOCHSTEIN. That is right.

Mr. DUNCAN. Let me ask you, and in the interests of time, you mentioned Argentina. So the Macri government is very interested in expanding the bountiful resources in Argentina. When we were in Chile and Argentina on the same codel, there is a gas pipeline that runs from Argentina to Chile. It was once used to export natural gas from Argentina to Chile. Now it is used to import natural gas from Chile, and that doesn't make the Argentine people very happy.

Mr. HOCHSTEIN. That is right.

Mr. DUNCAN. They want to be an exporter.

So the Macri government wants to really start exploring and exploiting the natural resources to make Argentina a player once again. How does he do that? How does he attract that investment at $30 to $50 a barrel of oil? And what is the price point that will make it attractive for foreign investment in Argentina?

Mr. HOCHSTEIN. So, again, I think what we are seeing is that putting together good governance and good tenders that are supportive, the kind of terms that will be supportive of investment, have already been successful, and American companies and international companies are coming to Argentina.

Our teams have already been down to Argentina. I will be there in a couple of weeks. They have tremendous unconventional shale gas potential, some of the best that we have seen in the world. We would like to be supportive of them, looking at how to develop that, bringing in the kind of companies that would be able to support them. So I think their production can rise in natural gas while at the same time looking at other power solutions in the power sector.

But it is not only there. We are seeing that by bringing the costs down of LNG and of floating storage and regasification units, so SFRUs, and the concept of a floating terminal, we are seeing that throughout Central America and South America. So Colombia is going to have a floating terminal. Honduras, El Salvador, and Guatemala all are talking about how do you utilize floating terminals while also interconnecting pipelines.

So you talked about, sir, the interconnection between the United States, the Eagle Ford, with Mexico, but if we can also have an interconnection from Mexico to Guatemala of natural gas, that will allow for bringing, essentially interconnecting the American market all the way down to Mexico and from Mexico down to Guatemala, and you are starting to see us develop a broader market that can support their economies while also bringing down costs by broadening the base of what the sector——

Mr. DUNCAN. It would be a huge game changer for the quality of life in some of these Third World countries. Mexican gas coming from the north, LNG coming from the Panama Canal as a distribution hub going north and south could be a game changer for some of those countries, and I truly believe it. Thanks for mentioning that.

I am out of time. I am going to yield to the ranking member for 5 minutes.

Mr. CASTRO. Thank you, Chairman.

And thank you to each of you for your testimony, and most of all for your service to our Nation.

You know, I sponsored legislation, was one of the sponsors of legislation last year on expediting LNG exports. And then this Congress voted in December, I believe, on the omnibus bill, which lifted the decades-long oil export ban. And Texas, of course, is a big oil and gas State. I represent San Antonio, and just south of that is the Eagle Ford Shale, one of the largest shale plays in the Nation. But I also see a bit of a cautionary tale in the Eagle Ford, and I will tell you why.

When the price of oil was very high, there were lots of predictions, that were considered very solid predictions, that things would be that way for 20 years or more, that the times would be great. And if you looked at all of these small towns, you had landowners who suddenly were wealthy because they were able to lease the rights for drilling and so forth, towns built more hotels and infrastructure to accommodate the new traffic that was coming through there, both commercial and visitors, all of the workers who were then staying in these towns. And then, when the price of oil started to go down, the number of rigs also went down, and many of those towns are now left kind of in a lurch and trying to figure out what to do.

So you mentioned the case of Argentina, for example. As we think about the direction that these countries are going to go, how do they avoid getting into that same boom-and-bust cycle? And perhaps it is not avoidable, we have gone through it before in the United States.

And also I agree with the chairman's comment about the issue of baseload versus intermittent sources of energy. I think that is a legitimate concern. That has to do with the predictability of availability, right? But what about the predictability of pricing? Because in the Eagle Ford Shale, what you saw was an issue with the predictability of pricing. In other words, people thought it was going to be $100 or more for years to come.

So, please, any of you, if you would discuss those things.

Mr. SIEMINSKI. I hear my colleagues sighing with relief that I would be delighted to answer your question, Mr. Castro.

I think, actually, something that Chairman Duncan mentioned during his question, the two comments are really running parallel. It is how can the U.S. help energy security in a period of low prices, cautionary tale of Eagle Ford, how do you attract capital at $30 to $40 a barrel crude oil, and this issue of volatility. When I mentioned during my opening remarks that the market-implied volatility for the month of September coming up could range from roughly $35 to $70 a barrel, you kind of go wow. I mean, that is plus or minus $20 from where we are now basically.

Why is that? And it is not a prediction from EIA. It is not a prediction from consensus forecasts of market analysts. It is actually the market itself. It is producers and refiners and airlines and trucking companies and hedge funds and others who are involved in the options market. And you can actually take the prices that they are paying in the futures markets and options and work it backwards to say what that means to volatility.

So this is just the reality. The reality is you really don't know what the price is going to be. So what companies tend to do, and countries need to understand this as well, they can't manage the price, they have to manage their costs. Companies have to be careful in what they spend, they have got to be very disciplined in how they build up their cost structures.

And for countries, I think as Amos was saying, they have to look at the contract structure. So if prices were to go back to $30 or $40 a barrel, countries have to be very careful how they set the contracts up, because they could get companies to come in if they made it attractive for the companies to participate at those levels.

Ms. KENDERDINE. I would say a couple of things. That looking at it, the low oil prices have had a small but positive impact on the U.S. economy, on U.S. GDP. And it is the same for countries in Latin America, that if you are an importer and relying on imports, you benefit from low oil prices.

The countries that are producers in Latin and South America that have diversified economies, one of them is Mexico—Mexico has the most diversified economy—has not suffered as much from low oil prices, because it has a large manufacturing sector, and that manufacturing sector benefits from low energy prices. And so I would say that diversification of economies is important so that you can avoid some of the boom-and-bust cycles.

And I agree with Adam that managing price is not what we do. But I would say one other thing, talking about Argentina—all of Latin America, actually. Development of flexible, transparent, and competitive markets is one of the principles that we are using for defining energy security. So that is important, as is diversification of energy fuel sources and roots. And so it is not just diversification of your economy, it is diversification of your infrastructure and sources of supply and types of supply.

Mr. HOCHSTEIN. First, never believe projections, long-term projections on oil price, and don't make plans based on them.

Mr. CASTRO. Well, I won't anymore.

Mr. HOCHSTEIN. Even EIA's. That is my first advice to any country.

Mr. CASTRO. Well, but let me ask you. We are talking about oil and gas, right? How does that stack up against the predictability

of pricing for wind or solar or hydro, I mean, these other sources of energy? We know with respect to baseload, the fossil fuel has obviously been more reliable, right? But with respect to the predictability of the pricing, how do these others stack up against fossil fuel?

Mr. HOCHSTEIN. Well, I think there it is different, because there is not a global price, benchmark price for wind or for solar the way there is for oil.

Mr. CASTRO. So it is more predictable?

Mr. HOCHSTEIN. So you are doing tenders and essentially companies are bidding on what they will charge you for the long term or for medium term if they get the contract to build it out.

But I will say on how these two issues that you just asked in Argentina play out, we have two programs that we are running right now in Argentina that we just started. One is in the power sector, a power sector program that works specifically on this issue to help them on the technical expertise side, how do you figure out how to put together a good tender where you will get the maximum benefit for the country and understand how to deal with some of these countries that are bidding and put it together in an open, transparent, but also economically and something that works well.

The same in the unconventional in shale gas. We have a program called the Unconventional Gas Technical Engagement Program. And in Argentina it is working really on how do you make sure that you have internationally competitive contractual and fiscal regimes that will support Argentina as they negotiate to bring in companies.

What you don't want is in some cases where we have seen over the last 40, 50 years in the oil and gas sector, countries have a newfound resource, they don't have the same legal expertise on how to deal with the oil sector, company comes in, 30 years later they realize they have been paying—all the profits have gone to the company, none have been able to be used for the country.

So we are trying to help, specifically on shale where we have expertise that nobody in the world has, to be able to support them. So we have a program that just started in Argentina on that.

Mr. CASTRO. Thank you.

Mr. DUNCAN. The gentleman's time has expired.

Global demand has an impact on that as well. I don't think you all touched on that. I drive a diesel truck. And in the times I have driven a diesel truck, historically diesel fuel has been higher than unleaded gasoline. Now what we have seen is diesel fuel is actually less than the per gallon price of unleaded gasoline.

And I have chewed on that a lot. I ask everyone listening in the audience today to think about that, because I really believe global demand on diesel fuel has an impact on low diesel prices right now, because the supply of crude oil is the same. Both of them are refined products. So after the refining process, the amount is pretty much the same. So now we have diesel prices at a low. I have been driving a diesel for 6 or 7 years, and I have never seen that until just recently. So it is an interesting impact.

I will go to the gentleman from New York, Mr. Donovan.

Mr. DONOVAN. Thank you, Mr. Chairman.

I have two questions for the panel, one dealing with the use of ethanol, the increase of ethanol in Mexico in their gas, and the other is about our national security and the oil reserve.

Over the last decade in the United States, we have experimented with an ethanol mandate requiring ethanol be blended into our gasoline. The mandate was created in about 2005 and expanded in 2007 with a goal to decrease the United States reliance on foreign sources of oil. While we were sitting here, the AP just reported that the EPA is holding a hearing in Kansas City, Missouri, today about reaching the goals that they set in 2007. Obviously, the oil market has changed with the revolution of hydrofracking for natural gas, the world has an abundance of oil, and the United States is now an exporter.

We also have seen the unintentional adverse impact of the ethanol mandate, including harming our environment, increasing the cost of food, and a negative impact on various types of engines. With the recent liberation of Mexico's energy sector and the mandate, or the push to increase ethanol use in Mexico, I was just wondering if you could comment on how that would affect the environment, how that is going to affect the food prices for the Mexican people, and how it would affect the engines in the cars in Mexico.

Ms. KENDERDINE. Well, the ethanol mandate is a mandate passed by Congress, and it is volumetric, it is not percentage, which has always been interesting to me, because if your consumption of fuel goes down, the percentage of ethanol goes up, because it is volumetric. But it is the law, and I think that it has generated a significant industry, and I am certain that it will do so in Mexico as well.

What I would say about DOE is that we have invested significantly in non-food biofuels, and so we are very interested in that. We will continue to do that and have been working with many countries in Latin America on technical expertise in nonfuel biofuels, in Brazil, Mexico, I believe, Canada. We are working with them on advanced biofuels, et cetera. So I can't say how it will turn out in Mexico, but I know that it has generated a significant industry there.

Mr. DONOVAN. Does anybody else care to comment?

My second question actually has to do with our national security, the oil reserve. The ban on exporting oil was to protect our national security. Now that that is lifted, are there any related threats to our national security that any of you see?

Mr. HOCHSTEIN. Well, first, I am going to let Adam talk about sort of the numbers, but even though we have seen this dramatic rise in production of oil and gas in the United States and that our rate of imports has decreased significantly, from over 60 percent to below 30 percent, that doesn't mean that we are isolated or insulated from the world markets. So a disruption anywhere in the world has impacts everywhere in the world, including the United States.

We are now living through the largest disruption level in oil production that we have seen in 5 years or so. We have seen through the fires in Canada 1 million barrels a day went off the market. Due to the terrorist attacks in Nigeria in the delta against the platforms, Nigeria has significantly cut its oil production, almost by

half, to just around 1 million, 1.1 million barrels a day. So that is a significant decline in production all of a sudden. So if you can see, other shortages or outages will affect the United States without a doubt.

So I think I would look at energy security not as how do we become independent of the rest of the world, because it is a commodity and it is always going to be tied, but rather see how much we can improve our diversified situation, how do we work closely with our allies and friends around the world, whether it is through the IEA, the International Energy Administration, or through other bilateral relationships, to make sure that we are working together on the stability in the market itself and to secure energy supplies and routes.

So I think that is our best bet in protecting our own national security, and making sure that no country in the world is beholden to one supplier, whether it is, as Melanie mentioned before, Russia and Eastern Europe, where that is using its monopoly on gas to politically coerce and use it as a weapon, or Venezuela, as we discussed before, in this hemisphere. Those are the things that we can do to ensure our national security.

Ms. KENDERDINE. If I could say something about the Strategic Petroleum Reserve. The requirement in law is to use it to protect the U.S. from the economic harm caused by oil disruptions. And Amos is right, it has very much changed since we first established the SPR in 1979, where you actually did have physical shortages. Now you get much more harm from the price spikes and prolonged outages than you do from actual physical loss of supply, and that is because we now have an oil market, a global oil market. We didn't have one when we started the SPR in 1979.

But another thing I would say is that we have been authorized for $2 billion to modernize the Strategic Petroleum Reserve, and we need to do that in part because we need to get oil on the water. And we are producing enough additional oil in the United States that a lot of that oil is moving to the Gulf of Mexico where the SPR oil facilities are located, and we need to be able to get incremental oil onto the water when there is a disruption in the world. And so it is thanks to the Congress for authorizing that. It is very important for our energy security in the future.

Mr. DONOVAN. I thank you all.

Chairman, my time has expired. Thank you.

Mr. DUNCAN. Thank you. I thank the gentleman.

I go now to the gentlelady from Illinois, Ms. Kelly.

Ms. KELLY. Thank you, Mr. Chair.

The last few years, we have seen declining oil prices. However, historic patterns of lower oil prices resulting in economic growth have yet to materialize. Quite simply, consumer demand is changing, and we are creating an oversupply of oil.

Another market where we already have an oversupply is in the international corn market. Corn is trading at roughly $4.30 a barrel. Years of high crop yields have resulted in excess corn. Seeing an oversupply in both marketplaces, with an overinvestment in oil and an underinvestment in corn and cellulosic ethanol as forms of alternative energy, I have seen the opportunity for ripe—ripe for growth and diversification.

I will say, my district is urban, suburban, and rural, but the rural part of my district has 1,200 family farms, and they grow $367 million worth of corn, wheat, and soybeans every year.

And expanding upon my colleague's question, Mr. Donovan, can you just explain more how you are working with Latin American countries to use non-edible portions from corn and ethanol?

Ms. KENDERDINE. Well, basically, it is technical assistance on how you produce ethanol and et cetera from non-food products—cellulosic ethanol. We worked with Brazil to produce bagasse, which is the non-edible part of sugarcane. And what I would say—one, we are an R&D organization, by and large, so that is what we do for a living.

Something I would say about the Caribbean and Central and South America is the production of ethanol will help with some of the energy security issues that we are talking about here today associated with Venezuela and oil. We need to find alternatives for these countries to oil, and that is one of the things that we can do.

And so we are also, in the U.S. and with some countries, working on advanced biorefineries. That is one of the things we are doing here and—I forget which country we have been working on biorefineries as well.

So it is, by and large, a technical assistance and R&D program but with the underlying motivation of enhancing the energy security of these countries in Latin America.

Ms. KELLY. What do you see the opportunities are with Cuba and the sugar ethanol?

Whoever——

Ms. KENDERDINE. Sorry. I don't know.

Amos, do you—I haven't looked at Cuba and sugar ethanol. So, sorry. I can get more information for you.

Ms. KELLY. Okay. Thank you.

Did you want to take a crack?

Mr. HOCHSTEIN. No. I have to be honest, I don't know much about Cuba's ethanol production. I have looked at Cuba from other perspectives but not that. We are happy to get back to you, I think collectively between the two of us, after the hearing.

Ms. KELLY. Okay. Thank you.

And, Mr. Chair, I yield back.

Mr. DUNCAN. Thank you. I thank the gentlelady. Great questions.

I go now to Mr. Yoho from Florida.

Mr. YOHO. Thank you, Mr. Chairman.

And I appreciate the panel being here.

As Venezuela goes through their tumultuous time, how much of the market have they lost? Or their production, I guess is a better question. How much is their production down in Venezuela?

Mr. HOCHSTEIN. What I said in my testimony earlier, sir, was that in 1997 they were at 3½ million barrels a day. Today they are somewhere between 2.2 and 2.5 but definitely below 2.5 million barrels a day.

Mr. YOHO. And they are doing most of their refinery in the United States with Citgo, right?

Mr. HOCHSTEIN. They do a lot of—they sell a lot of their oil to themselves through Citgo.

Mr. YOHO. Okay. Has that been impacted much by that reduction, or are they filling that void with their decreased production by U.S. suppliers?

Mr. HOCHSTEIN. No. The United States is actually one of few places they get market price for their oil, so I suspect that that is going to continue to be a good supply source for them. They have had to discount their oil significantly due to other reasons.

Mr. YOHO. Okay.

Where do you see the Venezuelan production in the near future, in, say, 5 to 10 years? And I know it is such an uncertainty, with the state of their politics and economy, but your prediction?

Mr. HOCHSTEIN. Sir, I said before to Mr. Castro that one should be wary of projections. So I don't want to——

Mr. YOHO. Yeah, I heard you say that. I was trying to get you to come clean on that. But——

Mr. HOCHSTEIN. But——

Mr. YOHO. Go ahead.

Mr. HOCHSTEIN [continuing]. Absent any change, their production will continue to decline below 2 million.

But I will say that it is not—what is happening now is not sustainable. At the end of the day, Venezuela's oil is easy to produce. It is not complicated. And the minute there is a political and economic change, you will see an increase in production. Because companies want to go to Venezuela; they are just forced out by both the politics, the corruption, and the—I would accuse the government of malpractice when it comes to management of the resource. When you have the largest resource in the world and you are declining at this rate, that is malpractice.

So, as long as this continues, the same situation as is today, they will continue to see declines—not to zero. There will be—because oil is too easy and PDVSA is too to good at producing it. But there is going to have to be some kind of change.

Mr. YOHO. How much does that influence the market and the security, I guess, of the Caribbean areas, especially the most important, you know, the U.S. Virgin Islands and, like, Puerto Rico? How much does that, number one, affect the price and then the stability of a reliable baseline energy production?

Mr. HOCHSTEIN. Well, our message has been, to the region, to the Caribbean in particular, is: You need to get off PetroCaribe, and you need to do it now.

Mr. YOHO. Okay.

Mr. HOCHSTEIN. And at low oil price is the right time to do that.

And you can do that—every island is going to be different because they have different resources, different capabilities, and different financial outlooks.

The other is not the issue of the oil itself but the issue of the debt and the credit. So if you look at Jamaica or Dominican Republic that use the cash crunch in Venezuela to buy back their debt at a few cents on the dollar, not everybody is able to do that.

You know, Haiti, while their reliance on PetroCaribe has decreased significantly—but if you look at their statistics, 86 percent of Haiti's foreign debt is held by Venezuela, which is 15 percent of their GDP. That is massive. And if you look at what Venezuela just

did to Paraguay, where they tried to, for political reason, call the debt, what happens to Haiti if they call that debt?

So we have to work on a number of things. One is diversify the energy economy in each island. The second is to make sure that we support them in getting out of the debt structure that they have to PetroCaribe and Venezuela.

That is why I said before they are living on borrowed time. They cannot celebrate the low oil prices as consumers because, as Adam talked about before, the oil prices are going to rise. We know that. We just don't know when. So we have to do it now.

Mr. YOHO. All right. And that brings me to another question then. It is talking about the floating LNG platforms. How feasible is that? Are they using that in U.S. Virgin Islands and/or Puerto Rico at this time?

Whoever wants to answer.

Mr. HOCHSTEIN. I don't believe they are using it yet, but I think what we are seeing is a proliferation of FSRUs and new technologies to make it even cheaper and easier to manage the scale. So, now, for the first time, there are companies discussing how to do it, instead of on a big ship that is an FRSU, do it with a barge.

There is another company, a U.S. company, that is looking at having a container ship in the Caribbean——

Mr. YOHO. Right.

Mr. HOCHSTEIN [continuing]. Where you would basically have it like a wheel and spoke. So you would come in there, and then smaller containers going out to islands.

So I think you are going to see a lot more. The bigger-scale ones of the FSRUs we are seeing in Central America. And with the expansion, as Melanie talked about before, of the Panama Canal, you are going to see a lot more traffic there and a lot more opportunities. Colombia just the other day started talking about an FSRU there as well.

So I think you are going to see that mix—small-scale for the Caribbean and LNG FSRUs for the larger countries.

Mr. YOHO. All right.

And, you know, in the Caribbean, we know how the hurricanes come through there, and they can pop up pretty quickly. I assume those things are agile enough that we will know ahead of time, that they can get them out of harm's way. And I am certain they have done the research on that.

Mr. HOCHSTEIN. Well, I think the companies that are deploying these ships are well aware of that.

Mr. YOHO. Yeah.

Mr. HOCHSTEIN. It has actually been discussed between them and the countries. But I think we have to be aware of that, too, because it will fall onto us——

Mr. YOHO. Right.

Mr. HOCHSTEIN [continuing]. If there is any disaster of any kind.

Mr. YOHO. Thank you for your time. I appreciate you being here.

I yield back, Mr. Chairman.

Mr. DUNCAN. I thank the gentleman from Florida.

I will now go to Mr. Lowenthal for 5 minutes.

Mr. LOWENTHAL. Thank you, Mr. Chair.

As the chair, myself, of the Safe Climate Caucus, I would like to drill down a little bit more deeply in terms of renewable and alternative energies and how we are really advancing our clean, low-carbon energy in the Western Hemisphere, as we have already pointed out; that renewal energy sources have the benefit of being virtually free of the negative health implements and are not subject to some of the international volatility in the fuel supply costs, which also, I believe, strengthens our energy security.

And, as you pointed out, we have seen the economies of many of the countries in our hemisphere falter because of their dependence on oil prices. That has already been made clear. As to the same matter, so have we seen some of the economies of budgets of oil extraction states have also been faltered.

So the question is, as I move forward, the Paris Climate Agreement has signaled the world is transitioning away from carbon-intensive energy. And I am glad, when I went through the readings, to hear of our efforts through initiatives like Connecting the Americas 2022 and the Energy and Climate Partnerships of the Americas that are going to help our neighbors diversity their energy portfolio and strengthen their energy security.

So the questions of any of the witnesses are: How do we measure the successes of these programs? Do we have any specific data to indicate the specific increase in alternative energy usage in the region?

And the third thing is, you know, we are talking about energy in terms of development on one hand, but we are also talking about both transportation sectors and power sectors. And I haven't heard the word "coal" at all mentioned once. Is coal a major player in the creation in Latin America of the power sector? And are we seeing specific changes in that also?

And so those are the questions that I have.

Ms. KENDERDINE. Let me say—and on coal in Latin American and South America, I am sure that Adam knows the data. South America is much more dependent on hydro——

Mr. LOWENTHAL. Hydro.

Ms. KENDERDINE [continuing]. Hydro than a lot of places in the world, certainly in the U.S. And I have long been worried about the melting of glaciers and the loss of hydro—somebody discussed it earlier, in Chile, the problems with hydropower when the glaciers are melting—and have thought about natural gas as adaptation strategy for climate change in South America, which is something I think we need to think about.

The Department of Energy has several initiatives. The Clean Energy Ministerial, that is more a best practices and kind of a deployment focus. There are 24 countries in the Clean Energy Ministerial, and Brazil, Mexico, U.S., Canada are the Western Hemisphere countries.

We also just launched Mission Innovation. And Mission Innovation is an initiative of 20 countries. There are five countries in the Western Hemisphere—Brazil, Canada, Mexico, and Chile. The commitment in Mission Innovation is to double our government spending on clean energy R&D to accelerate transformation of our energy systems.

Each country can define clean how they want it. We would define clean as all of the above. Coal would have a role in that, with carbon capture and sequestration. Our definition is reducing CO2 emissions. But that Mission Innovation I think holds enormous promise for accelerating the R&D that we need for that transformation for renewables for zero-carbon power generation, et cetera, et cetera.

How you measure it, it is—the course of R&D is hard to know. I don't think Adam's forecast 30 years ago would have picked up on the shale gas revolution. We didn't know about it then, although the Department was investing in it.

But one thing I would say on Mission Innovation, the doubling of the government R&D, clean energy R&D, of those 20 countries is not trivial. That is 85 percent of the world's total spending on clean-energy R&D. So I think it is something that is worth supporting. Innovation is good in general. And so we are excited about it. And we just came from a ministerial in San Francisco.

Mr. HOCHSTEIN. Mr. Chairman, if I may, we are putting quite a bit of resources—as the chairman talked before in his opening remarks about the conversations that the committee had, that you had led, with the leaders from the Caribbean during summits when they were here. We are working with them, but I don't want this to be a Band-Aid. I don't want to see, okay, a project is going up. Because the bottom line is, if they don't make the fundamental change in their regulatory environment, their legal structures, you are not going to see long-term investment of the right kind of companies to come in.

What we have done is we are putting resources behind, working with island by island, country by country, that have the political will to face the difficult task of facing the incumbents and some of the other special interests to be able to do that.

We have a great example in Nevis. It is a small country dependent 100 percent for their power on Venezuela but have great geothermal opportunities, potential. But they didn't have the expertise. We worked very closely with them for 2 years to rewrite their legal and their regulations. And they did a state-of-the-art tender. A company won the tender, an American company, and now we are looking at completing the process toward turning them into a geothermal-based power.

I know it is a small country, but it is a model not only in the Caribbean, but it is going to be a model for islands of how to utilize this kind of technology.

So we are working. I think it is entirely quantifiable and measurable. If you see that projects are happening—like the chairman mentioned, Jamaica. Jamaica is going on both the gas and renewables, and they have contracts to prove it. So when they are negotiating the right kind of contracts, giving the companies the rights to be able to come and create the incentives for companies to come and invest, they can spend the money up front but become far more secure and less expensive for the future.

And they all have different qualities. All of them have sun; some wind, some geothermal, et cetera. But I think it is measurable.

Mr. LOWENTHAL. Okay. Thank you.

And I yield back.

Mr. DUNCAN. Okay. Thank you.

We have a little bit of time for a second round, if the committee would like.

I do have a question for Ms. Kenderdine.

You mentioned five countries that had committed to double their spending on renewables, I think is what you said. What were the countries again?

Ms. KENDERDINE. Actually, it is 20 countries that have—it is doubling their government spending on clean-energy R&D, not renewables necessarily. But the five countries——

Mr. DUNCAN. On clean-energy R&D?

Ms. KENDERDINE. Clean-energy R&D, yes.

Mr. DUNCAN. Okay.

Ms. KENDERDINE. And the five countries in the Western Hemisphere are Brazil, Canada, Mexico, Chile, and the U.S.

Mr. DUNCAN. And the U.S. What do we spend currently? What is the U.S. spending on that?

Ms. KENDERDINE. We all have developed baseline numbers. Our baseline number for clean energy is—for the U.S. Government is $6.4 billion, $6.6 billion a year. That includes the Defense Department and other agencies. At DOE, I think it is about $4.6 billion a year.

And so we are a significant percentage of that clean-energy R&D. The Chinese just came in with a baseline surprisingly high. I think it was $3.4 billion, something in that range. And it creates a competitive position, as well. If these other countries are investing in the R&D, we need to be investing, too, so we can create commercial opportunities for that R&D, as well.

Mr. DUNCAN. So that is U.S. Government spending on R&D. What do you think the private sector spends in R&D for clean energy?

Ms. KENDERDINE. Clean energy? Much more than that, although it has been declining pretty significantly lately. The investment has gone down.

Mr. DUNCAN. Right. Okay.

We mentioned Jamaica earlier, about, you know, paying off their debt at a discount, I guess, to Venezuela. And Maduro went to Jamaica recently to show support for PetroCaribe and kind of give assurances to the Caribbean nation that it is still going to be a thriving enterprise. And, at the time, he mentioned that they were going to invest in upgrades to the refinery that is there in Jamaica.

I asked the question of OAS today, Mr. Fitzpatrick, you know, where are they going to get the money. Because they are struggling to provide, with the low oil prices, for their citizens. And he said, Well, they are going to borrow it from China.

That is alarming to me, that Venezuela is going to borrow from China to invest in their refinery in Jamaica. It just shows that dwindling oil prices has a dramatic impact not only on spending and revenues available but also now on the indebtedness of Venezuela. So I wanted to make that point.

I don't have any further questions. We don't have any other members on my side of the aisle. Mr. Lowenthal, do you have any——

Mr. LOWENTHAL. I just have one.

Mr. DUNCAN. Okay. You are recognized.

Mr. LOWENTHAL. We have spent a significant amount of time talking about the power sector. I am interested also if you are seeing the same kinds of changes toward renewables in the transportation sectors also in these countries.

Are we seeing investments in transportation, in renewable, electric? I know at one time Brazil had had very effective, kind of, alternative energy. So I am wondering, are we seeing it also in transportation?

Mr. SIEMINSKI. Thank you for the question, Congressman Lowenthal. I would like to start off, actually, with your last question——

Mr. LOWENTHAL. All right. Go back to the last question.

Mr. SIEMINSKI [continuing]. If you don't mind——

Mr. LOWENTHAL. Absolutely.

Mr. SIEMINSKI [continuing]. And then maybe we can provide something for the record on the transportation issue.

You had asked about coal.

Mr. LOWENTHAL. Right. I want to know about coal.

Mr. SIEMINSKI. And the two biggest countries on the consumption side for coal are Mexico and Brazil. They use it largely in power generation.

Mr. LOWENTHAL. Right. That is where it would be, in the power side.

Mr. SIEMINSKI. And on the supply side, of course, the United States is a big coal producer, user, and we export. But Colombia, the country of Colombia, exports coal, and they actually dominate the coal trade kind of south of our border.

Now, one of the interesting things about the natural gas situation, the pipeline gas that is going to go from Mr. Castro's Eagle Ford into Mexico is probably going to be used largely to offset coal being used in electricity, so it will be a cleaner fuel. It is relatively cheap. Natural gas is tremendously competitive in the electric power markets.

One of the—I think the very first shipment of LNG from the Sabine Pass facility down on the Texas-Louisiana border went to Brazil, the LNG went to Brazil, and they are using it in the same way. So the possibility of U.S. gas competing in these Latin American power markets is really kind of an interesting opportunity.

You asked about renewables. The EIA does an international energy outlook. We try to forecast out, you know, 20 or 25 years. Over the period that we are looking at, renewables actually grow faster than any other fuel in the outlook, but oil and coal and natural gas continue to have a higher market share even at the end of the, you know, 2040 forecast period than renewables. But renewables are growing very strongly.

A lot of that is—so we count hydro in there, renewables——

Mr. LOWENTHAL. As a renewable.

Mr. SIEMINSKI [continuing]. Wind and power—wind and solar really go into those electric markets, as you were indicating. And you have to have something as the base load provider, you know, unless—the kinds of things that the Department of Energy was working on—the grid and the infrastructure allows for renewables to back up renewables. Right now, we need something like coal or

nuclear or natural gas to provide the base load power. Natural gas is very effective at that.

So, on the coal side, I think that the—in our projections, with China moving more toward more of a service economy rather than purely manufacturing, China's use of coal is going to begin to flatten, and that is probably going to flatten out coal use on a global basis.

So, back to the renewable side, there is a lot of opportunity there. It is going to grow pretty rapidly. But, in our projections, fossil fuel is still going to be needed, especially in transportation, your last question.

Mr. LOWENTHAL. Right. That is right.

Mr. SIEMINSKI. So, on renewables, Brazil, of course, has got ethanol. We have ethanol in the U.S. It is about 900,000 barrels a day of ethanol in the U.S. It is quite a bit, 10 percent of our gasoline consumption.

The other renewables in transportation, Brazil has been pretty effective in using their sugar-based ethanol in transportation. But it is very difficult to compete with diesel fuel, as Chairman Duncan was saying, and gasoline in a lot of these locations where they don't have the opportunity for sugarcane production or corn production.

And, Mr. Chairman, just to wrap up my 30 seconds, if you will give it to me, I have a feeling that one of the reasons the diesel prices are lower now than gasoline is that the warm winter resulted in relatively low price differentials for the heating fuel side of the barrel, which is kind of right in the same area that diesel fuel occupies when it comes out of refineries. And so having heating oil around meant that diesel fuel prices came down.

It is very possible that if we go back to normal winters—and that is what the NOAA forecasters are saying for this coming winter—that your diesel prices might go back up again.

Mr. DUNCAN. Yeah. The dynamics—the gentleman's time has expired—dynamics of blending and wintertime and summertime fuel prices and blends are a fact, as well. Most people in America don't think about that as they are changing over to that summer blend, but that does affect prices.

It has been a great hearing. We are going to continue to delve into energy in the hemisphere and also continue to watch the Venezuela issue very, very closely.

Members of the committee may have questions for the witnesses, and if we submit those questions, we would ask you all to provide an answer within 10 days. And I don't know that that will happen.

You all have been great witnesses.

I want to thank the staff of the committee for working with the witnesses in providing today's hearing.

So, in wrapping up, pursuant to committee rule 7, members of the subcommittee will be permitted to submit written statements to be included in the official hearing record. And so, without objection, the hearing record will remain open for 5 business days to allow statements, questions, extraneous materials for the record, subject to the length limitation in the rules.

With no further business, this committee will stand adjourned.

[Whereupon, at 11:57 a.m., the subcommittee was adjourned.]

APPENDIX

Material Submitted for the Record

SUBCOMMITTEE HEARING NOTICE
COMMITTEE ON FOREIGN AFFAIRS
U.S. HOUSE OF REPRESENTATIVES
WASHINGTON, DC 20515-6128

Subcommittee on the Western Hemisphere
Jeff Duncan (R-SC), Chairman

TO: MEMBERS OF THE COMMITTEE ON FOREIGN AFFAIRS

You are respectfully requested to attend an OPEN hearing of the Committee on Foreign Affairs, to be held by the Subcommittee on the Western Hemisphere in Room 2172 of the Rayburn House Office Building (and available live on the Committee website at http://www.ForeignAffairs.house.gov):

DATE: Thursday, June 9, 2016

TIME: 10:30 a.m.

SUBJECT: The Impact of Low Oil Prices on Energy Security in the Americas

WITNESSES: Mr. Amos Hochstein
Special Envoy and Coordinator for International Energy Affairs
Bureau of Energy Resources
U.S. Department of State

Ms. Melanie Kenderdine
Director
Office of Energy Policy and Systems Analysis
U.S. Department of Energy

The Honorable Adam Sieminski
Administrator
U.S. Energy Information Administration

By Direction of the Chairman

The Committee on Foreign Affairs seeks to make its facilities accessible to persons with disabilities. If you are in need of special accommodations, please call 202/225-5021 at least four business days in advance of the event, whenever practicable. Questions with regard to special accommodations in general (including availability of Committee materials in alternative formats and assistive listening devices) may be directed to the Committee.

COMMITTEE ON FOREIGN AFFAIRS

MINUTES OF SUBCOMMITTEE ON *the Western Hemisphere* HEARING

Day *Thursday* Date *06-09-2016* Room *2172*

Starting Time *10:33 AM* Ending Time *11:57 AM*

Recesses *n/a* (____to ____) (____to ____) (____to ____) (____to ____) (____to ____) (____to ____)

Presiding Member(s)
Chairman Jeff Duncan

Check all of the following that apply:

Open Session ☑
Executive (closed) Session ☐
Televised ☑

Electronically Recorded (taped) ☑
Stenographic Record ☑

TITLE OF HEARING:
The Impact of Low Oil Prices on Energy Security in the Americas

SUBCOMMITTEE MEMBERS PRESENT:
Chairman Jeff Duncan, Ranking Member Joaquin Castro, Rep. Dan Donovan, Rep. Ron DeSantis, Rep. Ted Yoho, Rep. Matt Salmon, Rep. Robin Kelly

NON-SUBCOMMITTEE MEMBERS PRESENT: *(Mark with an * if they are not members of full committee.)*
n/a

HEARING WITNESSES: Same as meeting notice attached? Yes ☑ No ☐
(If "no", please list below and include title, agency, department, or organization.)

STATEMENTS FOR THE RECORD: *(List any statements submitted for the record.)*
n/a

TIME SCHEDULED TO RECONVENE _____
or
TIME ADJOURNED *11:57 AM*

Mark O. Walker
Subcommittee Staff Director

Chairman Jeff Duncan - QFRs

WHEM Subcommittee Hearing: "The Impact of Low Oil Prices on Energy Security in the Americas"

June 9, 2016 at 10:30 a.m. in Rayburn Room 2172

TO: MR. AMOS HOCHSTEIN

1. North American Energy Independence. How can the North American governments work better together to promote the region's energy potential and achieve greater energy independence and security? What steps are being taken bilaterally and trilaterally with respect to planning and investing in energy infrastructure, technology-sharing, reducing export restrictions, and harmonizing regulations that affect the energy sector?

2. Caribbean Energy Security Initiative (CESI) & Summits. The Administration launched the Caribbean Energy Security Initiative in June 2014. Since then, there have been multiple Summits with the most recent one occurring last month, involving leaders from both the Caribbean and Central America. We've heard some criticism that these initiatives have been a lot of talk and meetings but that they haven't produced many tangible outcomes.
   - Other than the report produced by the Taskforce that was submitted at the May 2016 Summit, what other deliverables has the Administration had related to CESI and the Summits?
   - Have you found energy engagement to be more successful at the regional or country level in Caribbean nations?
   - Have U.S. companies received the support that they need to enter the Caribbean and Central American market, especially considering the fact that many of these companies are very small?

3. U.S. Renewable Energy Efforts. It appears from U.S. initiatives in the region that the adoption of renewable energy resources is the primary focus of the Administration. How are you measuring the costs and results of the Energy and Climate Partnership of the Americas (ECPA), Connecting the Americas 2022, Caribbean Energy Security Initiative, and Regional Clean Energy Initiative to name a few?

4. Venezuela & U.S. Supply. How important is Venezuela to the United States as a supplier of oil? Given CITGO's refinery operations in the United States, to what extent does Venezuela depend on the U.S. for its oil production? What is the U.S. strategy to prevent a short-term energy crisis off our shores with Venezuela?

5. OPEC Impact. OPEC is a cartel but it's not always successful at colluding. Just look at the Saudi decision to flood the market and have oil prices drop, while other cartel members, like Venezuela and Ecuador, would like nothing more than to see the Saudis cut production and have oil prices go up. What is the takeaway from the OPEC meeting that took place recently? How long can the Saudis keep drawing down on their sovereign wealth fund to maintain

market share? How much longer can Venezuela's oil revenue-dependent government stay in power if oil prices don't come up?

6. Impact on Israel: Given that the USG provided assistance in other strategic energy projects like Baku-Tbilisi-Ceyhan oil and gas projects through Ex-Im, OPIC, and TDA as well as other resources, should the U.S. be offering financial support and/or financial guarantees to Israel and/or Jordan to facilitate development of Israel's natural gas resources?

7. Impact on Israel: Does the low oil price environment help or impede the development of Israeli gas? Is it in the U.S. interest to see the Leviathan project is actualized? How does the development of Israel gas facilitate U.S. national security objectives?

8. Russia: Is it the intent of U.S. sanctions policy to target future production of Russian natural gas and is it in the long term interests of the U.S. and our allies in Europe and Asia to be preventing the development of Sakhalin gas?

TO: MS. MELANIE KENDERDINE

1. North America Oil & Gas Issues. What improvements in coordination have been put into place since our hearing last year in July related to Mexico's energy reforms? Three different departments handle cross-border approvals with the State Department handling oil pipelines, Federal Energy Regulatory Commission (FERC) handling natural gas pipelines, and Department of Energy (DOE) handling electric transmission lines. Is this an efficient way to handle the approval process, especially for oil and gas pipelines, which have certain similarities?

2. U.S. LNG Export Licenses. The U.S. participates in the Natural Gas Working Group of Mexico and the Northern Triangle countries of Central America with the Inter-American Development Bank, and the Department of Energy has approved some LNG export licenses for the region. There are a number of small-scale LNG export projects that are targeting the Caribbean market. How many LNG export licenses for the Americas have been approved and how many remain in the queue? Why not declare all projects of a certain size and selling to Caribbean nations to be deemed in the U.S. national and public interest and have DOE approve all of them expeditiously?

3. U.S. Crude Oil Exports Ban Lifted. At the end of last year, the ban on U.S. crude oil exports was lifted. American crude oil is now beginning to compete in the global market at a time when some OPEC members have called for a so-called "freeze" in production while others, such as Iran, vow to increase their exports of crude oil. What are the short-, mid-, and long-term economic and geopolitical implications of this policy change?

4. Impact to Region of Halting U.S. Crude Oil and Natural Gas Exports. At a time when the United States is re-emerging as an energy superpower, this Administration is pushing for policies which would seriously undermine our ability to continue producing domestic energy resources. Others want the United States to disengage from global energy markets by halting exports of crude oil and natural gas. What would be the economic and geopolitical

repercussions to the Western Hemisphere of significantly reducing U.S. energy production and blocking American energy from competing in the global marketplace?

TO: ADMINISTRATOR SIEMINSKI

1. Shale Gas in Latin America. In 2011, the U.S. Energy Information Administration released a study that indicated that Argentina, Brazil, Mexico, and Paraguay have significant shale gas development potential. To what extent are U.S. energy companies investing in shale production in Latin America? How have Latin American countries' regulatory environments affected the development of shale resources? What is the Administration doing to help these countries put regulatory regimes in place to promote shale gas development? To what extent have lower prices for oil and natural gas affected the region's ability to exploit shale resources?

2. OPEC Oil Market Manipulation. Oil price spikes and volatility, which threaten our economy and national security, are caused by a variety of factors, including OPEC oil market manipulation and oil supply disruptions in unstable oil rich countries. What impact are low oil prices having on Venezuela, and what is the likelihood these prices could trigger instability and an oil supply disruption in that country? What impact would such a disruption have on global oil prices?

3. Low Oil Prices' Impact on U.S. Oil is traded on an unfree market, operating under the shadow of the OPEC cartel and various national oil companies whose actions have an outsized impact on America's economy and national security. Saudi Arabia flooded the market with its spare capacity reserves as prices dropped—increasing output from 9.6 million barrels per day (mbd) in November 2014 to 10.2 mbd by March 2015. This action triggered a rapid slide in the price of oil which boosted domestic demand for oil and an increase in sales of gas-guzzling SUVs, undermining the growth of electric vehicles. It also undermined U.S domestic production. The Saudi strategy aims to use an extended period of extremely low prices to structurally rebalance the market on terms that will benefit OPEC and other large global oil exporters over the coming decade. What do you think should be done to reduce U.S. vulnerability to oil market manipulation and oil price volatility?

[NOTE: Responses were not received to the previous questions prior to printing.]

QUESTIONS SUBMITTED FOR THE RECORD BY THE HONORABLE DANIEL DONOVAN, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF NEW YORK

Questions for Melanie Kenderdine
Director of the Office of Energy Policy and Systems Analysis
U.S. Department of Energy

- What is the view of the U.S. Department of Energy on the use of ethanol in gasoline in Mexico?
- Does the U.S. Department of Energy support the increased use of ethanol in gasoline in Mexico?
- To what extent would the increased use of ethanol or an ethanol mandate in Mexico increase food costs for the Mexican people?
- To what extent will increased use of ethanol or an ethanol mandate in Mexico increase fuel prices for the Mexican people?
- To what extent would the increased use of ethanol or an ethanol mandate in Mexico lead to corrosion of engines?
- What can Mexico learn from the U.S. experience with an ethanol mandate?
- What are potential downside consequences of increased use of ethanol or an ethanol mandate in Mexico?
- To what extent would the increased use of ethanol or an ethanol mandate in Mexico harm the environment in Mexico or other countries in the Americas who would export ethanol to Mexico for blending into gasoline?
- Given the water-intensive nature of ethanol production, how would Mexico's water supply and availability be impacted by increased use of ethanol or an ethanol mandate?

In 2017, Mexico will begin privatizing its energy sector and the Mexican gasoline market will be open to foreign suppliers for the first time since 1938, when the energy sector was nationalized.

- To what extent is PEMEX refinery infrastructure and gasoline distribution system compatible with increased ethanol production or an ethanol mandate?
- Will new infrastructure costs will needed to blend ethanol into Mexican gasoline at refineries?
- What new infrastructure costs will be needed to transport ethanol via pipeline for blending in Mexico?

As one of the biggest cities in the world, Mexico City has air pollution challenges. In the last 20 years, Mexico has made significant progress in improving air quality, yet challenges still remain.

- To what extent would an increase in ethanol or an ethanol mandate impact air pollution in Mexico City and other large cities in Mexico facing air pollution?
- How would increased use of ethanol or an ethanol mandate impact air quality in the United States?
- To what extent would a shift away from the use of MTBE in gasoline blends adversely impact air quality in Mexico?
- To what extent would increase use of ethanol in gasoline in Mexico contribute to an increase in ozone in Mexico?

Please provide an assessment of Mexican regulation, standards and enforcement of Underground Storage Tanks (USTs) and contamination of drinking water.

[NOTE: Responses were not received to the previous questions prior to printing.]

Questions for the Record Submitted to
Special Envoy Amos Hochstein by
Representative Daniel Donovan (#1-9)
Western Hemisphere Subcommittee
June 9, 2016

Questions:

1. Does the U.S. Department of State support the increased use of ethanol in gasoline in Mexico?
2. Does the U.S. Department of State support an ethanol mandate in Mexico?
3. To what extent would the increased use of ethanol or an ethanol mandate in Mexico increase food costs for the Mexican people?
4. What can Mexico learn from the U.S. experience with an ethanol mandate?
5. What are potential downside consequences of increased use of ethanol or an ethanol mandate in Mexico?
6. To what extent will increased use of ethanol or an ethanol mandate in Mexico increase fuel prices for the Mexican people?
7. What are the environmental risks of increased use of ethanol or an ethanol mandate in Mexico?
8. To what extent would the increased use of ethanol or an ethanol mandate in Mexico harm the environment in Mexico and other countries in the Americas who would export ethanol to Mexico for blending into gasoline?
9. Given the water-intensive nature of ethanol production, how would Mexico's water supply and availability be impacted by increased use of ethanol or an ethanol mandate?

Answer:

Domestically, the Administration supports the Renewable Fuel Standard (RFS) as a means to grow the market for commercial biofuels and invest in research and development to help bring the next generation of biofuels online. Internationally, we advocate for the development of biofuel policies that are economically, environmentally, and socially sustainable. Recent scholarly analysis suggests that there is no inherent tension between food security and biofuel development, and that food and energy security are, in fact, complementary goals that benefit from an integrated approach.

We have a number of regional and bilateral mechanisms through which we engage Mexico on energy topics, including the North American Leaders Summit (NALS) and the

High Level Economic Dialogue (HLED). While we have been supportive of Mexico's efforts to transform its energy sector and have been willing to provide technical and policy support where appropriate, we have not been asked to provide technical assistance related to ethanol policy development. As such, we have not performed an analysis of the impact of a Mexican ethanol mandate on the country's water supply. Questions related to lessons learned from the RFS would be best addressed to the U.S. Environmental Protection Agency (EPA).

Questions for the Record Submitted to
Special Envoy Amos Hochstein by
Representative Daniel Donovan (#10-12)
Western Hemisphere Subcommittee
June 9, 2016

Questions:

In 2017, Mexico will begin privatizing its energy sector and the Mexican gasoline market will be open to foreign suppliers for the first time since 1938, when the energy sector was nationalized.

10. To what extent is PEMEX refinery infrastructure and gasoline distribution system compatible with increased ethanol production or an ethanol mandate?
11. Will new infrastructure costs need to blend ethanol into Mexican gasoline at refineries?
12. What new infrastructure costs will be needed to transport ethanol via pipeline for blending in Mexico?

Answer:

While we have been supportive of Mexico's efforts to transform its energy sector and have been providing technical and policy support, where appropriate, we have not been asked to provide technical assistance related to ethanol policy development. We have therefore not conducted analyses of the ability of PEMEX's refinery and distribution infrastructure to handle ethanol fuel blending. Should Mexico request technical support related to these topics, we would hold discussions with the Department of Energy and the U.S. Environmental Protection Agency to determine if and how to assist.

Questions for the Record Submitted to
Special Envoy Amos Hochstein by
Representative Daniel Donovan (#13-16)
Western Hemisphere Subcommittee
June 9, 2016

Questions:

As one of the biggest cities in the world, Mexico City has air pollution challenges. In the last 20 years, Mexico has made significant progress in improving air quality, yet challenges still remain.

13. To what extent would an increase in ethanol or an ethanol mandate impact air pollution in Mexico City and other large cities in Mexico facing air pollution?
14. How would increased use of ethanol or an ethanol mandate impact air quality in the United States?
15. To what extent would a shift away from the use of MTBE in gasoline blends adversely impact air quality in Mexico?
16. To what extent would increased use of ethanol in gasoline in Mexico contribute to an increase in ozone in Mexico?

Answer:

While we have been supportive of Mexico's efforts to transform its energy sector and have been providing technical and policy support where appropriate, we have not been asked to provide technical assistance related to ethanol policy development. We have therefore not conducted analyses of the ability of PEMEX's refinery and distribution infrastructure to handle ethanol fuel blending. Should Mexico request technical support related to these topics, we would likely direct them to the U.S. Environmental Protection Agency and the Department of Transportation.

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