Testimony of Kevin Book
Managing Director, Research
ClearView Energy Partners, LLC

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Chairman Duncan, Ranking Member Sires and distinguished Members of this Committee, good afternoon and thank you for inviting me to contribute to your discussion of energy revolutions in the Western Hemisphere. My name is Kevin Book and I head the research team at Washington, D.C.-based ClearView Energy Partners, LLC, an independent firm that examines macro energy trends for institutional investors and corporate strategists.

It is hard to miss the dramatic shift in U.S. energy security during the last decade. Ten years ago, our nation was the world's largest net importer of oil and petroleum products. In May 2005, net petroleum imports accounted for 59% of our consumption on a trailing, twelve-month (TTM) average basis, according to data from the Energy Information Administration (EIA). This fact linked our economic fate to the sometimes unstable political circumstances of foreign producers and the insatiable energy appetites of emerging economies.

As of February 2015, the most recent month for which robust EIA data are available, net imports represented only 25.8% of our petroleum consumption on a TTM average basis. Much of this can be explained by the incremental production from shale and other tight formations that transformed the U.S. into the world's most prolific oil and gas producer. Not to be overlooked, we also reduced our petroleum consumption by 1.69 MM bbl/d, or 8.1%, between May 2005 and February 2015. China is now the world's largest net petroleum importer in our place (and, based on preliminary April 2015 data, the largest gross importer, too).

The U.S. wasn't the only energy story in the Western Hemisphere, however. According to International Energy Agency (IEA) data, Canadian crude oil and natural gas liquids (NGL) production grew by 47% between 1Q2005 and 1Q2015, from 2.95 MM bbl/d to 4.34 MM bbl/d. Most of that volume added to global supply. Data from Canada's National Energy Board (NEB) show that Canada exported an incremental 1 MM bbl/d between 4Q2009 and 4Q2014, with roughly 55% of that volume comprised of syncrude and blended bitumen. Last June, the Canadian Association of Petroleum Producers (CAPP) projected that production will rise to 6.4 MM bbl/d by 2030, although that forecast preceded the recent price collapse.

Mexico, meanwhile, weathered a bruising 29% production decline over the same ten-year interval. According to IEA data, Mexico's crude output fell from 3.75 MM bbl/d in 1Q2005 to 2.66 MM bbl/d in 1Q2015. In August 2013, to reverse this trend, Mexican President Enrique Peña Nieto proposed constitutional reforms that would end Petroleos Mexicanos' (Pemex) 75-year monopoly. Breaking a string of failed attempts by predecessors, Peña Nieto signed the reforms into law in December of that year. In August 2014, the Mexican Congress enacted secondary (enabling) legislation imposing a 25% local content requirement, and the government allowed Pemex to retain 83% of Mexico's probable and possible reserves and 21% of prospective reserves. In December 2014, Mexico announced bidding terms for its first round. This week, bidding opened for the third of five first-round tenders.

Brazil opened its oil and gas sector to foreign competition in 1997. That reform made possible the joint venture between state-run Petróleo Brasileiro (Petrobras) and private operators that discovered the massive Tupi deepwater field in October 2006. Tupi (now called "Lula") was the first of Brazil's many promising "pre-salt" offshore finds over the course of the last decade. In June 2010, however, then-President Luiz

Inacio Lula da Silva amended Brazil's concession-based regulatory framework. The new regime gives Petrobras and "Petrosal" – a new state administrator of production sharing agreements (PSAs) – substantially greater control over "strategic" resources, including pre-salt fields. An October 2013 competitive round for the Libra field attracted only one bid from a Petrobras-led consortium (the minority partners were two international supermajors and two Chinese national oil companies). It remains to be seen whether, and to what extent, Brazil's tighter grip on the pre-salt might further deter foreign investment, potentially compounding the challenges posed by the ongoing Petrobras corruption scandal.

As the U.S. transitions out of an era of energy scarcity into an age of adequacy – and, potentially, abundance – we are likely to encounter new opportunities to contribute to the energy security of our regional neighbors. For example, financial pressures have reportedly forced Venezuela to pare back its subsidized and payment-deferred crude oil and products exports to signatories of the Petrocaribe agreement forged in 2005 by the late Venezuelan President Hugo Chávez. Including Cuba, which receives in-kind crude and products from Venezuela under a separate agreement, Petrocaribe members imported approximately 212 kbbl/d of Venezuelan petroleum in 2012, corresponding to approximately 34% of their gross petroleum imports (see Figure 1). Venezuelan deliveries accounted for an even larger fraction – about 84% - of the gross crude imports received in 2012 by the five Petrocaribe members with refineries (Cuba, Dominican Republic, Jamaica, Nicaragua and Suriname).

Figure 1 – Petrocaribe Member Countries' Refining Capacity, Allotments and Total Crude/Products Exports

Member Country	Number of Refineries (2015) [1]	Refinery Capacity (2015) [1]	Gross Imports of Crude (2012), kbbl/d [2]	Gross Imports of Products (2012), kbbl/d [2]	Consumption (2012), kbbl/d [2]	Petrocaribe Allotment (2011), kbbl/d [3]	Total Petrocaribe Crude (2012), kbbl/d [4]	Total Petrocaribe Products (2012), kbbl/d [4]
Antigua and Barbuda	n/a	0.0	0.0	5.1	4.9	4.4		
Bahamas	n/a	0.0	0.0	64.4	22.8			
Belize	n/a	0.0	0.0	3.5	3.5	4.0		
Cuba *	4	301.4	130.2	24.6	170.2	*	85.0	6.0
Dominica	n/a	0.0	0.0	0.9	0.9	1.0		
Dominican Republic	2	50.0	26.4	90.9	115.6	30.0		
Granada	n/a	0.0	0.0	2.0	2.0	1.0		
Guatemala	n/a	0.0	0.0	72.2	70.2	20.0		
Guyana	n/a	0.0	0.0	10.8	10.8	5.2		
Haiti	n/a	0.0	0.0	14.7	14.7	14.0		
Honduras	n/a	0.0	0.0	62.8	51.2	20.0		
Jamaica	1	36.0	24.2	32.1	51.7	23.5		
Nevis and St. Kitts	n/a	0.0	0.0	1.7	1.7	1.2		
Nicaragua	1	20.0	16.7	19.8	30.2	27.0		
St. Lucia	n/a	0.0	0.0	3.0	3.0			
St. Vincent and Grenadines	n/a	0.0	0.0	1.5	1.5	1.0		
Suriname	1	7.0	0.0	10.1	17.2	10.0		
Total Petrocaribe		**414.4**	**197.4**	**420.1**	**572.1**	**162.3**	**80.3**	**40.7**
Petrocaribe + Cuba							**165.3**	**46.7**

* Although it is a Petrocaribe member, Cuba receives in-kind crude and products under a separate agreement with Venezuela.

Sources

[1] Oil and Gas Journal, *Worldwide Refineries – Capacities as of January 1, 2015*, published December 1, 2014

[2] Energy Information Administration, *International Energy Statistics*

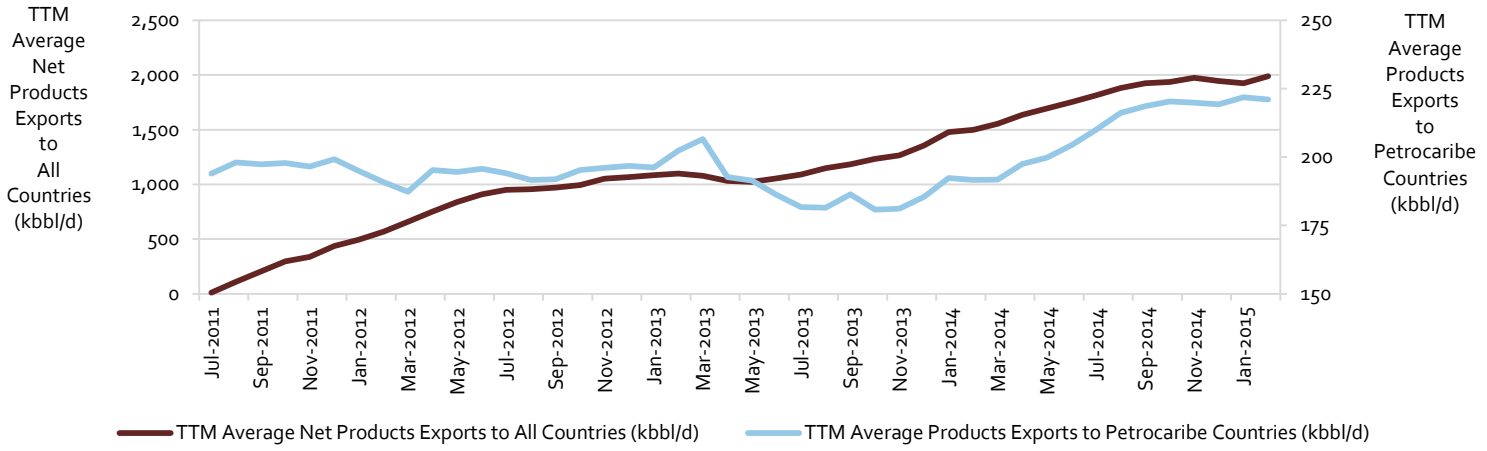
[3] Petrocaribe.org

[4] Atlantic Council, *Uncertain Energy: the Caribbean's Gamble with Venezuela*, using data prepared by Jorge Piñon at U.T. Austin; individual country-level data regarding crude and products imports are not available.

Source: ClearView Energy Partners, LLC using sources noted above, accessed May 11, 2015

According to EIA data, the U.S. became a net petroleum products exporter in July 2011 (on a TTM basis; the first month of net exports in recent memory arrived in November 2010). As of February 2015, TTM average net products exports to all countries were nearly 2 MM bbl/d. During the same interval, TTM average products exports to Petrocaribe member countries rose about 14%, from 194 kbbl/d in July 2011 to 221 kbbl/d in February 2015 (Figure 2).

Figure 2 – U.S. Net Products Exports and Exports to Petrocaribe Countries, July 2011 – February 2015 (TTM Average kbbl/d)



Source: ClearView Energy Partners, LLC using EIA data, accessed May 11, 2015

U.S. exporters aren't likely to offer the same financing terms that Venezuela does, but U.S. refined products can provide Caribbean importers with volumes to cover supply shortfalls. In that vein, two U.S. policy changes – liberalizing crude oil exports and approving the Keystone XL pipeline (or another southbound conduit out of the oil sands) – could contribute to similar cover to Petrocaribe's crude importers.

The reference case in EIA's *2015 Annual Energy Outlook* (AEO) projects that the U.S. will remain a net petroleum importer through 2040, although the agency estimates that net imports will decline to 17% of consumption. EIA sees a different story for natural gas. The AEO reference case projects net natural gas exports of 0.46 Bcf/d in 2017, rising to almost 6 Bcf/d by 2040. With high oil prices, there may be even more to export; more than 50% of U.S. natural gas production is either directly associated with oil production or comes from unconventional wells where it may be produced along with higher-value liquids that price in line with crude. Pipeline exports to Mexico appear likely to continue growing, particularly in the even that low prices deter near-term shale development south of the border. Moreover, liquefied natural gas (LNG) exports from the Lower-48 have potential to enhance energy security throughout the Western Hemisphere.

The first new U.S. LNG facility is scheduled to come onstream as soon as 4Q2015. Ongoing construction and final investment decisions taken to date suggest that more than 6.6 Bcf/d of Lower-48 LNG nameplate capacity could be in service by the end of 2018. The Federal Energy Regulatory Commission (FERC) has finalized or scheduled environmental reviews for 11 facilities that have applied to the Department of Energy (DOE) for a total of 15.1 Bcf/d of non-FTA exports (exports to countries without free trade agreements with the U.S.). Current market conditions could complicate plant financing or cause project deferrals, but the midpoint of that range (about 10.9 Bcf/d) could represent a rational capacity expectation for the intermediate term.

The International Gas Union's (IGU) *2014 World LNG Report* estimated that capital costs for large-scale, onshore LNG import facilities averaged $192 per metric ton of import capacity in 2013 and could be as high as $274 per metric ton in 2016. For a 1 Bcf/d regasification facility, those figures would correspond to capital costs of between $1.44 B and $2.05 B, or amortized fixed costs of between $0.40 and $0.57 per Mcf (assuming a 50:50 debt-equity split, 6% cost of debt, 10% cost of equity, 42-month construction period, 85% capacity factor and 20-year financing).

The high total costs of onshore facilities may be out of reach for many Caribbean nations, but floating storage and regasification units (FSRUs) provide a possible alternative. The IGU estimated 2013 capital costs for FSRUs to be $145 per metric ton, or $0.27 per Mcf using the foregoing assumptions and an 18-month (rather than 42-month) construction time. Faster construction and lower overall costs come with a flip side, however: higher operating expenditures associated with diseconomies of scale (to say nothing of manning and managing a ship). With the expected 2Q2015

completion of a 0.067 Bcf/d FSRU in Colombia, Latin American floating regas capacity will total more than 2.8 Bcf/d, the vast majority of it in Brazil.

Reliable, affordable electricity facilitates development for all economic sectors and social strata. The IEA's *2014 World Energy Outlook* estimated that approximately 23 million people in Latin America lacked access to electricity in 2012 (see Figure 3). The fuel mix doesn't tell the whole story, but it does suggest that countries that cannot harness endogenous hydroelectric resources may be short of fossil-fueled baseload generation. Cross-referencing IEA data with EIA and World Bank generation mix statistics reveals a weak (0.33), positive correlation between electrification and hydroelectric share and an equally weak (-0.32), negative correlation between electrification and fossil energy share. Likewise, the relatively low electrification rates for natural gas exporters such as 62.5% gas-fired Bolivia (88.3%) and 35.7% gas-fired Peru (91.1%) point to energy transportation challenges in addition to generation capacity deficits. Simply put, the region needs pipelines and transmission lines, too.

Most of the countries listed in Figure 3 do not rely primarily on gas for power generation. With outside financing – including facilities outlined in the *Electrify Africa Act of 2014* (H.R. 2548) – a number of them could theoretically operate new gas-fired turbines using waterborne LNG imports. In addition, Latin America gets plenty of sunlight, creating an opportunity for distributed solar photovoltaic (PV) generation to supplement regions where economic development, population density and/or topography might make the build-out of pipes and wires impracticable or unfeasible.

Figure 3 – 23 MM People in Latin America without Access to Electricity in 2012

			Power Generation Share, % of Mix by Fuel							
Country	Population without electricity, (2012), MM [1]	National electrification rate (2012), % [1]	% Fossil (2012) [2]	% Hydro (2012) [2]	% Wind (2012) [2]	% Solar, Tidal or Wave (2012) [2]	% Biomass or Waste (2012) [2]	% Natural Gas (2011) [3]	Net Natural Gas Imports as % of Cons. (2012) [2]	Insolation of Largest City, (kWh/m²/d) [4]
Argentina	1.5	96.4%	70.8%	22.7%	0.3%	0.01%	1.9%	51.4%	19.0%	4.42
Bolivia	1.2	88.3%	65.1%	31.7%	0.0%	0.04%	3.2%	62.5%	exporter	4.65
Brazil	1.0	99.5%	13.2%	76.5%	0.9%	0.00%	6.6%	4.7%	44.1%	4.55
Colombia	1.4	97.1%	17.6%	81.5%	0.1%	0.00%	0.9%	13.4%	exporter	4.61
Costa Rica	0.0	99.4%	7.8%	71.2%	5.3%	0.02%	1.8%	0.0%	n/a	4.18
Cuba	0.2	97.8%	96.0%	0.6%	0.1%	0.03%	3.2%	11.6%	0.0%	5.76
Dom. Republic	0.4	96.2%	86.2%	12.8%	0.7%	0.00%	0.2%	25.1%	100.0%	4.92
Ecuador	0.9	94.1%	43.8%	54.8%	0.0%	0.00%	1.3%	9.5%	0.0%	4.20
El Salvador	0.5	92.5%	39.3%	29.8%	0.0%	0.00%	6.1%	0.0%	n/a	5.16
Guatemala	2.2	85.7%	31.9%	48.1%	0.0%	0.00%	17.3%	0.0%	n/a	4.89
Haiti	7.3	28.0%	85.5%	14.5%	0.0%	0.00%	0.0%	0.0%	n/a	5.30
Honduras	1.1	86.1%	54.9%	37.7%	4.6%	0.00%	2.7%	0.0%	n/a	4.95
Jamaica	0.2	93.0%	90.7%	3.7%	2.6%	0.00%	2.9%	0.0%	n/a	5.70
Nicaragua	1.6	73.7%	58.9%	9.9%	7.9%	0.00%	10.9%	0.0%	n/a	5.20
Panama	0.4	88.8%	35.9%	63.8%	0.0%	0.00%	0.3%	0.0%	n/a	4.84
Paraguay	0.1	99.2%	0.0%	100.0%	0.0%	0.00%	0.0%	0.0%	n/a	4.82
Peru	2.7	91.1%	42.4%	55.9%	0.0%	0.05%	1.7%	35.7%	exporter	5.11
Trinidad/Tobago	0.0	96.6%	99.8%	0.0%	0.0%	0.00%	0.2%	99.7%	exporter	6.08
Uruguay	0.0	99.1%	37.0%	52.1%	1.1%	0.00%	9.8%	0.9%	100.0%	4.31
Venezuela	0.1	99.7%	34.0%	66.0%	0.0%	0.00%	0.0%	17.2%	7.6%	5.60
Other	0.2	91.2%								
Latin America	**23**	**95%**								

Sources

[1] International Energy Agency, *2014 World Energy Outlook*

[2] Energy Information Administration, *International Energy Statistics*

[3] World Bank, *World Development Indicators*

[4] Gaisma.com, using data obtained from the NASA Langley Research Center Atmospheric Science Data Center; New et al. 2002

Source: ClearView Energy Partners, LLC using sources noted above, accessed May 11, 2015

Mr. Chairman, this concludes my prepared testimony. I will look forward to responding to any questions you might have at the appropriate time.