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BEFORE THE
U.S. SENATE COMMITTEE
ON ENERGY AND NATURAL RESOURCES

SEPTEMBER 13, 2018

Good morning, Chairman Murkowski, Ranking Member Cantwell and distinguished Members of this Committee. My name is Kevin Book, and I head the research team at ClearView Energy Partners, LLC, an independent firm that serves institutional investors and corporate strategists.

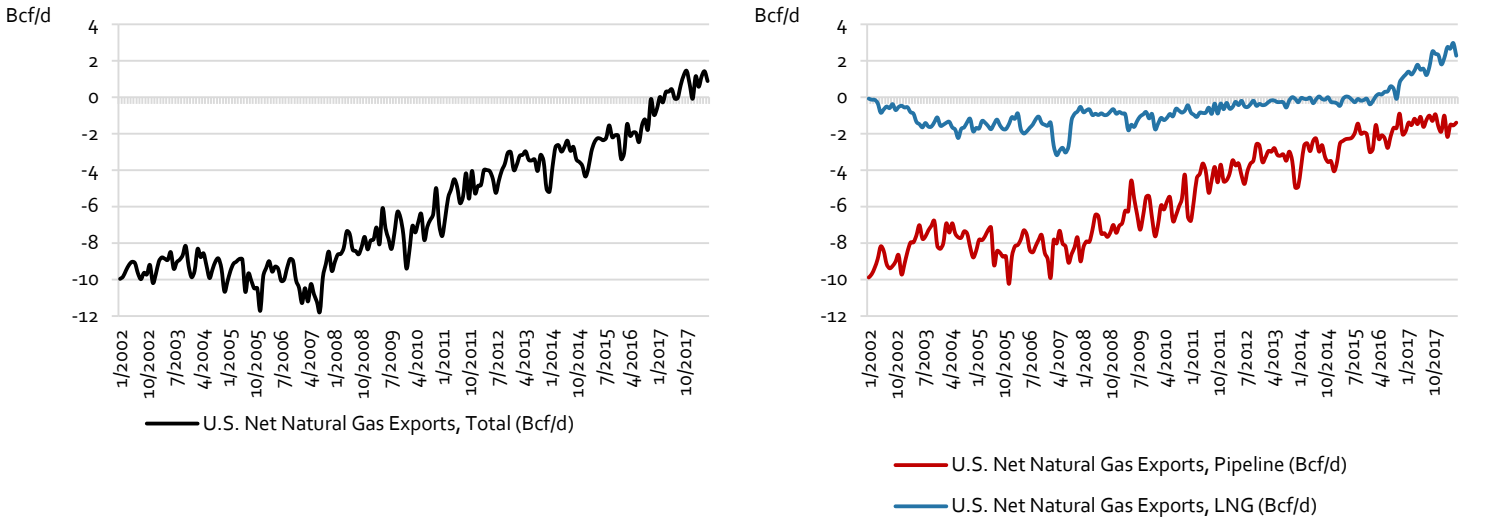
Thank you for inviting me to contribute to your discussion of U.S. liquefied natural gas (LNG) exports to Europe. My testimony considers how U.S. LNG exports can connect dramatic changes in energy facts on the ground here in the U.S. to end-users overseas. I believe our nation is on track to play a major role in global gas markets by the early years of the next decade. But getting there, in my view, will require considerable investment: not just financial investment in energy infrastructure, but also the intellectual investment in sound energy policy that this Committee continues to make. I am grateful for the important work you are doing today.

Sizing the Opportunity

According to data from the Energy Information Administration (EIA), U.S. net natural gas exports averaged ~0.34 billion cubic feet per day (Bcf/d) during calendar year (CY) 2017. That statistic may not sound impressive when one considers that the nation's dry gas production averaged ~73.6 Bcf/d over the course of that year, and I would concede that it might not look as eye-popping as the ~45% increase in U.S. dry gas production between CY 2007 and CY 2017, but one three-letter word can make a big difference: "net."

Prior to last year, the U.S. had not been a net exporter of natural gas on an annual average basis for six decades – the last year of net exports in EIA's annual data set was CY 1957 – and, for the record, I would note that net exports averaged ~0.01 Bcf/d in that year. The black line in the chart on the left-hand side of Figure 1 (below) depicts U.S. net natural gas exports over the 15 years through CY 2017. The chart on the right-hand side of Figure 1 breaks down those net exports into by pipeline volumes (the red line) and liquefied natural gas volumes (LNG, the blue line).

Figure 1 – The U.S. Became a Net Natural Gas Exporter Last Year

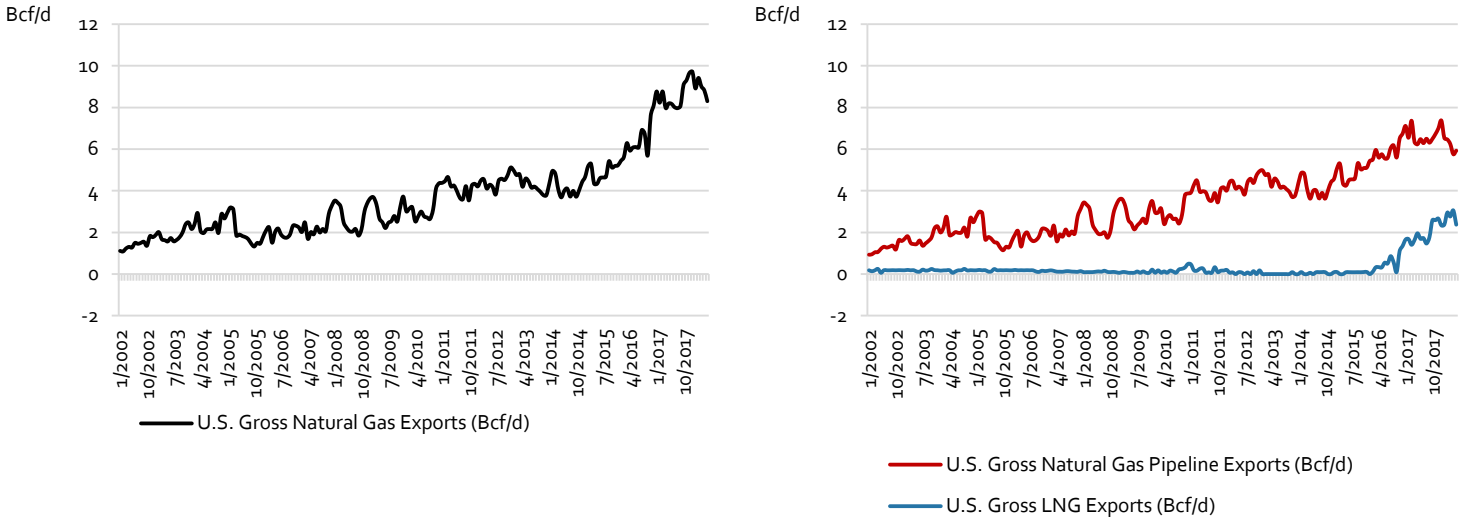


Source: ClearView Energy Partners, LLC, using EIA data

The fact that the red line remains below the x-axis indicates that the U.S. continues to be a net importer of pipeline gas, albeit decreasingly so. The widening gap between blue line and the red line (and the blue line's steep upward slope relative to the red line) indicates that net LNG exports have been more than offsetting net pipeline imports since last year. Putting numbers to the slope of the blue line: year-to-date (YTD) through June 2018, U.S. LNG exports averaged ~2.7 Bcf/d, representing a ~1.0 Bcf/d (~58%) increase relative to a comparable interval during CY 2017. This is not to say that U.S. pipeline gas exports have

stagnated. To the contrary, on a gross basis – that is, counting gas the U.S. sends out without subtracting gas that the U.S. receives – both types of exports have been increasing, as depicted in Figure 2 (below).

Figure 2 – The U.S. Became a Net Natural Gas Exporter Last Year

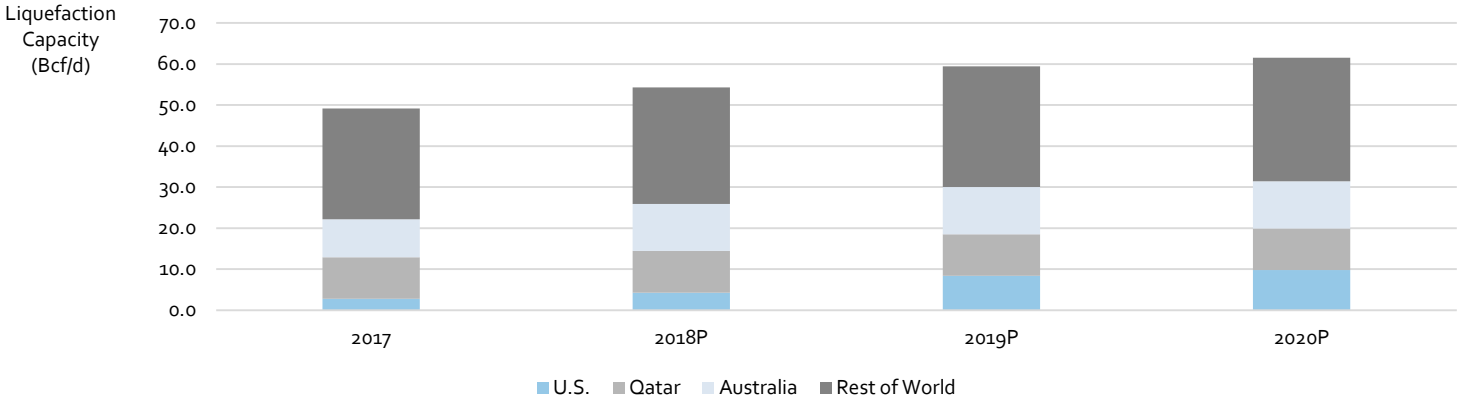


Source: ClearView Energy Partners, LLC, using EIA data

For now, pipeline gas continues to account for the majority of gross U.S. natural gas exports, but LNG's share of gross exports has grown from essentially *nil* in January 2016 to an average of ~22% during CY 2017, and that share looks likely to continue growing even as southbound pipeline exports ramp up. On a trailing, twelve-month (TTM) average basis through June 2018, the latest month of EIA data currently available, LNG accounted for ~27% of gross U.S. natural gas exports.

U.S. LNG export volumes are rising as U.S. liquefaction capacity grows. EIA estimates that aggregate, in-service peak capacity at the two facilities currently operating on a commercial basis in the lower 48 states totals ~3.5 Bcf/d. By early next year, five facilities could be in service, increasing aggregate peak capacity to ~5.7 Bcf/d. By the middle to end of CY 2020, that total could rise to ~10 Bcf/d, making the U.S. the number three global LNG exporter, behind Australia and Qatar (Figure 3).

Figure 3 – By CY 2020, Australia, Qatar and the U.S. Could Account for ~50% of Global Liquefaction Capacity



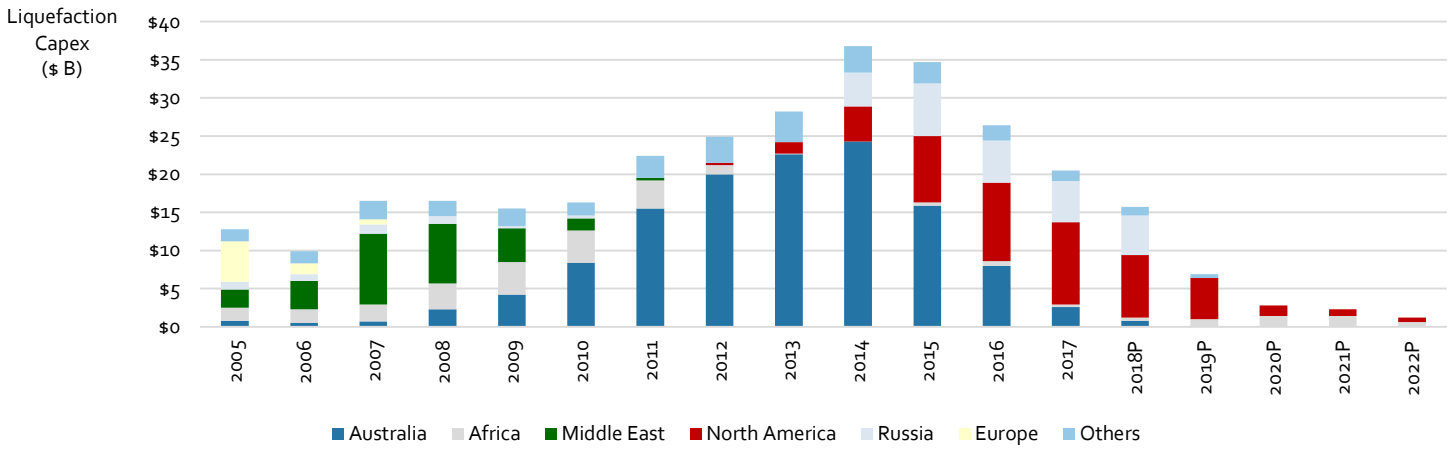
Source: ClearView Energy Partners, LLC, using EIA and IGU data

Dynamics of a Growing Market

The International Energy Agency (IEA) projects that worldwide LNG demand could reach 58 Bcf/d in CY 2020, or ~12% of the agency's estimate for CY 2020 global gas demand as a whole (~501 Bcf/d, inclusive of endogenous production and pipeline trade). U.S. gas production shows little sign of faltering in the meantime, thanks in part to significant associated gas volumes produced in conjunction with fast-growing tight oil production, especially in the Permian Basin. In its August 2018 *Short Term Energy Outlook* (STEO), the EIA projected that U.S. dry gas production would increase by ~7.5 Bcf/d (~10%) to 81.1 Bcf/d during CY 2018 before increasing by another ~3.0 Bcf/d (~4%) to ~84.1 Bcf/d during CY 2019.

Strong global LNG demand growth and continuing U.S. gas production gains could create a need for additional U.S. liquefaction capacity in the 2020s. If project sponsors were to sanction and construct every facility that has already received final approvals from the Department of Energy (DOE) and the Federal Energy Regulatory Commission (FERC), this next generation of U.S. facilities could expand the visible horizon of U.S. capacity to ~18 Bcf/d, a level that – as of now – would make the U.S. the world's largest LNG exporter. Not every analyst thinks further investment is imminent, however. The IEA's *Gas 2018* report, released in June, projected that annual global liquefaction capital expenditures would decline from ~$37 B in CY 2014 to ~$1 B in CY 2022P (Figure 4).

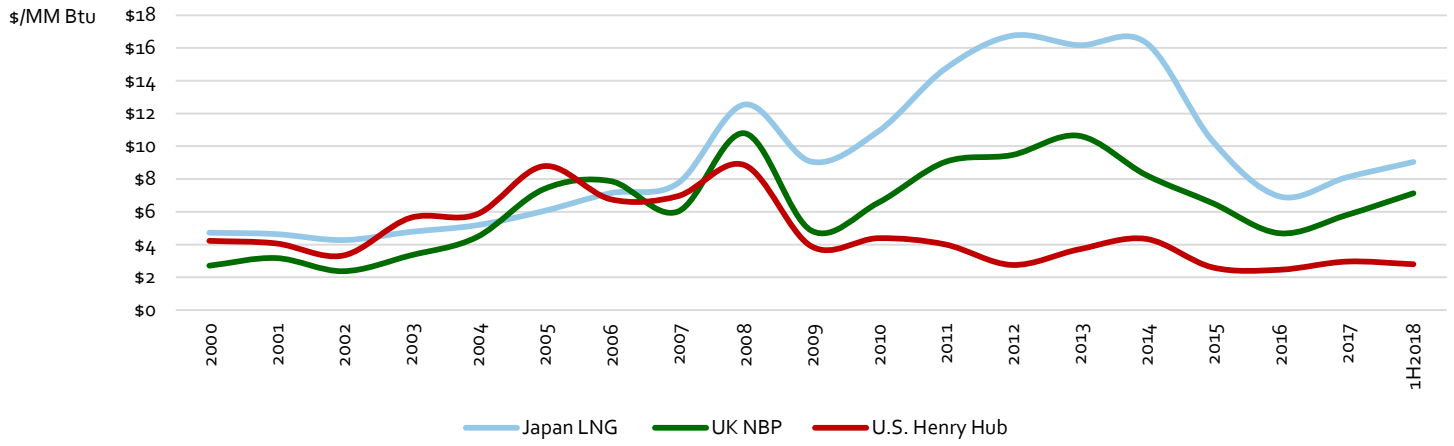
Figure 4 – Global Capital Expenditures on Liquefaction Capacity Have Declined Precipitously Since CY 2014



pSource: ClearView Energy Partners, LLC, using IEA data

This expectation of a stark decline in capital spending appears predicated on an excess of global liquefaction capacity and generally lower global gas prices during recent years. Low prices may also have made it harder for project sponsors to negotiate sales and purchase agreements that generate enough value to secure financing for new facilities (Figure 5).

Figure 5 – Although Global Gas Prices Vary Widely, They Have Been Generally Lower In Recent Years



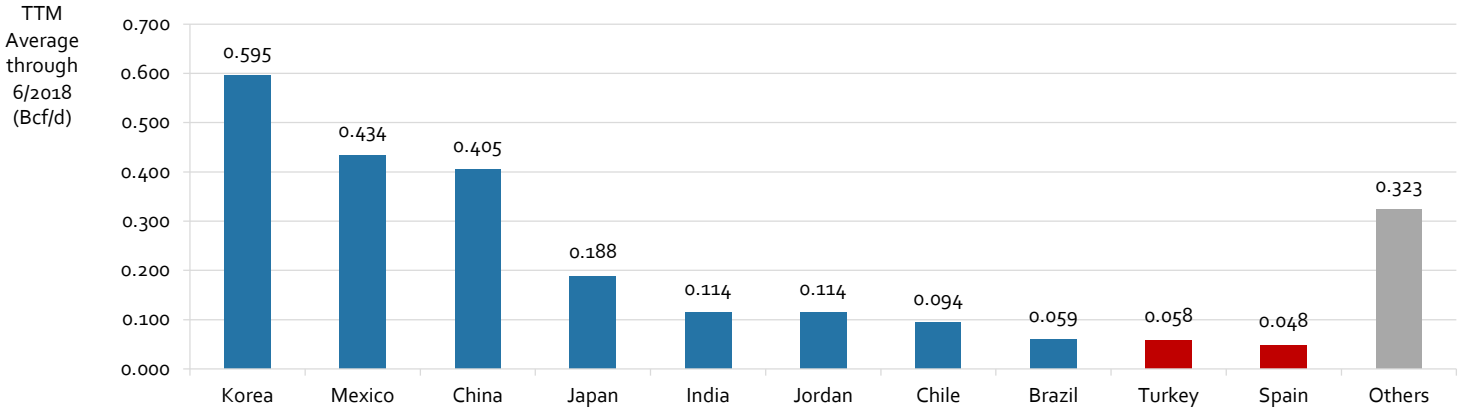
Source: ClearView Energy Partners, LLC, using Bloomberg and BP data

Market balances for energy commodities – and the prices that go with them – can change fast. Moreover, energy infrastructure can be prone to the same sorts of boom-and-bust cycles that typify upstream production, often for the same reasons (i.e., long planning lead-times and supply inelasticity). Because liquefaction facilities take years to permit and build, a period of strong global LNG demand growth amid an enduring investment slowdown could quickly tighten gas markets.

Getting to Europe

The U.S. is on its way to becoming a decisive player in global gas markets and, perhaps even a dominant one. Figure 6, which relies on DOE export data through June 2018, shows that most U.S. LNG exports currently go to Asia and Latin America. On a TTM basis through June 2018, only two European countries – Turkey and Spain – were in the top ten U.S. export destinations.

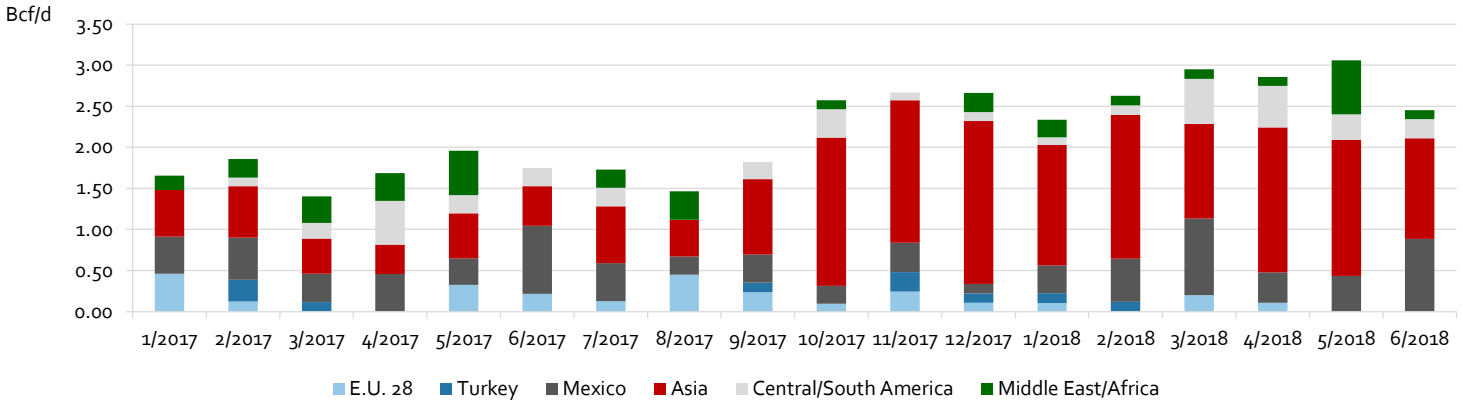
Figure 6 – U.S. LNG Exports by Destination, TTM Through 6/2018



Source: ClearView Energy Partners, LLC, using DOE data

Figure 7 offers another view of the same data set, in this case on a monthly basis between January 2017 and June 2018. Here, the DOE data indicate that only ~10% (~0.2 Bcf/d) of U.S. LNG exports went to Europe during CY 2017, and that share fell to ~6% (~0.14 Bcf/d) on a TTM basis through June 2018. Another ~4% (~0.06 Bcf/d) went to Turkey during CY 2017, and Turkey's also share fell to ~2% (~0.06 Bcf/d) on a TTM basis through June.

Figure 7 – U.S. LNG Exports, by Country or Region Destination, 1/2017 – 6/2018



Source: ClearView Energy Partners, LLC, using DOE data

Figure 8, on the next page, shows the story from the other side of the Atlantic using International Gas Union (IGU) data. During CY 2017, Europe (inclusive of Turkey), received only ~4% of net LNG imports (~0.27 Bcf/d of ~6.14 Bcf/d) from the U.S. Most of Europe's LNG came from African countries (~44%, ~2.7 Bcf/d) and Qatar (~37%, ~2.3 Bcf/d).

Figure 8 – Europe Imported only ~4% of its LNG from the U.S. During CY 2017

Importing Country or Region	Source (Bcf/d) U.S.	Qatar	Norway	Russia	Other Middle East	Asia and Australia	Africa	Central and South America	Net Re-Exports	Net Imports
Belgium	0.000	0.128	0.009	0.000	0.000	0.000	0.000	0.000	0.004	0.141
France	0.000	0.203	0.075	0.000	0.000	0.000	0.772	0.042	-0.099	0.993
Greece	0.000	0.016	0.005	0.000	0.000	0.000	0.126	0.000	0.000	0.147
Italy	0.018	0.629	0.017	0.000	0.000	0.000	0.100	0.030	0.000	0.794
Lithuania	0.018	0.000	0.087	0.000	0.000	0.000	0.009	0.008	0.000	0.122
Malta	0.001	0.000	0.000	0.000	0.000	0.000	0.008	0.024	0.001	0.034
Netherlands	0.008	0.074	0.058	0.009	0.000	0.000	0.016	0.000	-0.066	0.099
Poland	0.009	0.149	0.008	0.000	0.000	0.000	0.000	0.000	0.000	0.166
Portugal	0.055	0.058	0.000	0.000	0.000	0.000	0.245	0.000	0.008	0.366
Spain	0.074	0.337	0.088	0.000	0.000	0.000	0.702	0.400	0.003	1.603
Turkey	0.075	0.132	0.088	0.000	0.000	0.000	0.679	0.041	0.017	1.031
United Kingdom	0.009	0.568	0.000	0.009	0.000	0.000	0.032	0.030	-0.013	0.635
Europe	**0.267**	**2.291**	**0.443**	**0.020**	**0.000**	**0.000**	**2.691**	**0.573**	**-0.145**	**6.140**

Source: ClearView Energy Partners, LLC, using IGU data

Why isn't more U.S. gas going to Europe today? The answer probably includes economics, infrastructure and policy.

First, Europe may not be taking much U.S. LNG today because Europe doesn't import that much LNG as a whole. LNG accounted for only ~15.6% of Europe's net natural gas imports during CY 2017, according to data in the *2018 BP Statistical Review of World Energy;* the rest (~32.9 Bcf/d out of ~39 Bcf/d) came in via pipeline. IGU data reveal an uptick in European net imports of LNG last year, but in the context of the five-year IGU data series I have presented in Figure 9, last year's bump looks more like a reversion to CY 2012 levels than a true trend shift to the upside.

Figure 9 – European LNG Import Volumes, CY 2012 – CY 2017 (Bcf/d)

Importing Country or Region	Net Import Volumes (Bcf/d) 2012	2013	2014	2015	2016	2017
Belgium	0.25	0.14	0.12	0.25	0.16	0.14
France	0.98	0.76	0.62	0.60	0.74	0.99
Greece	0.14	0.07	0.05	0.06	0.07	0.15
Italy	0.69	0.56	0.44	0.55	0.60	0.79
Lithuania	0.00	0.00	0.01	0.04	0.13	0.12
Malta	0.00	0.00	0.00	0.00	0.00	0.03
Netherlands	0.08	0.04	0.06	0.08	0.05	0.10
Poland	0.00	0.00	0.00	0.01	0.10	0.17
Portugal	0.22	0.17	0.13	0.15	0.17	0.37
Spain	1.87	1.23	1.08	1.17	1.30	1.60
Turkey	0.75	0.56	0.70	0.73	0.73	1.03
United Kingdom	1.37	0.90	1.11	1.29	0.97	0.64
Europe	**6.36**	**4.44**	**4.33**	**4.93**	**5.02**	**6.14**

Source: ClearView Energy Partners, LLC, using IGU data

Second, European regasification terminals are running at relatively low capacity utilization levels. The IGU's *2018 World LNG Report* estimated global average LNG regasification capacity utilization at between 34% and 41% during CY 2017. By contrast, Gas Infrastructure Europe daily capacity and utilization data for E.U. LNG regasification facilities imply a capacity utilization rate of ~20% during the year through September 8, 2018, well below IGU's estimated global averages. This may reflect limited exporter interest in selling cargoes to Europe that could command higher prices elsewhere. In addition, utilization rates at European terminals vary widely with geography. This could suggest infrastructure gaps, regulatory barriers (or both), but disparate utilization rates can also reflect country-specific consumption differentials.

Third, U.S. policy matters. America may not be able to raise gas prices in Europe (nor would that necessarily be desirable), but U.S. supply additions that alleviate LNG imbalances worldwide could narrow price disparities across markets, potentially increasing European LNG import volumes.

In that vein, faster throughput by the FERC, which handles environmental reviews of LNG export facilities under the *National Environmental Policy Act* (NEPA) on behalf of the DOE, could help. After a hiatus, the relatively brisk timelines in the Schedules for Environmental Review (SERs) the FERC released on August 31 for ten new LNG export projects (and its reissue of SERs for two others) may point towards a regulatory debottlenecking. With these new SERs, FERC appears to be targeting a four-month window between draft and final environmental impact statements (EIS). If so, this would mark a faster pace

than the five-month average and three-to-nine-month range my colleagues at ClearView have distilled in their tracking of all reviews related to the *Natural Gas Act* (NGA) since 2010 (Figures 10 and 11).

Figure 10 – FERC's Observed NEPA Review Tempo since 2010 for NGA §3 and NGA §7 Projects Subject to an EIS

Project	Docket	Draft EIS	Final EIS	Draft to Final EIS Interval (days)	NGA §3/§7 Order	Final EIS to Order Interval (days)
Ruby Pipeline	CP09-54	6/19/2009	1/8/2010	203	4/5/2010	87
Bison Pipeline	CP09-161	8/21/2009	12/29/2009	130	4/9/2010	101
APEX Expansion	CP10-14	3/26/2010	7/23/2010	119	9/16/2010	55
NJ-NY Expansion Project	CP11-56	9/9/2011	3/16/2012	189	5/21/2012	66
Transco Rockaway Lateral	CP13-36, *et al.*	10/4/2013	2/28/2014	147	5/2/2014	63
Sierrita Pipeline	CP13-73	10/25/2013	3/28/2014	154	6/6/2014	70
Cameron 1-3	CP13-25	1/10/2014	4/30/2014	110	6/19/2014	50
FLEX LNG	CP12-509	3/14/2014	6/16/2014	94	7/31/2014	45
Constitution	CP13-499	2/12/2014	10/24/2014	254	12/2/2014	39
Corpus Christi	CP12-507	6/3/2014	10/8/2014	127	12/30/2014	83
Algonquin AIM	CP14-96	8/6/2014	1/23/2015	170	3/3/2015	39
Aguirre Offshore Gasport Project	CP13-193	8/7/2014	2/20/2015	197	7/24/2015	154
Lake Charles	CP14-120	4/10/2015	8/14/2015	126	12/17/2015	125
Sabal Trail	CP14-554, *et al.*	9/4/2015	12/18/2015	105	2/2/2016	46
Magnolia	CP14-347	7/17/2015	11/16/2015	122	4/15/2016	151
XOM Golden Pass	CP14-517	3/25/2016	7/29/2016	126	12/21/2016	145
Leach Express/Rayne Express	CP15-514, *et al.*	4/21/2016	9/1/2016	133	1/19/2017	140
Rover Pipeline and Backhauls	CP15-93, *et al.*	2/19/2016	7/29/2016	161	2/2/2017	188
Transco Atlantic Sunrise	CP15-138	5/5/2016	12/30/2016	239	2/3/2017	35
NEXUS Gas	CP16-22, *et al.*	7/8/2016	11/30/2016	145	8/25/2017	268
Mountain Valley Pipeline	CP16-10, *et al.*	9/16/2016	6/23/2017	280	10/13/2017	112
Atlantic Coast Pipeline	CP15-554, *et al.*	12/30/2016	7/21/2017	203	10/13/2017	84
Mountaineer Express	CP16-357	2/27/2017	7/28/2017	151	12/29/2017	154
Penn East	CP15-558	7/22/2016	4/7/2017	259	1/19/2018	287
Midcontinent Supply Header	CP17-458	2/9/2018	6/21/2018	132	8/13/2018	53
			Range	**94-280**	**Range**	**35-287**
			Average	**164**	**Average**	**106**
			Median	**149**	**Median**	**84**

Source: ClearView Energy Partners, LLC based on FERC project Dockets

Figure 11 – FERC's Projected NEPA Review Tempo for Upcoming NGA §3 and NGA §7 Projects Subject to an EIS

Project	Docket	Draft EIS[1]	Final EIS (E)	Draft to Final EIS Interval (days)	NGA §3/§7 Order (E)[2]	Final EIS to Order Interval (days)
Transco NE Supply Enhancement	CP17-101	3/23/2018 A	9/17/2018	178	NA	NA
Calcasieu Pass	CP15-550, *et al.*	6/22/2018 A	10/26/2018	126 E	1/22/2019*	88
Driftwood LNG	CP17-117, *et al.*	9/15/2018 E	1/18/2019	125 E	2-4/2019	NA
Port Arthur LNG and PA Pipeline	CP17-20, *et al.*	9/15/2018 E	1/31/2019	138 E	3-5/2019	NA
Texas LNG	CP16-116	10/15/2018 E	3/15/2019	151 E	4-6/2019	NA
Eagle LNG Partners Jacksonville LLC	CP17-41	11/15/2018 E	4/12/2019	148 E	5-7/2019	NA
Gulf LNG	CP15-521	11/15/2018 E	4/17/2019	153 E	7/16/2019*	90
Annova LNG	CP16-480	12/15/2018 E	4/19/2019	125 E	5-7/2019	NA
Rio Grande LNG	CP16-454, *et al.*	10/15/2018 E	4/26/2019	193 E	5-7/2019	NA
Venture Global Plaquemines LNG	CP17-66, *et al.*	11/15/2018 E	5/3/2019	169 E	6-8/2019	NA
Jordan Cove, Pacific Connector	CP17-494, *et al.*	2/15/2019 E	8/30/2019	196 E	11/29/2019*	91
Alaska LNG	CP17-178	2/15/2019 E	11/8/2019	266 E	2/6/2020*	90
			Range	**123-266**		
			Average	**164**		
			Median	**152**		

[1] The SER issued do not identify a fixed date for the release of the draft EIS, only a target month. We selected the middle of the month to calculate an approximate interval.

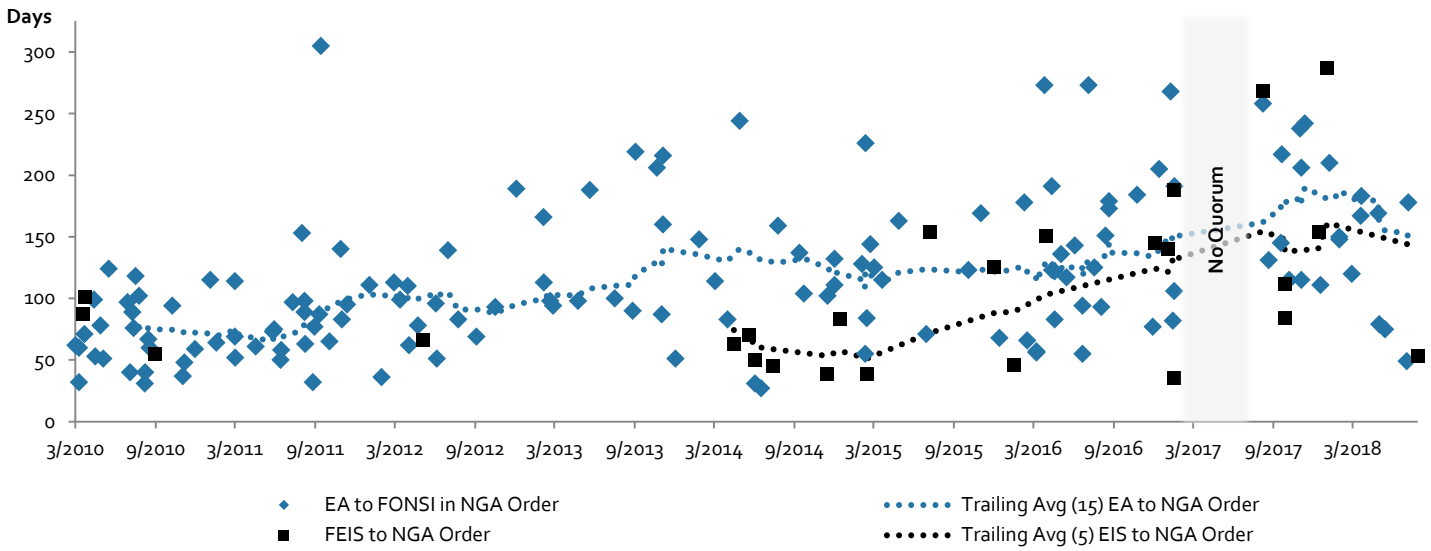
[2] The dates marked with an asterisk were identified by FERC in the August 31, 2018 Notice of Anticipated Schedule of Final Order issued to FAST-41 projects. The balance of the estimates are ours and is based on the 30 to 90-day window we have used in the past when estimating potential final order issue dates.

Source: ClearView Energy Partners, LLC based on FERC project Dockets through August 31, 2018

I would note that the burden does not fall exclusively on the Commission. Our observations indicate that some project sponsors respond more quickly than others. Because FERC does not observe strict linearity in its processing of reviews, better

prepared applicants can move more quickly through the process. This merit-based approach seems appropriate in this context. As Figure 12 shows, since 2010, the Commission has moved forward with final orders for projects reviewed under EIS within 30 to 60 days, suggesting that the 90-day approval window indicated for final order issuance under FAST-41 may prove conservative.

Figure 12 – Interval between EA and FEIS Documents and FERC NGA Order (§3 and §7)



Notes: Between March 2010 and the loss of its quorum in February 2017, FERC averaged 109 days from an Environmental Assessment to issuance of an NGA order containing Finding of No Significant Impact (FONSI) under the *National Environmental Policy Act* (NEPA), and the median review was 98 days. For projects subject to an EIS, the average interval from final EIS to order was 89 days (median of 70 days) since 2010. Toward the end of that period, the intervals for action on completed environmental reviews lengthened. For projects evaluated with an EA, the statutory comment period follows the EA. For projects evaluated with an EIS, the statutory comment period occurs between the draft and final version.

Our analysis does not include evaluation of Environmental Assessment Reports (EARs) which are smaller EAs for minor projects where in the vast majority of cases no adversarial environment review- related comments were filed.

Our data is colored by the 187-day gap where the Commission lacked a quorum to act. However, we would note that many projects were on a review timeline that did not appear to be materially affected by the loss of quorum, and approvals in recent months appear to be consistently within the 50-200 day range that captures most of the data in our observation set.

Source: ClearView Energy Partners, LLC from FERC dockets through August 31, 2018

Madam Chairman, this concludes my prepared testimony. I will look forward to answering any questions you or your colleagues may have at the appropriate time.