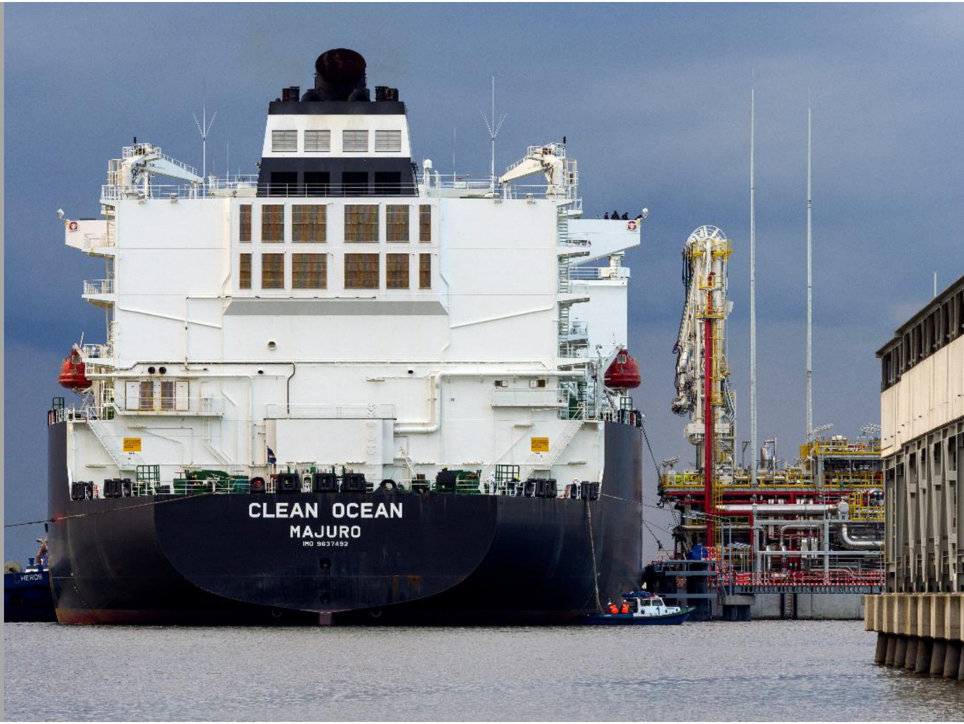
LNG Trade, Competition, Economics

EIA 2018 Workshop

27 Sept. 2018



LNG Allies – Mission

To expedite and maximize LNG exports to create U.S. jobs and economic growth, enhance the energy security of America's allies, and improve economic and environmental conditions worldwide.

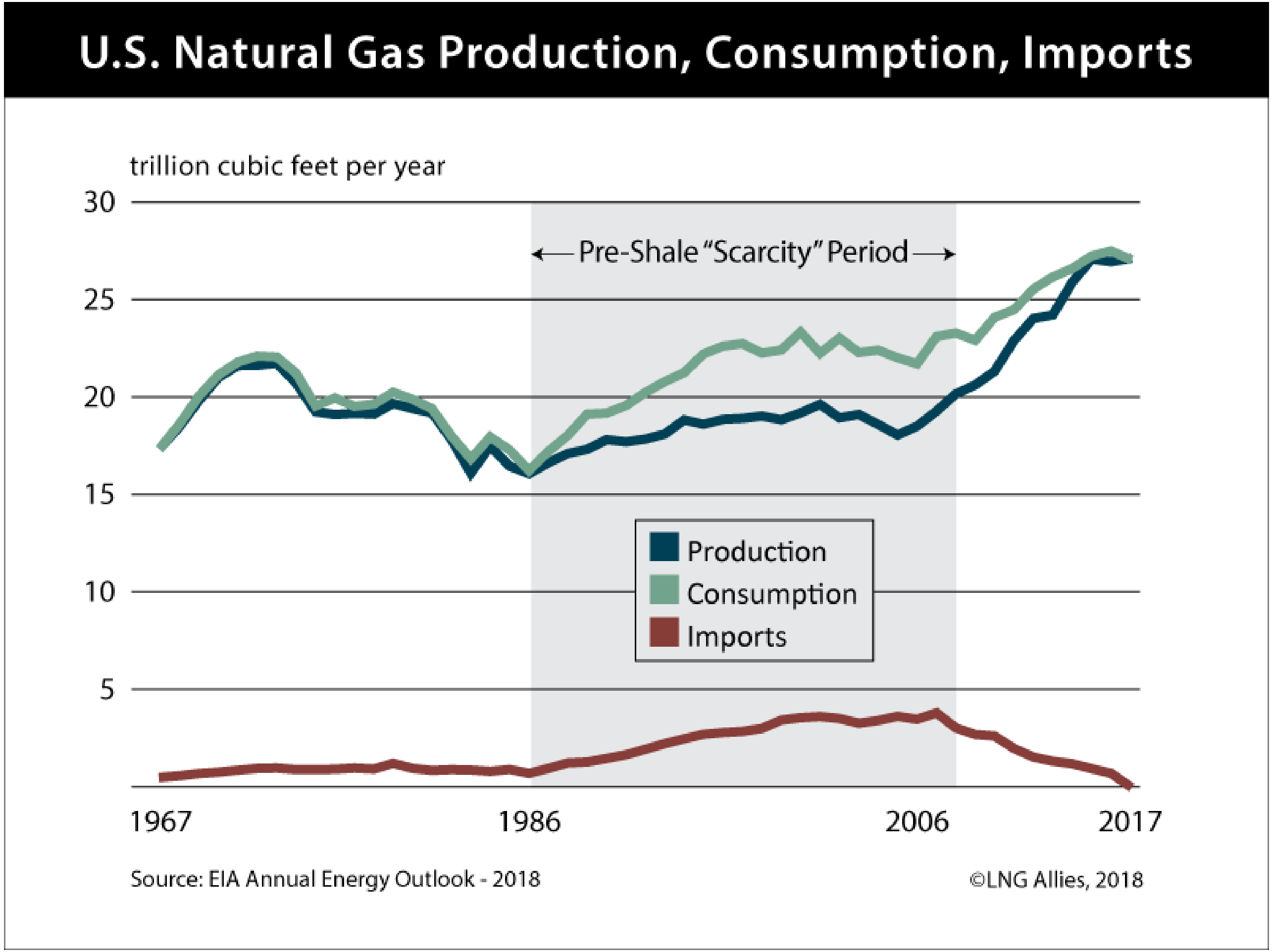
U.S. LNG Export Industry

- Eight major brownfield (import) terminals adding/planning liquefaction capabilities
- Another 16+ greenfield projects proposed
- Ownership: midstream players and special purpose entities; IOCs mostly offtakers not project sponsors

U.S. LNG Export Industry (cont.)

- Capital expense ($500-$600/mtpa) means most projects rely on nonrecourse loans
- Even companies with growing revenue from LNG sales not likely to finance new trains on balance sheet due to dividend pressure (may adjust debt/equity ratio)

Quick Background Review


U.S. Natural Gas Production, Consumption, Imports
trillion cubic feet per year
30
25
20
15
10
5
Pre-Shale "Scarcity" Period
Production
Consumption
Imports
1967
1986
2006
2017
Source: EIA Annual Energy Outlook - 2018
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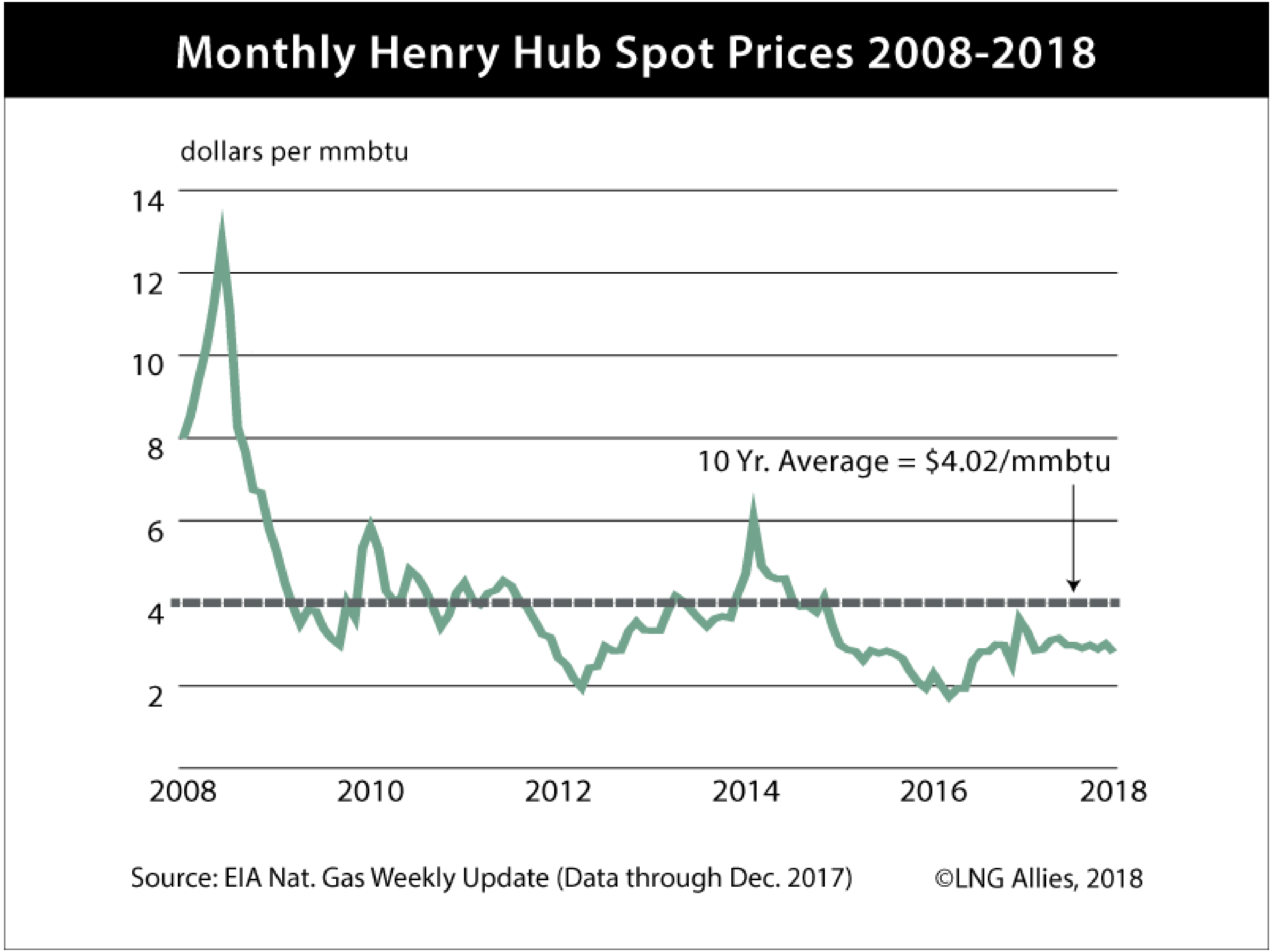

Monthly Henry Hub Spot Prices 2008-2018
dollars per mmbtu
14
12
10
8
6
4
2
10 Yr. Average = $4.02/mmbtu
2008
2010
2012
2014
2016
2018
Source: EIA Nat. Gas Weekly Update (Data through Dec. 2017)
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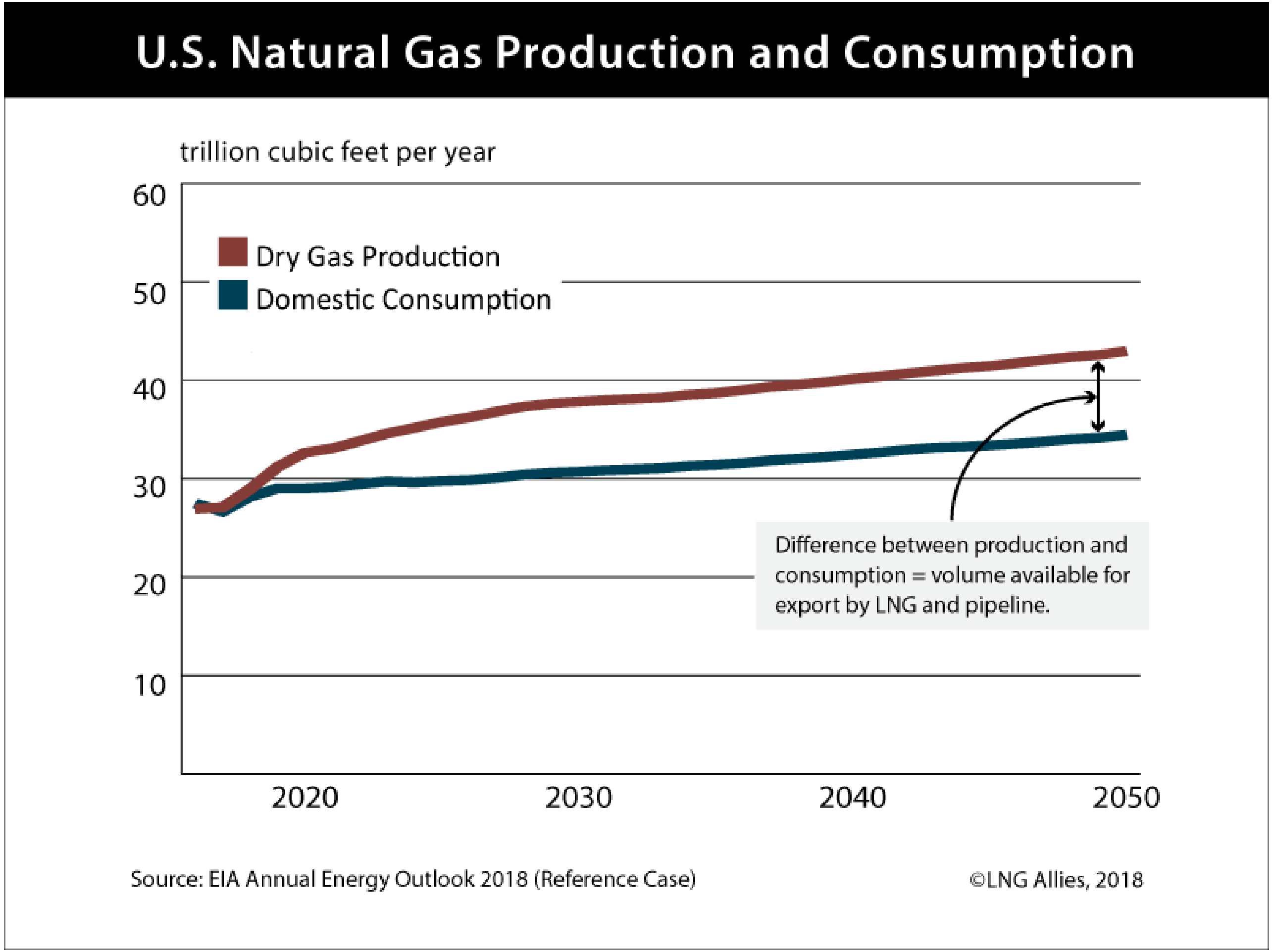
U.S. Natural Gas Production and Consumption
trillion cubic feet per year
60
50
40
30
20
10
Dry Gas Production
Domestic Consumption
Difference between production and consumption = volume available for export by LNG and pipeline.
2020
2030
2040
2050
Source: EIA Annual Energy Outlook 2018 (Reference Case)
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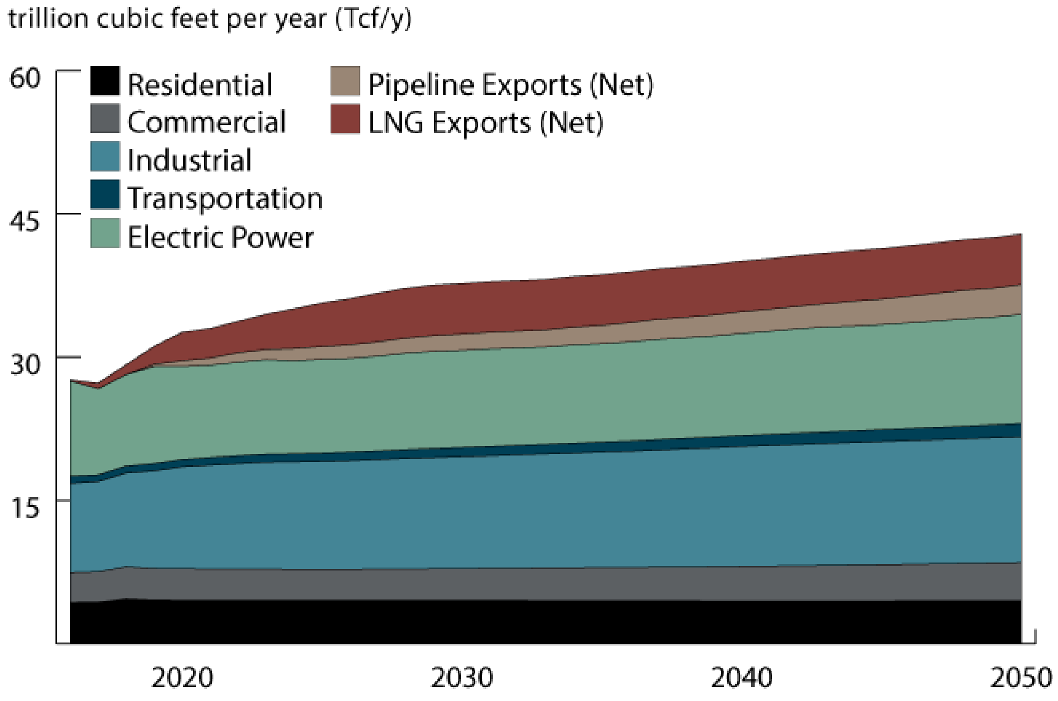
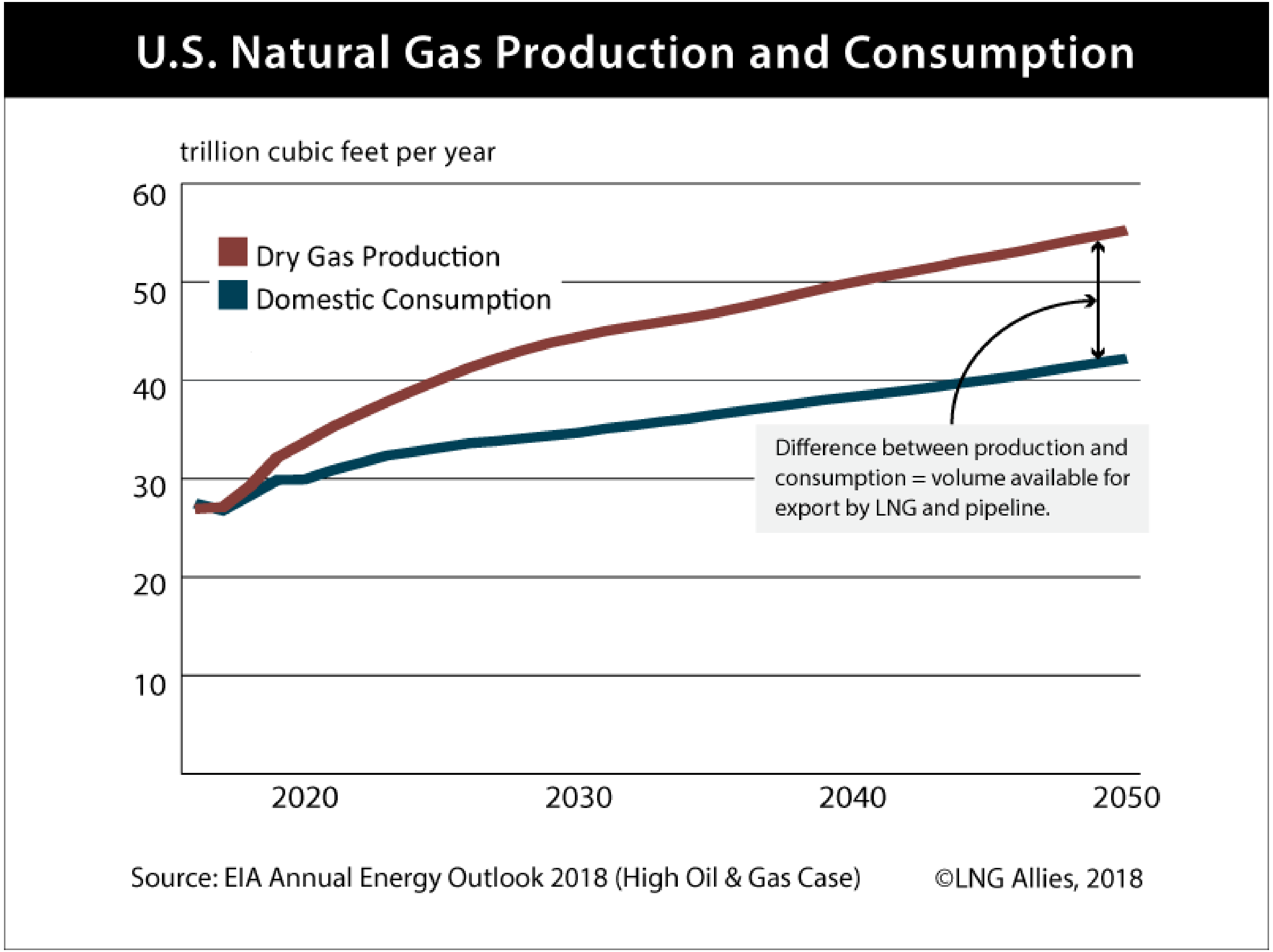
U.S. Natural Gas Consumption by Sector



Source: EIA Annual Energy Outlook 2018 (Reference Case)


U.S. Natural Gas Production and Consumption
trillion cubic feet per year
60
50
40
30
20
10
Dry Gas Production
Domestic Consumption
Difference between production and consumption = volume available for export by LNG and pipeline.
2020
2030
2040
2050
Source: EIA Annual Energy Outlook 2018 (High Oil & Gas Case)
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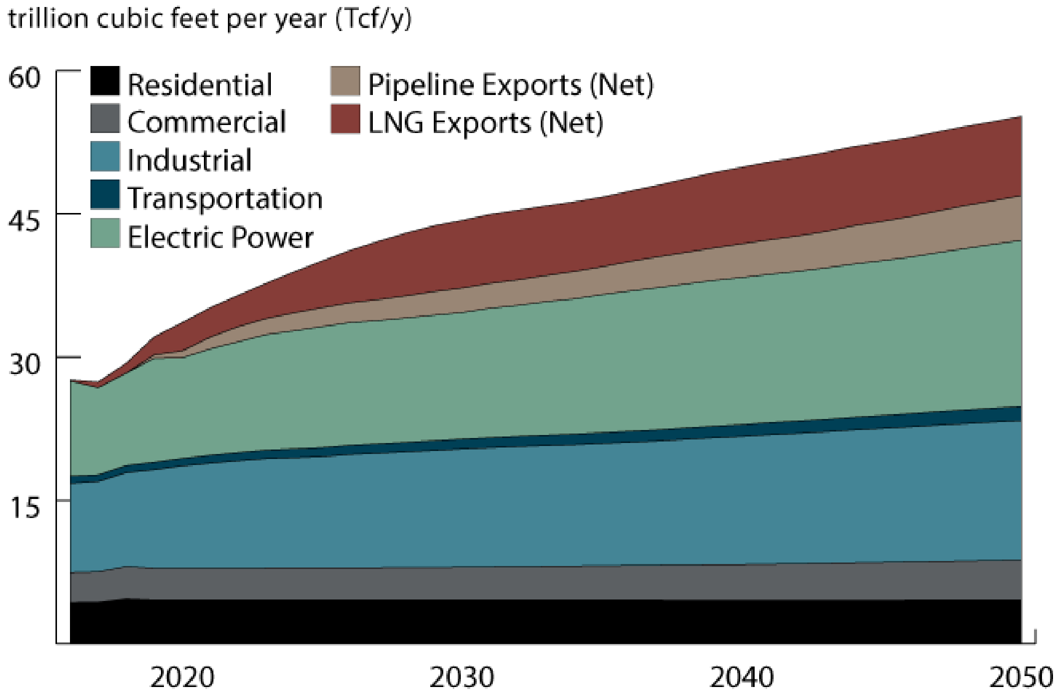
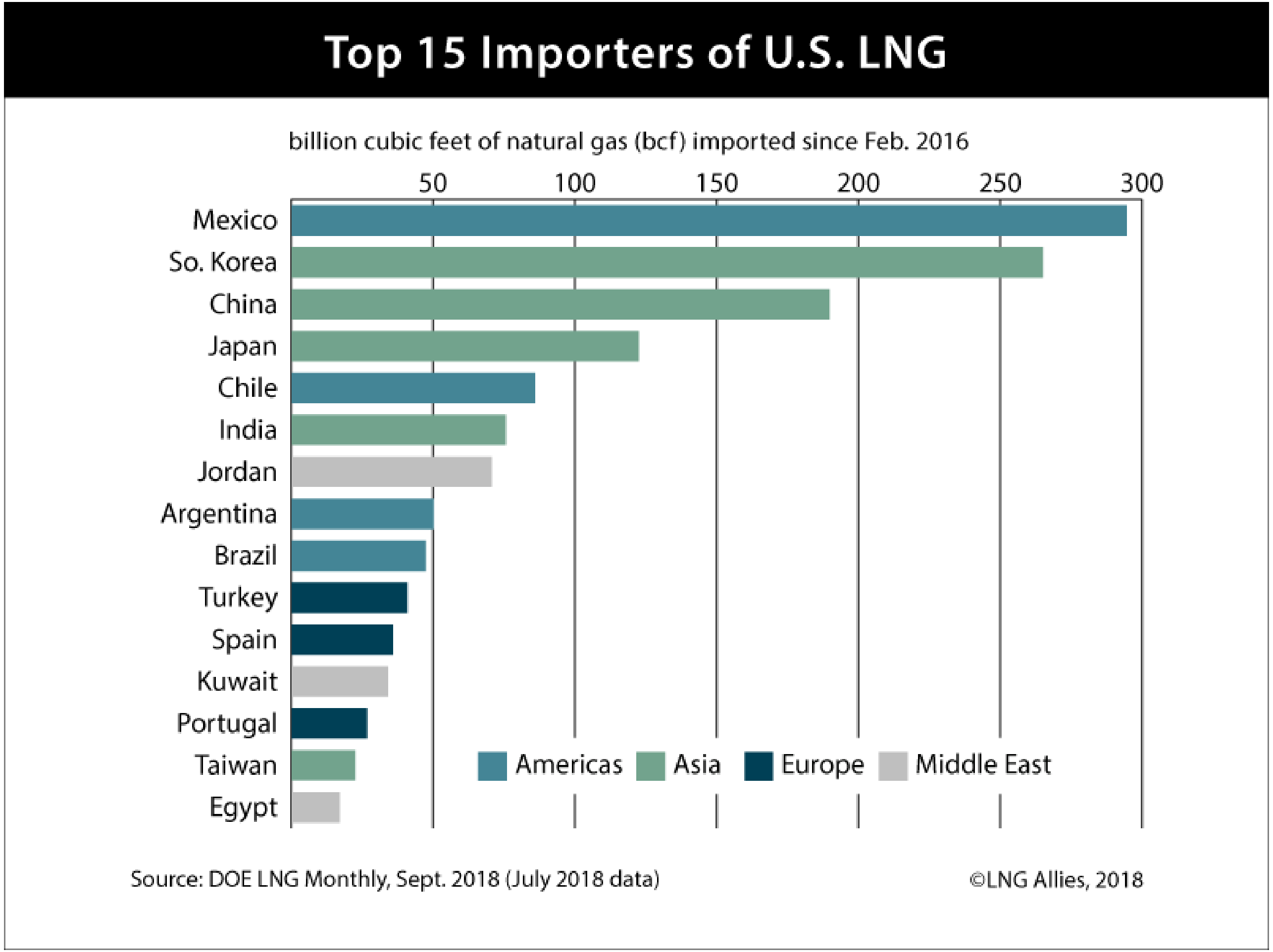
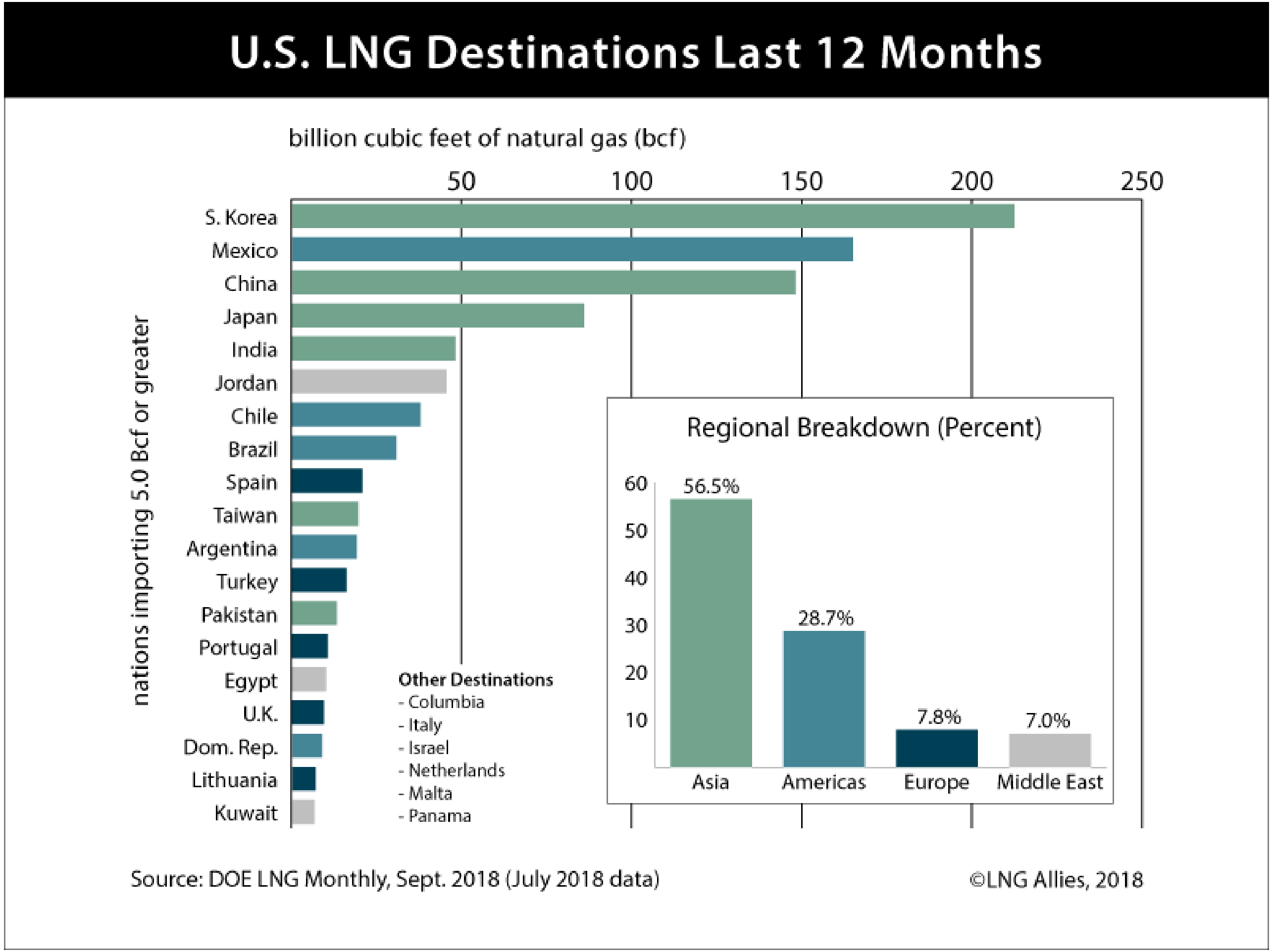
U.S. Natural Gas Consumption by Sector



Source: EIA Annual Energy Outlook 2018 (High Oil & Gas Case)

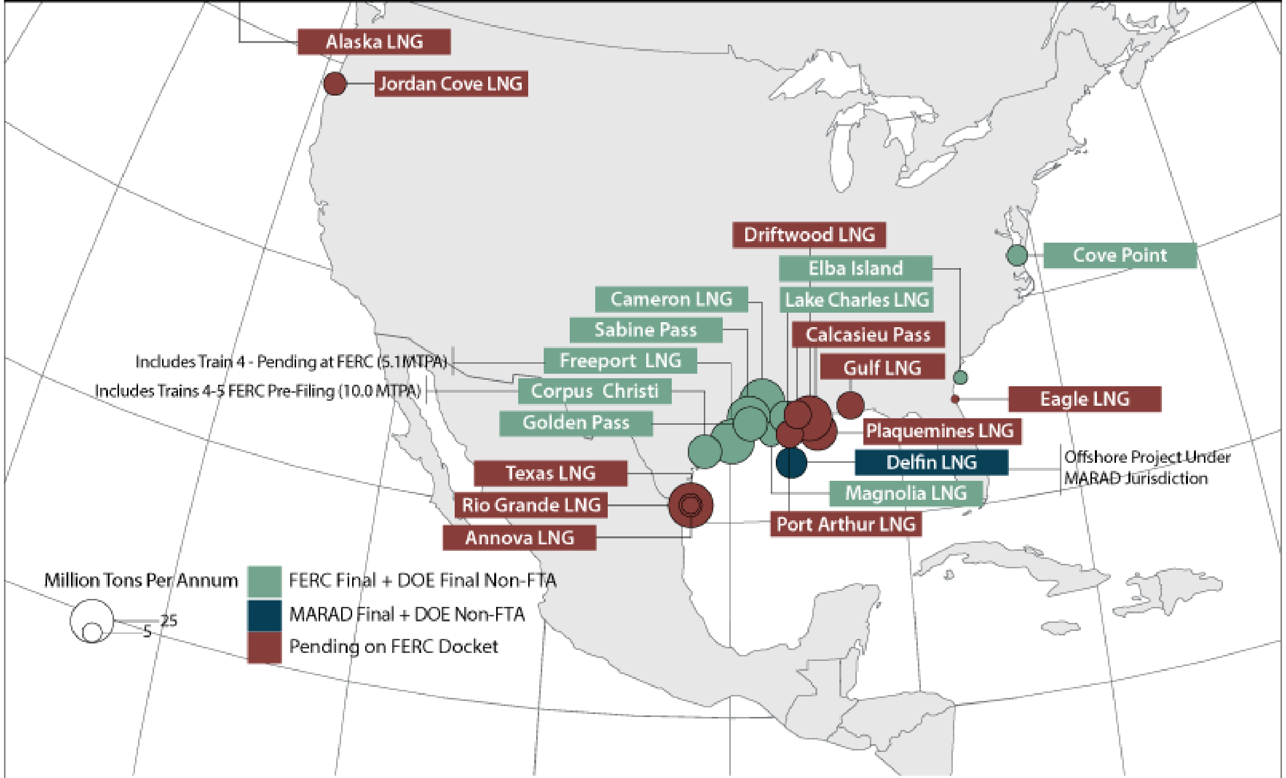
U.S. LNG Exports


Top 15 Importers of U.S. LNG
billion cubic feet of natural gas (bcf) imported since Feb. 2016
50
100
150
200
250
300
Mexico
So. Korea
China
Japan
Chile
India
Jordan
Argentina
Brazil
Turkey
Spain
Kuwait
Portugal
Taiwan
Egypt
Americas
Asia
Europe
Middle East
Source: DOE LNG Monthly, Sept. 2018 (July 2018 data)
©LNG Allies, 2018


U.S. LNG Destinations Last 12 Months
billion cubic feet of natural gas (bcf)
50
100
150
200
250
nations importing 5.0 Bcf or greater
S. Korea
Mexico
China
Japan
India
Jordan
Chile
Brazil
Spain
Taiwan
Argentina
Turkey
Pakistan
Portugal
Egypt
U.K.
Dom. Rep.
Lithuania
Kuwait
Other Destinations
- Columbia
- Italy
- Israel
- Netherlands
- Malta
- Panama
Regional Breakdown (Percent)
60
50
40
30
20
10
56.5%
28.7%
7.8%
7.0%
Asia
Americas
Europe
Middle East
Source: DOE LNG Monthly, Sept. 2018 (July 2018 data)
©LNG Allies, 2018

U.S. LNG Exports Industry

Major U.S. LNG Export Projects - Existing & Proposed



Sources: LNG Allies, EIA, DOE (May 2018)

Permitting Status of U.S. LNG Export Projects

Project Stage	Projects	MTPA	Bcm/yr	Bcf/day
Operating / Under Construction	6	75.4	103.9	10.0
Fully Permitted (Major Projects)	4	64.4	88.8	9.1
Fully Permitted (Small Projects)	N/A	9.0	12.4	1.3
Formal FERC Review	11	146.9	202.6	20.9
FERC Pre-Filing	2	24.0	33.1	3.3
Total	**23**	**310.7**	**428.5**	**43.4**

Notes: (1) Projects = individual projects. (2) Additional trains for existing projects not included in the project count, but in the MTPA, Bcm/year, and Bcf/day totals (Sabine Pass #6, Cameron #4 #5, Freeport #4).

Source: Federal Energy Regulatory Commission & LNG Allies (24 June 2018)

Wave 1

Operating & Under Construction

Wave 1: Operating

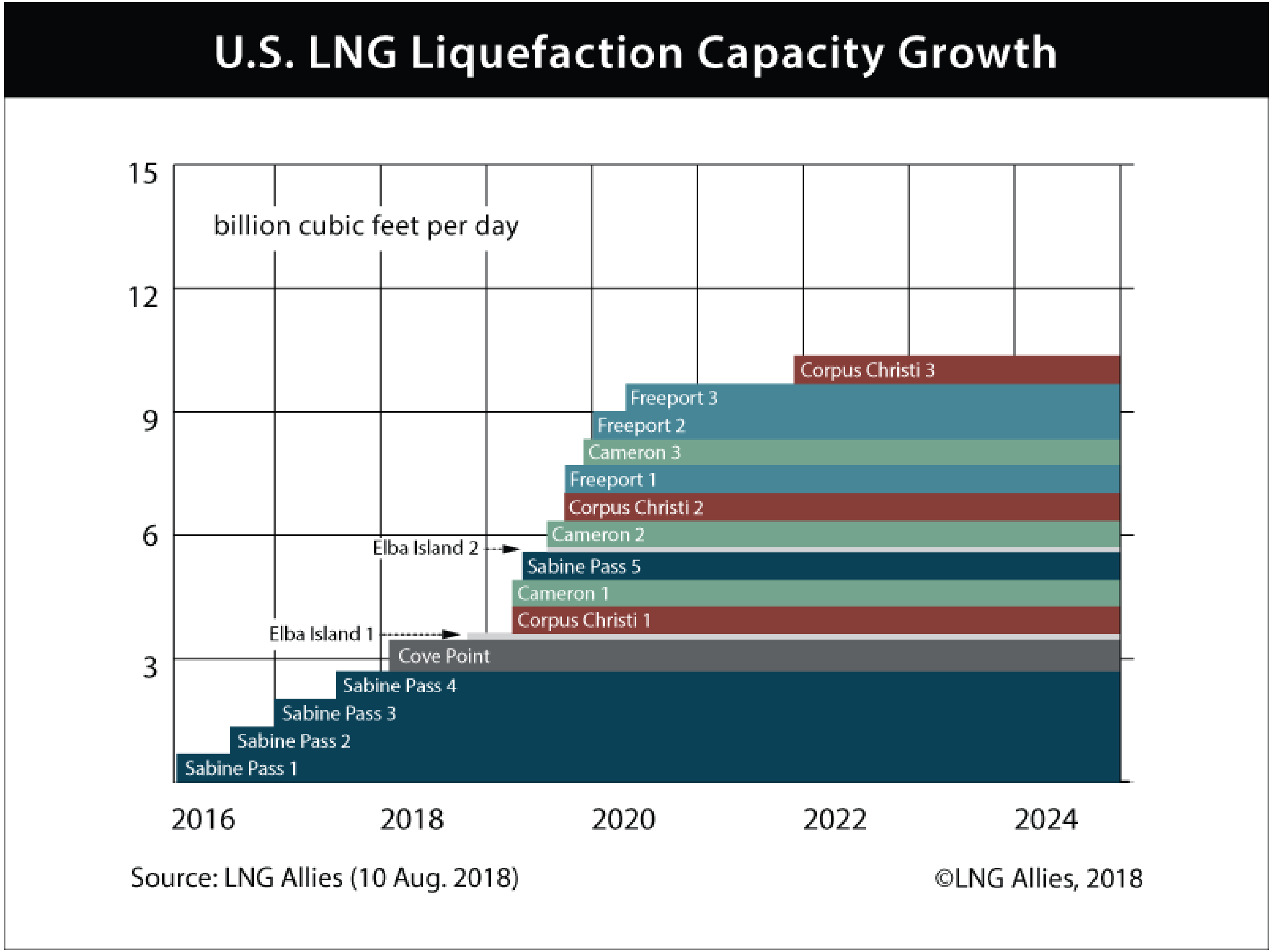
- Cheniere's Sabine Pass (T1-T4)
- Dominion's Cove Point (T1)

Wave 1: Under Construction

- Kinder Morgan's Elba Island (Ph1-Ph2)
- Cheniere's Sabine Pass (T5)
- Cheniere's Corpus Christi (T1-T3)
- Sempra's Cameron (T1-T3)
- Freeport (T1-T3)

Operating & Under Construction

- Six Projects, Five Companies, Four States
- Production: 75.4 mtpa
- Liquefaction: 10 Bcf/d
- Gas for Liquefaction: 1 Bcf/d


U.S. LNG Liquefaction Capacity Growth
billion cubic feet per day
15
12
9
6
3
Corpus Christi 3
Freeport 3
Freeport 2
Cameron 3
Freeport 1
Corpus Christi 2
Cameron 2
Elba Island 2
Sabine Pass 5
Cameron 1
Corpus Christi 1
Elba Island 1
Cove Point
Sabine Pass 4
Sabine Pass 3
Sabine Pass 2
Sabine Pass 1
2016
2018
2020
2022
2024
Source: LNG Allies (10 Aug. 2018)
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Wave 2A

Fully Permitted Awaiting FID

Wave 2A: Permitted / Pre-FID

- Cheniere's Sabine Pass (T6)
- Sempra's Cameron (T4-T5)
- Equity Transfer's Lake Charles (T1-T3)
- LNG Ltd.'s Magnolia (T1-T2)
- QP/XOM's Golden Pass (T1-T3)
- Delfin (Offshore, 4 FLNG)

Permitted / Pre-FID

- Six Projects, Six Companies, Two States
- Production: 64.4 mtpa
- Liquefaction: 9.1 Bcf/d
- Gas for Liquefaction: 0.9 Bcf/d

Wave 2B

Under FERC / DOE Review

Wave 2B: Still Under Review

- Venture Global's Calcasieu Pass
- Freeport (T4)
- Tellurian's Driftwood
- Sempra's Port Arthur
- Cheniere's Corpus Christi (Ph 3)
- Texas LNG Brownsville

Wave 2B: Still Under Review (cont.)

- Eagle LNG
- Kinder Morgan's Gulf LNG
- Exelon's Annova LNG
- NextDecade's Rio Grande LNG
- Venture Global's Plaquemines LNG
- Pembina's Jordan Cove LNG

Wave 2B: Still Under Review (cont.)

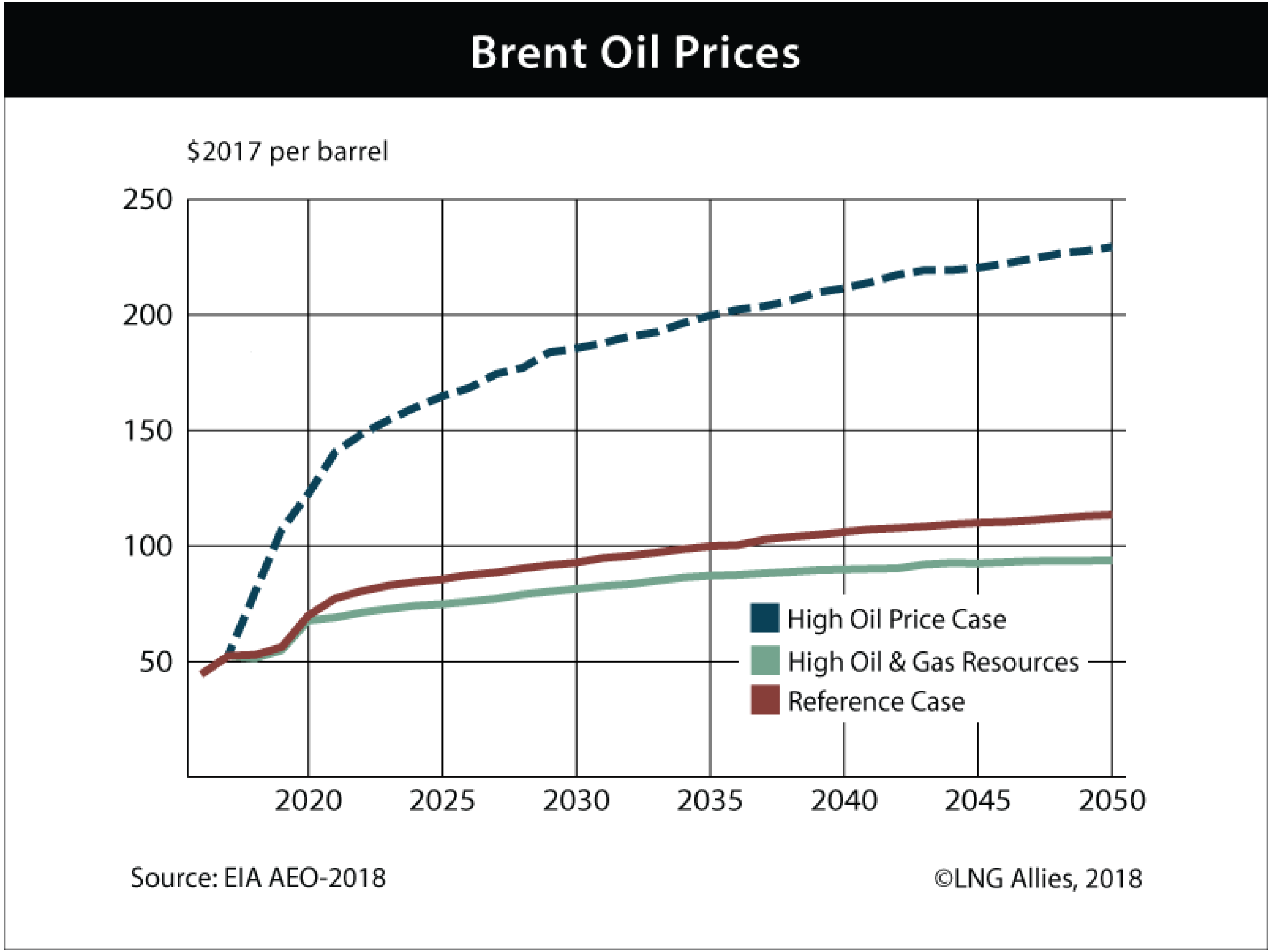
- Alaska Gasline's Alaska LNG

Still Under FERC & DOE Review

- 12 Projects, 11 Companies, Six States
- Production: 146.9 mtpa
- Liquefaction: 20.9 Bcf/d
- Gas for Liquefaction: 2 Bcf/d

Benefits of U.S. LNG Exports

ICF for LNG Allies – April 2018


Brent Oil Prices
$2017 per barrel
250
200
150
100
50
2020
2025
2030
2035
2040
2045
2050
High Oil Price Case
High Oil & Gas Resources
Reference Case
Source: EIA AEO-2018
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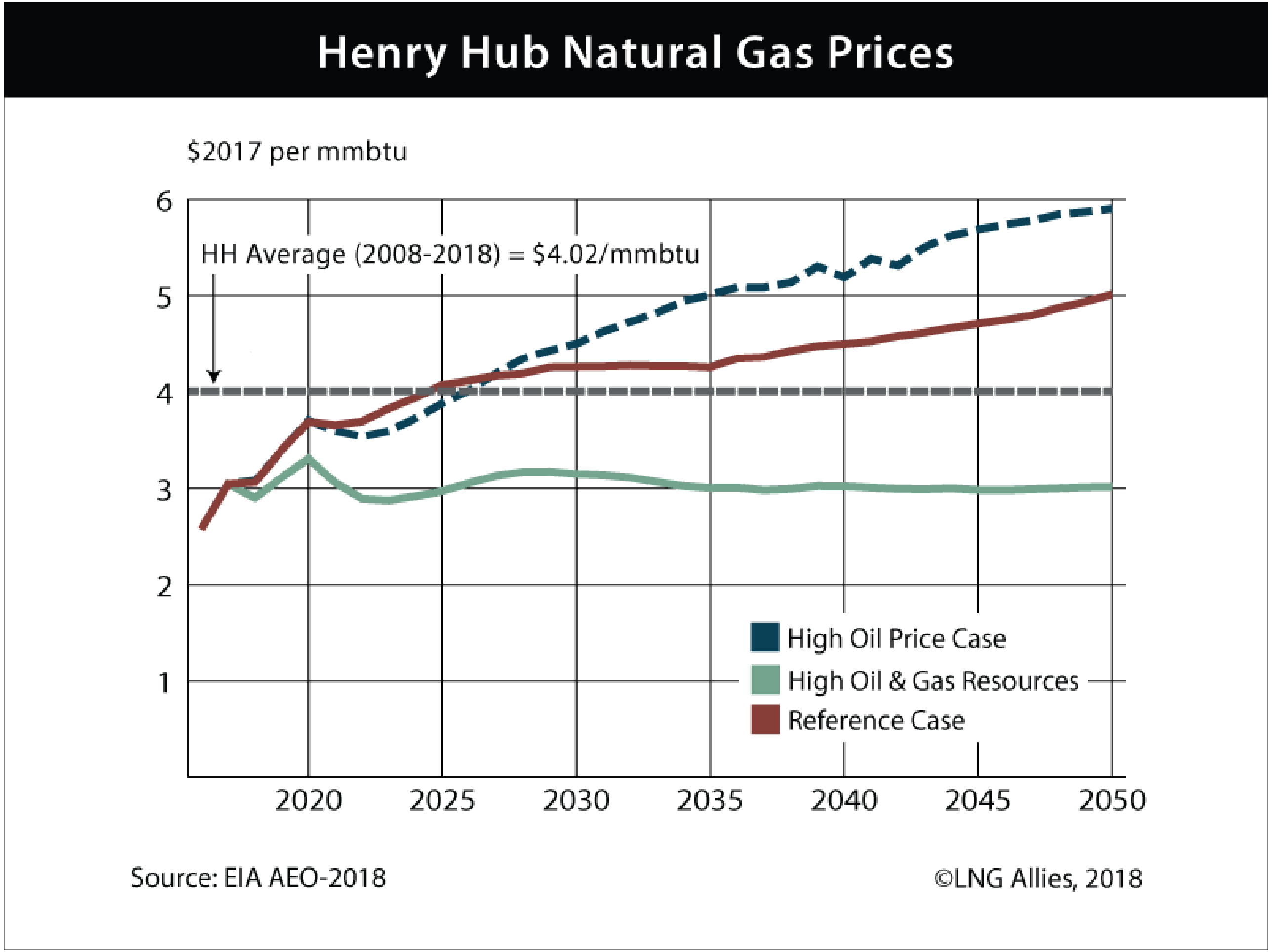
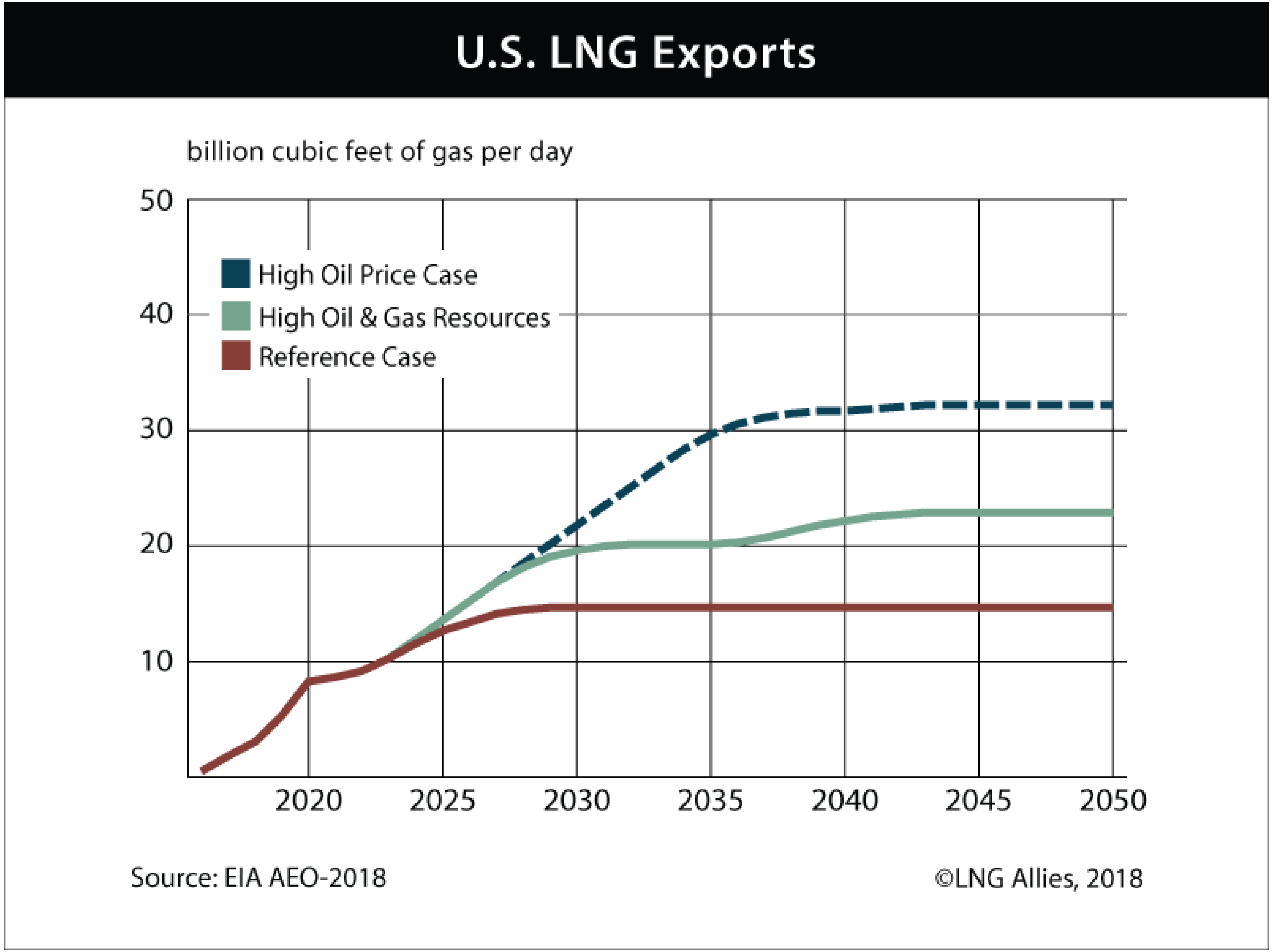
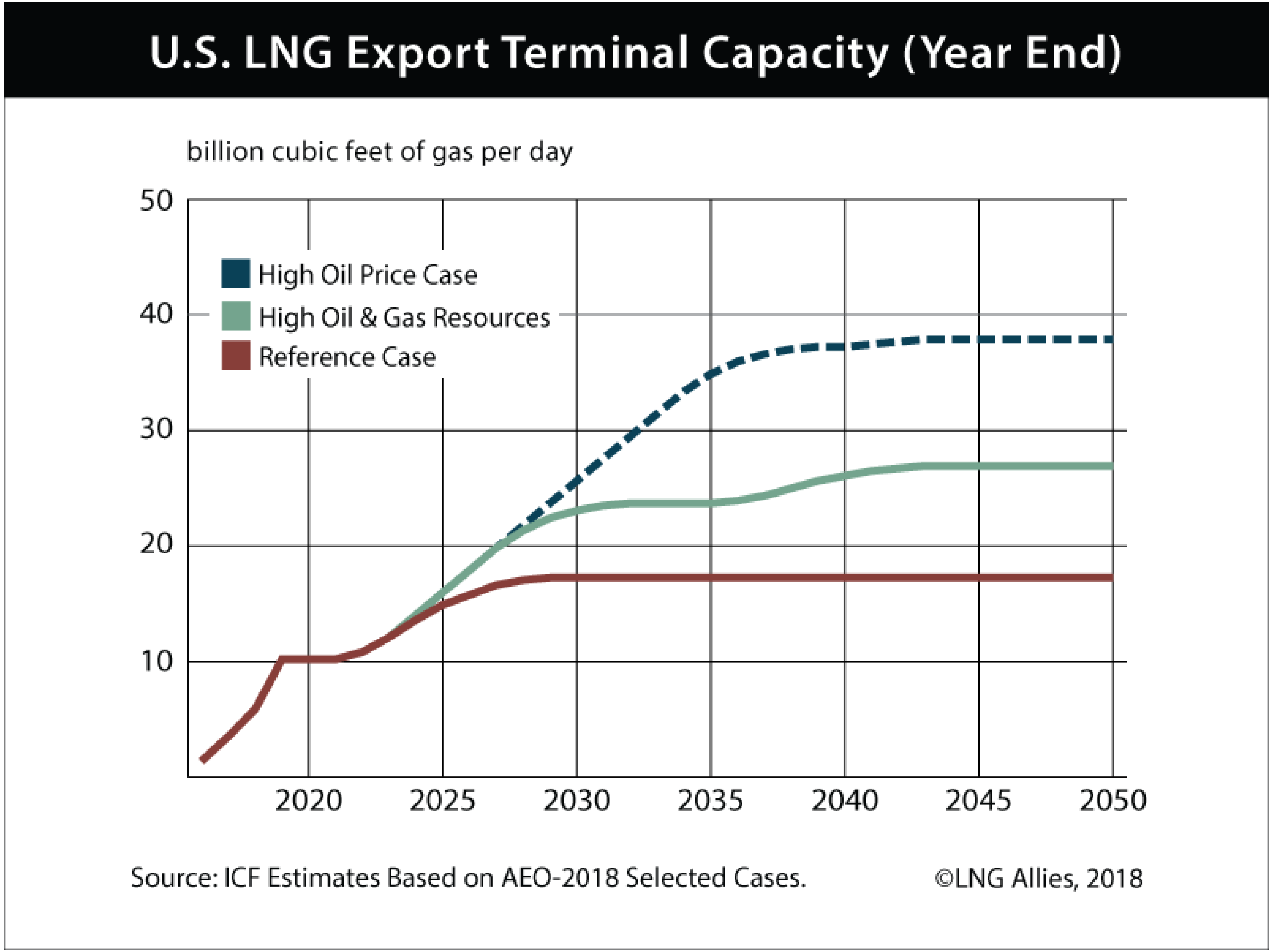

Henry Hub Natural Gas Prices
$2017 per mmbtu
HH Average (2008-2018) = $4.02/mmbtu
6
5
4
3
2
1
2020
2025
2030
2035
2040
2045
2050
High Oil Price Case
High Oil & Gas Resources
Reference Case
Source: EIA AEO-2018
©LNG Allies, 2018


U.S. LNG Exports
billion cubic feet of gas per day
50
40
30
20
10
High Oil Price Case
High Oil & Gas Resources
Reference Case
2020
2025
2030
2035
2040
2045
2050
Source: EIA AEO-2018
©LNG Allies, 2018


U.S. LNG Export Terminal Capacity (Year End)
billion cubic feet of gas per day
50
40
30
20
10
High Oil Price Case
High Oil & Gas Resources
Reference Case
2020
2025
2030
2035
2040
2045
2050
Source: ICF Estimates Based on AEO-2018 Selected Cases.
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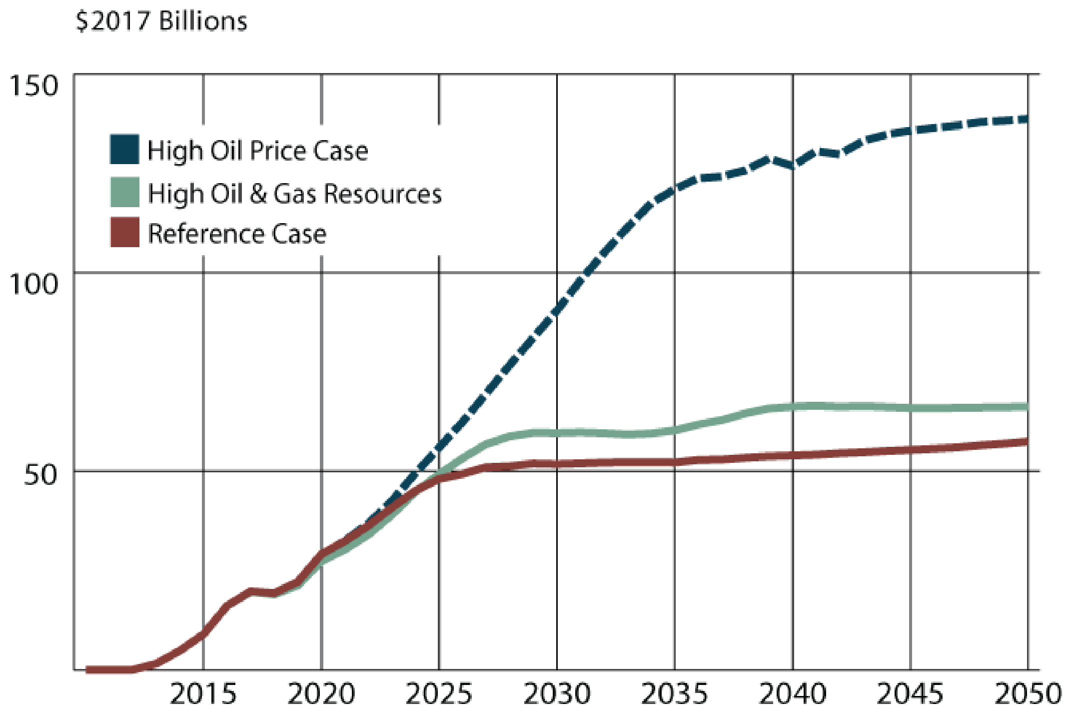
Value Added: LNG Terminals + Natural Gas Supply



Source: ICF Estimates Based on AEO-2018 Selected Cases.

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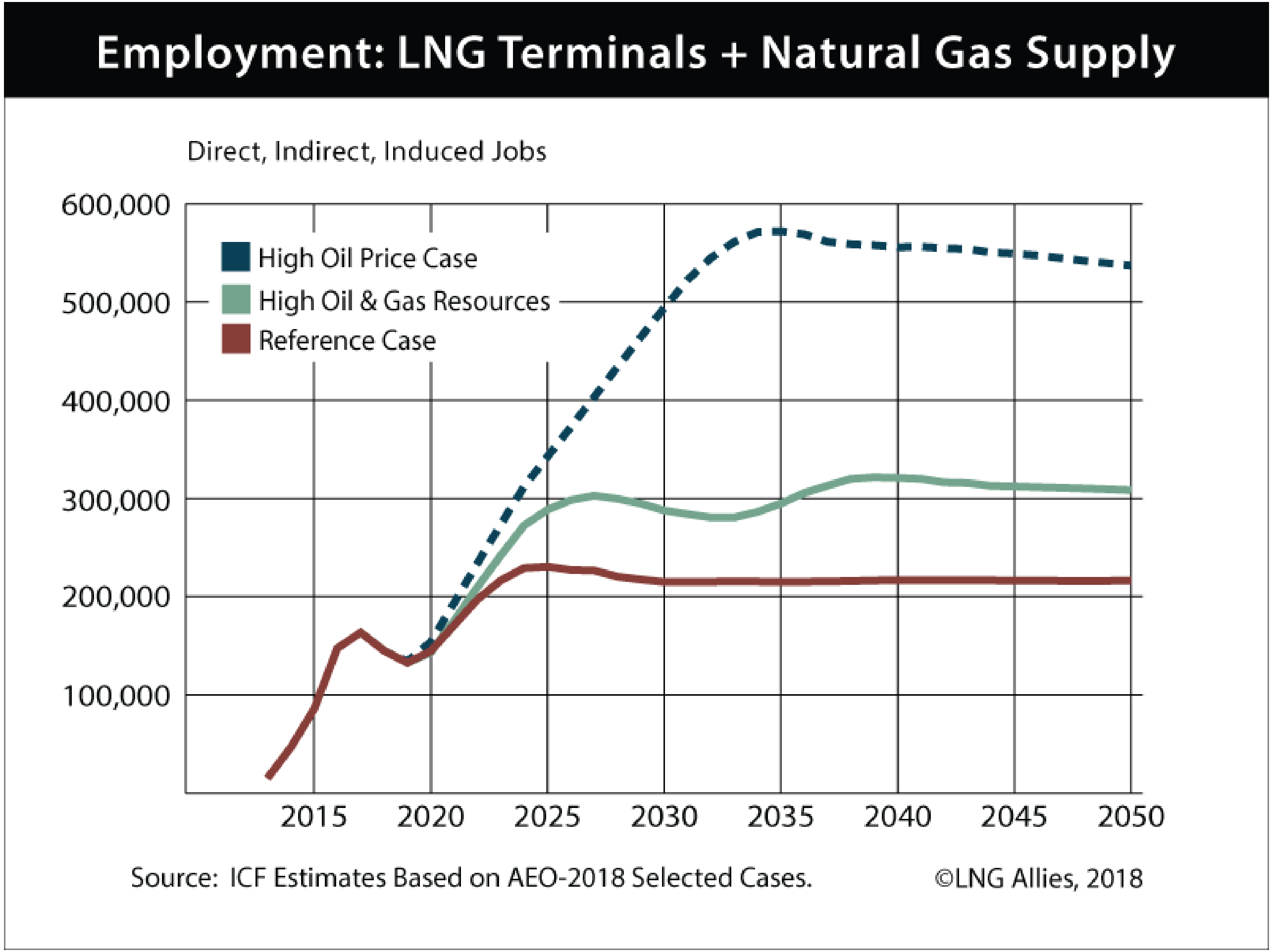
Employment: LNG Terminals + Natural Gas Supply
Direct, Indirect, Induced Jobs
600,000
500,000
400,000
300,000
200,000
100,000
High Oil Price Case
High Oil & Gas Resources
Reference Case
2015
2020
2025
2030
2035
2040
2045
2050
Source: ICF Estimates Based on AEO-2018 Selected Cases.
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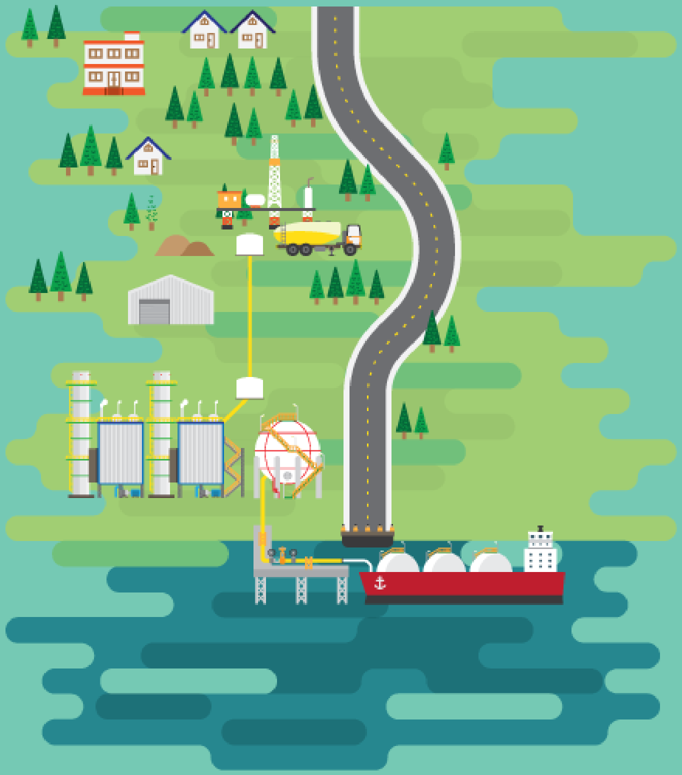
Annual Benefits of US LNG Exports*



GDP

$47.22 Billion (low)
$53.11 Billion (medium)
$92.72 Billion (high)

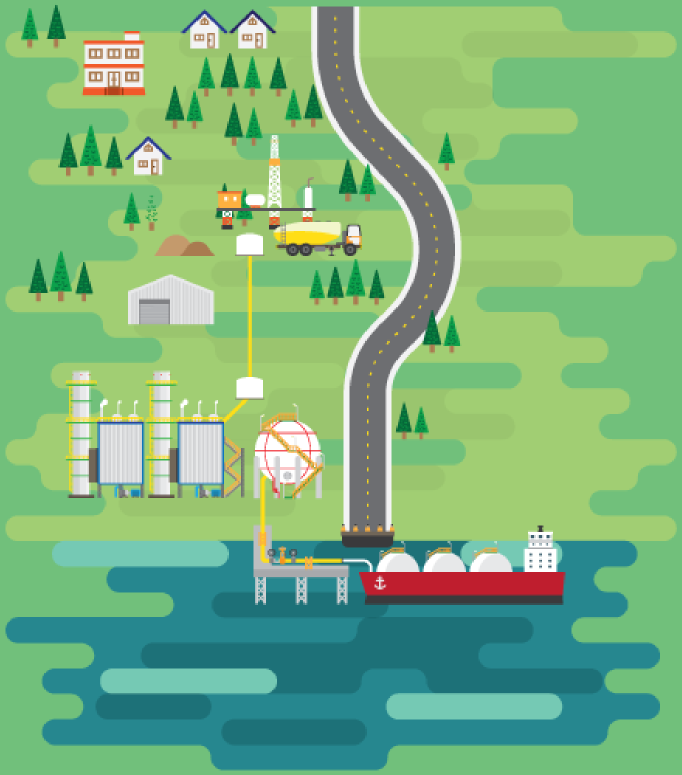
JOBS

205,400 (low)
270,100 (medium)
432,900 (high)

*Average annual direct, indirect, and induced impacts from 2013-2050, calculated by ICF for LNG Allies, based on Feb. 2018 EIA scenarios.

www.lngallies.com/jobs.pdf

Peak Benefits of US LNG Exports*



GDP

$59.8 Billion (low)
$67.3 Billion (medium)
$141.2 Billion (high)

JOBS

325,400 (low)
336,500 (medium)
637,350 (high)

*Highest annual direct, indirect, and induced impacts through 2050, calculated by ICF for LNG Allies, based on Feb. 2018 EIA scenarios.

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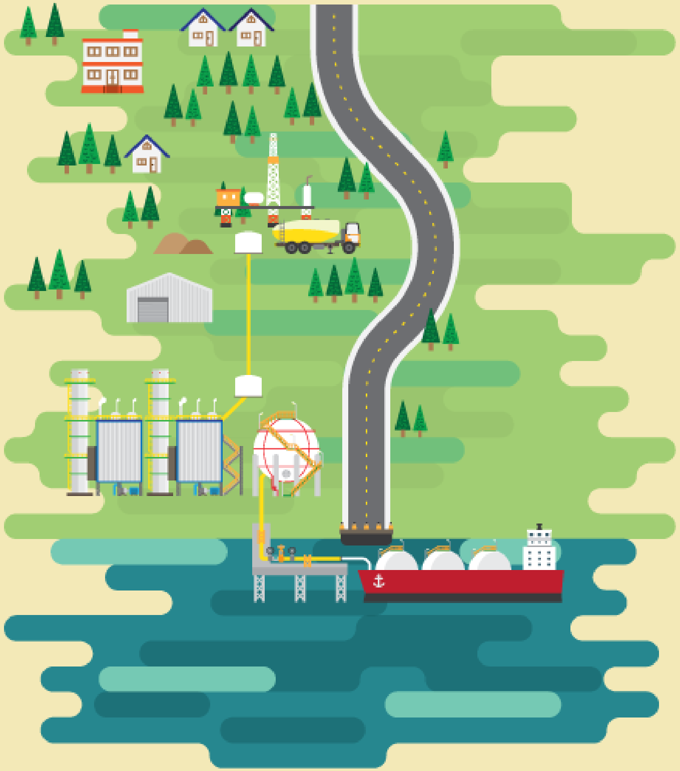
Cumulative Benefits of US LNG Exports*



GDP

$1.66 Trillion (low)

$1.89 Trillion (medium)

$3.26 Trillion (high)

Job-Years

7.35 Million (low)

9.68 Million (medium)

15.46 Million (high)

*Cumulative direct, indirect, and induced impacts from 2013-2050, calculated by ICF for LNG Allies, based on Feb. 2018 EIA scenarios.

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Competition and Economics
(No Slides)

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