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Liquid Markets: Assessing the Case for U.S. Exports of LNG

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Overview

- **Research Introduction**
- Feasibility
- Implications
  - » Prices and Volatility
  - » Macroeconomy and Jobs
  - » International Pricing and Geopolitics
- Conclusions and Recommendations

Research Introduction

- Research Process
  - » Expert input from Natural Gas Task Force
  - » Report reflects task force input but not group consent
  - » Invited expert testimonials on specific topics
  - » Analysis of existing data and additional research/ interviews

Research Introduction

- Study Outline
  - » Part 1: **Feasibility** of LNG exports
    - – Domestic supply, domestic demand, and international gas markets
  - » Part 2: **Implications** LNG exports
    - – "Public interest": impact on other sectors, economic impact, jobs, US energy security, balance of trade, international implications, environment
  - » Part 3: **Conclusions and recommendations**

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Feasibility

- Dependent on:
  - » Domestic supply
    - – Availability of resources, sustainability of production
    - – Environmental policy and regulations
  - » Domestic demand
    - – Electricity, industrial, transportation, and residential and commercial sectors
  - » Global gas markets

Domestic Supply: Resource Base

- Given current estimates, the supply base can support expansion in all sectors
- Production rates appear to be sustainable

Shale Gas Estimates for Lower 48 states (Technically Recoverable Resources)	
Report	Estimate (tcf)
ICF International	1,842
Advanced Resources Int'l.	1,189
Energy Information Adm.	827
Potential Gas Committee	687

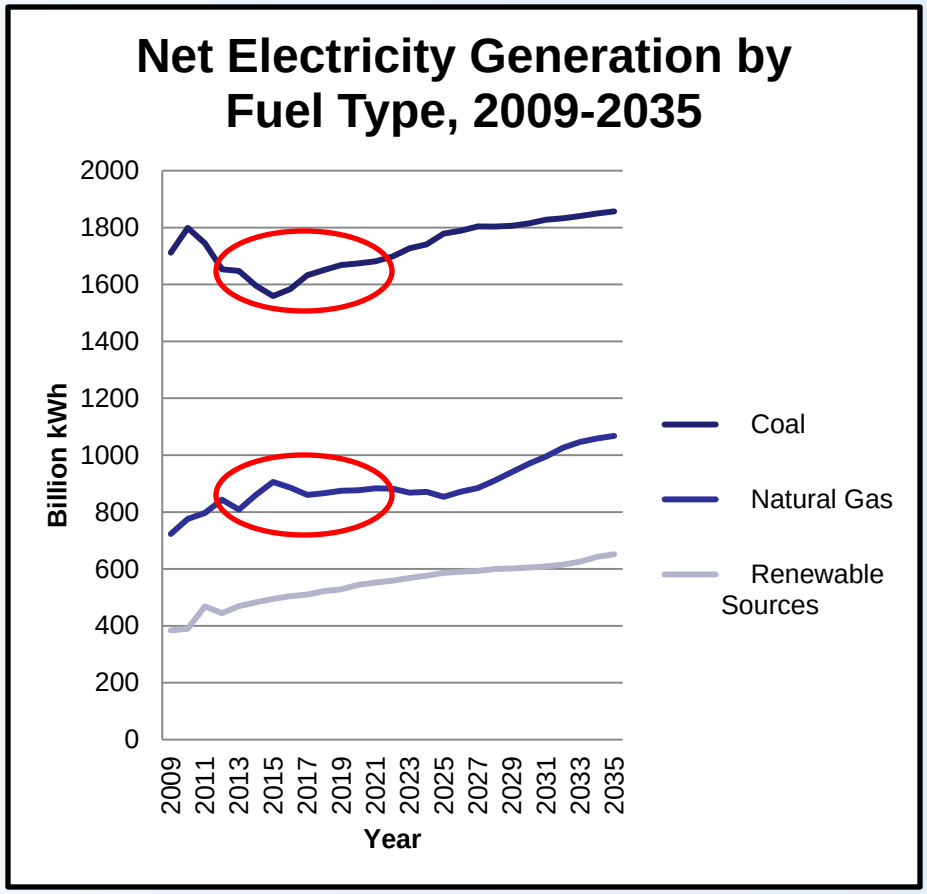
Sources: ICF International, ARI, EIA, Potential Gas Committee

Domestic Supply: Environmental Considerations

- Environmental considerations
  - » Water
  - » Emissions and flaring
  - » Seismic activity
- Regulatory considerations
  - » EPA
  - » State and Local Regulations

Domestic Demand

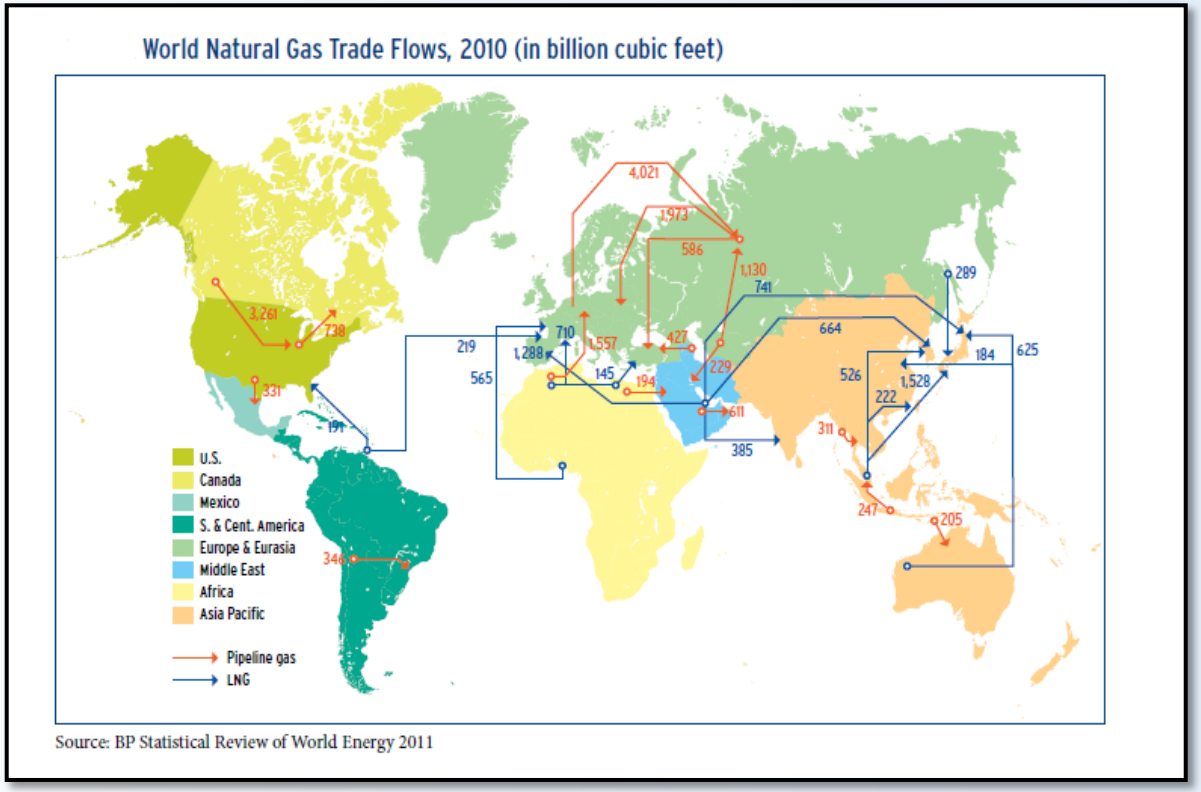
- Electricity
  - » Incremental gas-fired generation will replace coal-fired generation
- Industry
  - » Shale gas has boosted U.S. competitiveness
- Transportation
  - » High economic barriers; will require significant policy support
- Commercial and Residential



Source: Energy Information Administration

Global Gas Markets

- Important considerations
  - » Widening of Panama Canal
  - » Impacts of future nuclear energy policies
  - » Unconventional production in new markets



- Given existing knowledge, exports are technically and logistically feasible

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Implications: Natural Gas Price Increase

- The price implications of exports on domestic prices is likely to be modest

Study-by-study comparison of the Average Price Impact from 2015-2035 of 6 bcf/day of LNG exports (unless otherwise noted)

Study	Average Price without Exports ($/MMBtu)	Average Price with Exports ($/MMBtu)	Average Price Increase (%)
EIA*	$5.28	$5.78	9%
Deloitte	$7.09	$7.21	2%
Navigant (2010) (2 bcf/day of exports)**	$4.75	$5.10	7%
Navigant (2012)***	$5.67	$6.01	6%
ICF International***	$5.81	$6.45	11%

* Price impact figure for EIA study reflects the reference case, low-slow export scenario.

** The Navigant study did not analyze exports of 6 bcf/day.

*** Navigant (2010 and 2012) and ICF International studies are based on Henry Hub price.

Source: EIA, Deloitte, Navigant, ICF International.

Implications: Electricity and Industrial Sectors

- The electricity and industrial sectors will not see dramatic changes in prices or competitiveness

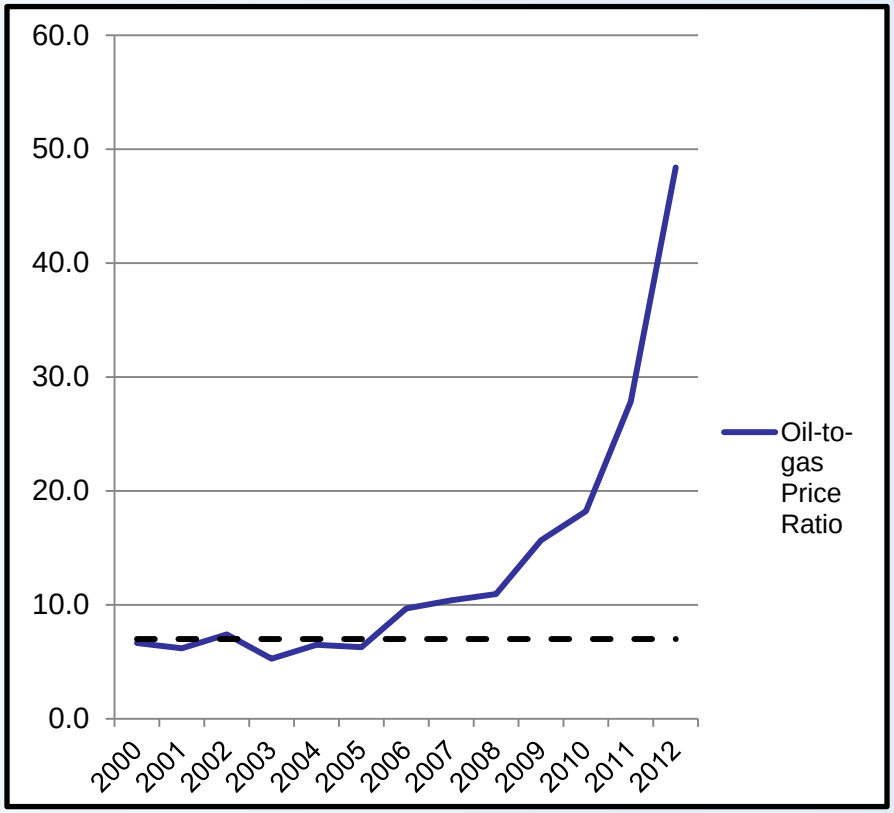
Increase in Electricity Prices as a Result of 6 bcf/day of exports, 2035

Study	Estimated Increase in Electricity Prices ($/MWh)
EIA*	$1.40-$2.90/MWh
Deloitte	<$1.65/MWh
ICF International	$1.66-$4.97/MWh

* EIA range does not include high-rapid export scenario

Source: EIA, Deloitte, ICF International

Brent-to-Henry Hub Price Ratio, 2000-2012*



* 2012 prices average of prices from January-March 2012

Source: EIA

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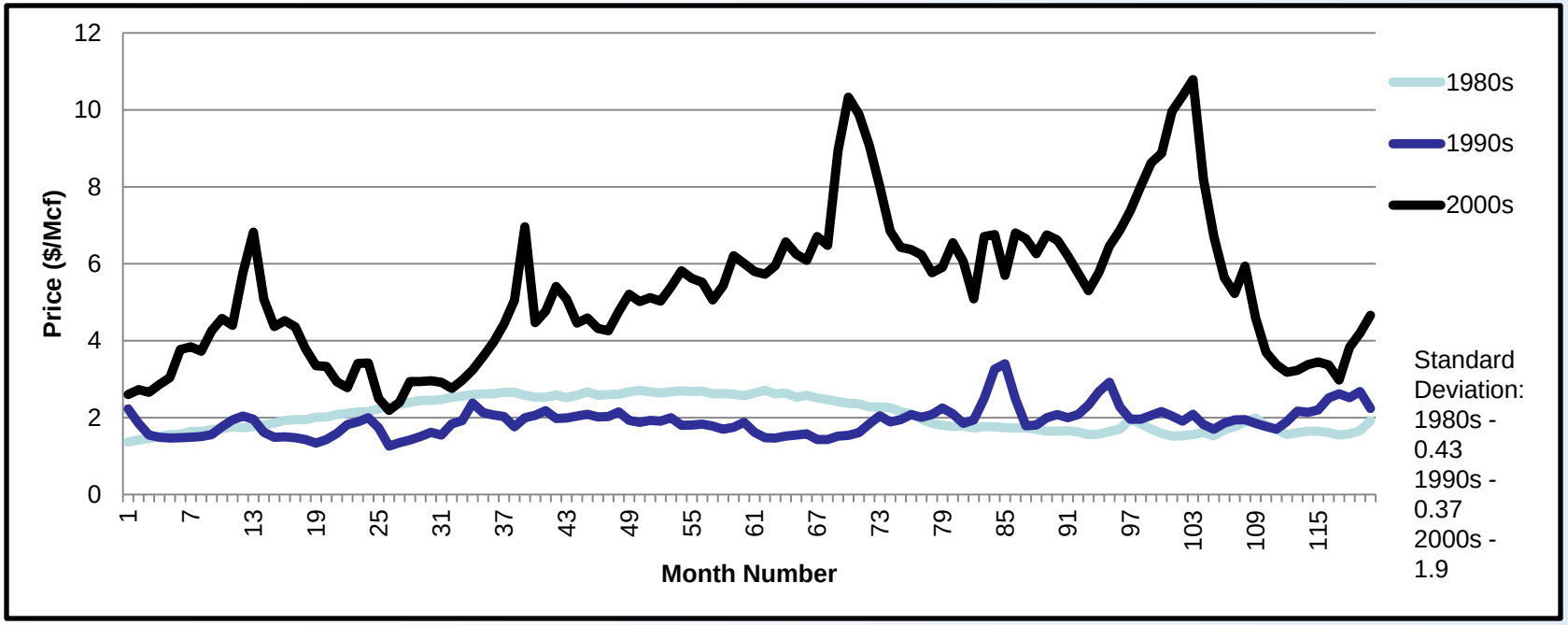
Implications: Natural Gas Price Volatility

- The price volatility of natural gas following exports will still be limited because of the infrastructure constraints of LNG exports

Natural Gas Prices in 1980s, 1990s, and 2000s, by month ($/Mcf)



Source: EIA

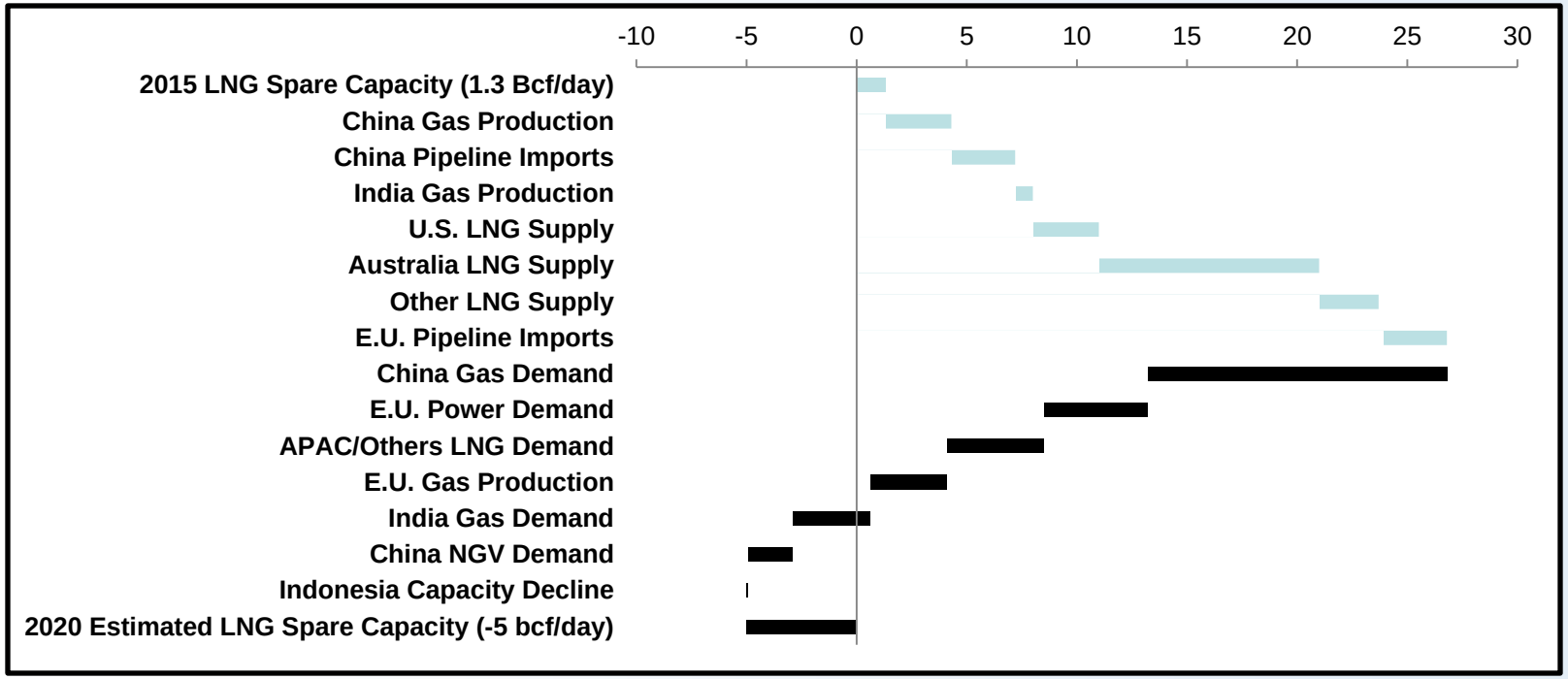
Implications: Macroeconomy and Jobs

- The economic impact of exports is likely to be modest
  - Price increases will have marginal impact on industrial consumers' competitiveness
  - Liquefaction projects will create temporary construction employment but will require few permanent employees
  - 65% of exported gas will come from new production: new production will increase employment demand
- Trade and exchange rate impacts are modest
  - LNG exports will result in gains from trade
  - *All* oil and gas exports estimated to cause dollar appreciation by between 1% and 5% by 2020

Implications: International Pricing and Geopolitics

- U.S. LNG would be exporting to a tight LNG market
- U.S. LNG exports would soften oil-linked LNG contracts in Atlantic, Pacific Basins
- Additional liquidity is would help U.S. allies and trading partners

Estimated LNG Spare Capacity from 2015-2020 (bcf/day)



Source: Brookings analysis of Morgan Stanley research and data; IEA, EIA, Clearview Energy Partners

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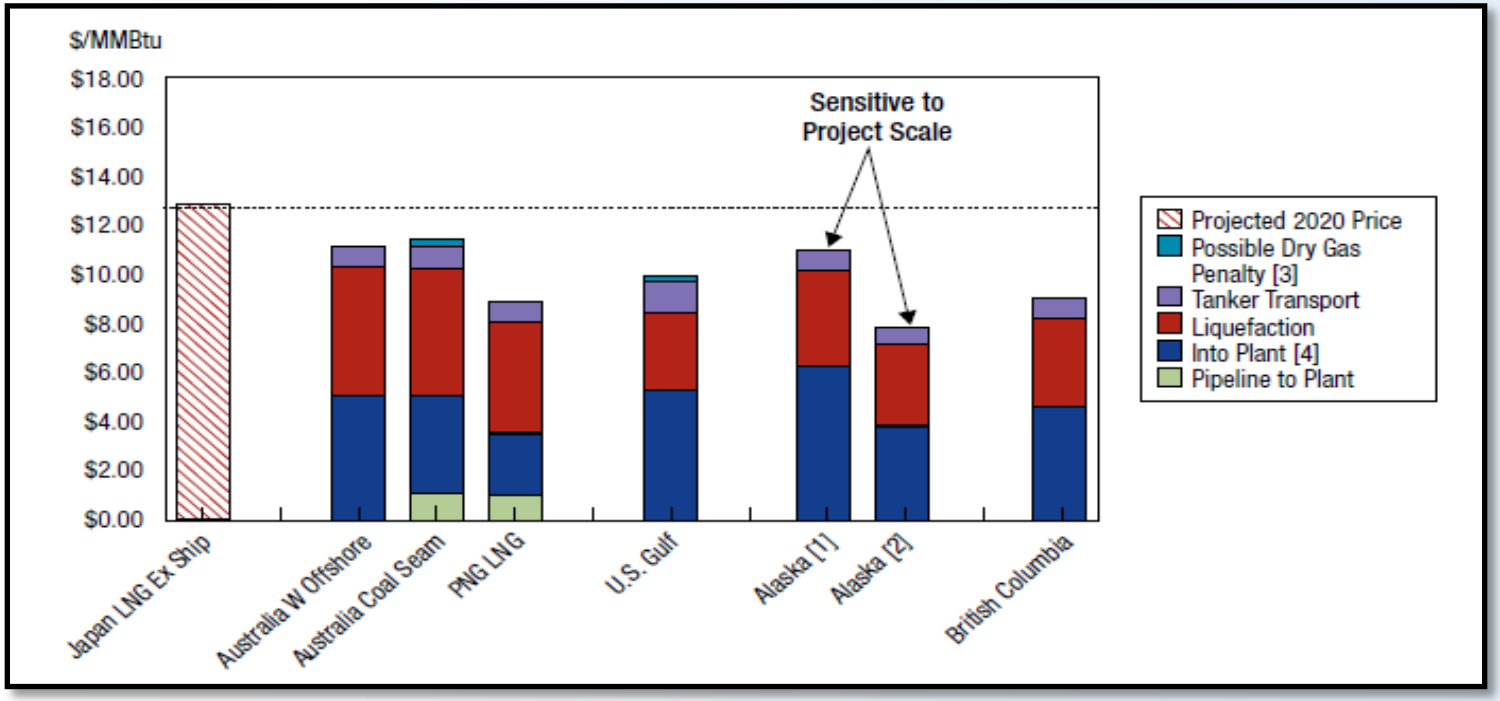
Implications: International Pricing and Geopolitics

- The market will put a natural cap on how much LNG will be economic to export

Estimated Costs of Delivering LNG to Japan in 2020 ($/MMBtu)



[1]: Assumes 1 bcf/day of exports from Valdez, Alaska
[2]: Assumes 3.1 bcf/day of exports from Valdez, Alaska
[3]: Dry gas penalty is assumed at 2%
[4]: Opportunity cost for Alaska and B.C.
Source: Client Presentation by James Jensen, President, Jensen and Associates

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Conclusions

- Exports are feasible
- Natural gas prices will increase modestly
- Negligible impact on price and competitiveness of electricity and industrial sectors
- Limited macroeconomic, jobs, or environmental impact
- Exports would erode (but not dramatically alter) oil-linked LTCs in Asia and Europe
- Geopolitical benefits to increased LNG supply and supply diversity
- Market considerations will limit the arbitrage opportunity and economic feasibility of export projects

Recommendations

- The U.S. government should neither prohibit nor promote LNG exports
- Capping exports would distort markets and likely have unintended consequences
- The U.S. has an interest in continuing to promote free trade

Thank You