



Outlook for U.S. LNG Exports and Implications for Europe

Paul Bernstein

NERA Economic Consulting

EPRG Winter Seminar

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Agenda



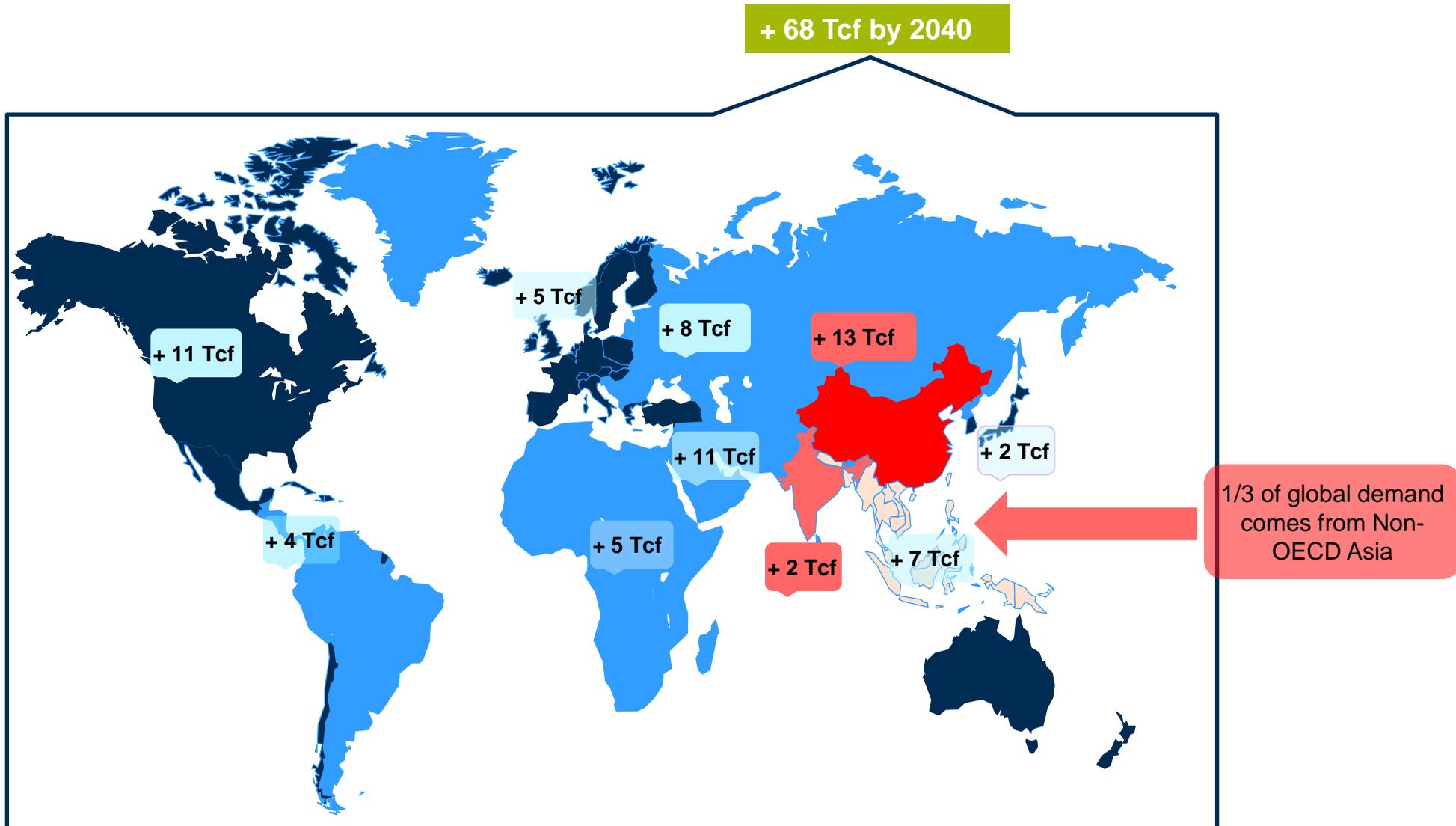
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- Overview of the global natural gas market
- Why such interest in U.S. LNG exports?
- NERA Study for U.S. Department of Energy (DOE) on economic impacts of U.S. LNG exports
 - Key assumptions
 - Scenarios design
 - NERA's N_{ew}ERA and GNGM models
 - Results and implications
- How robust are results and insights with new forecasts?
- What are the potential impacts of shale gas for Europe?

World Demand For Natural Gas Will Continue To Expand



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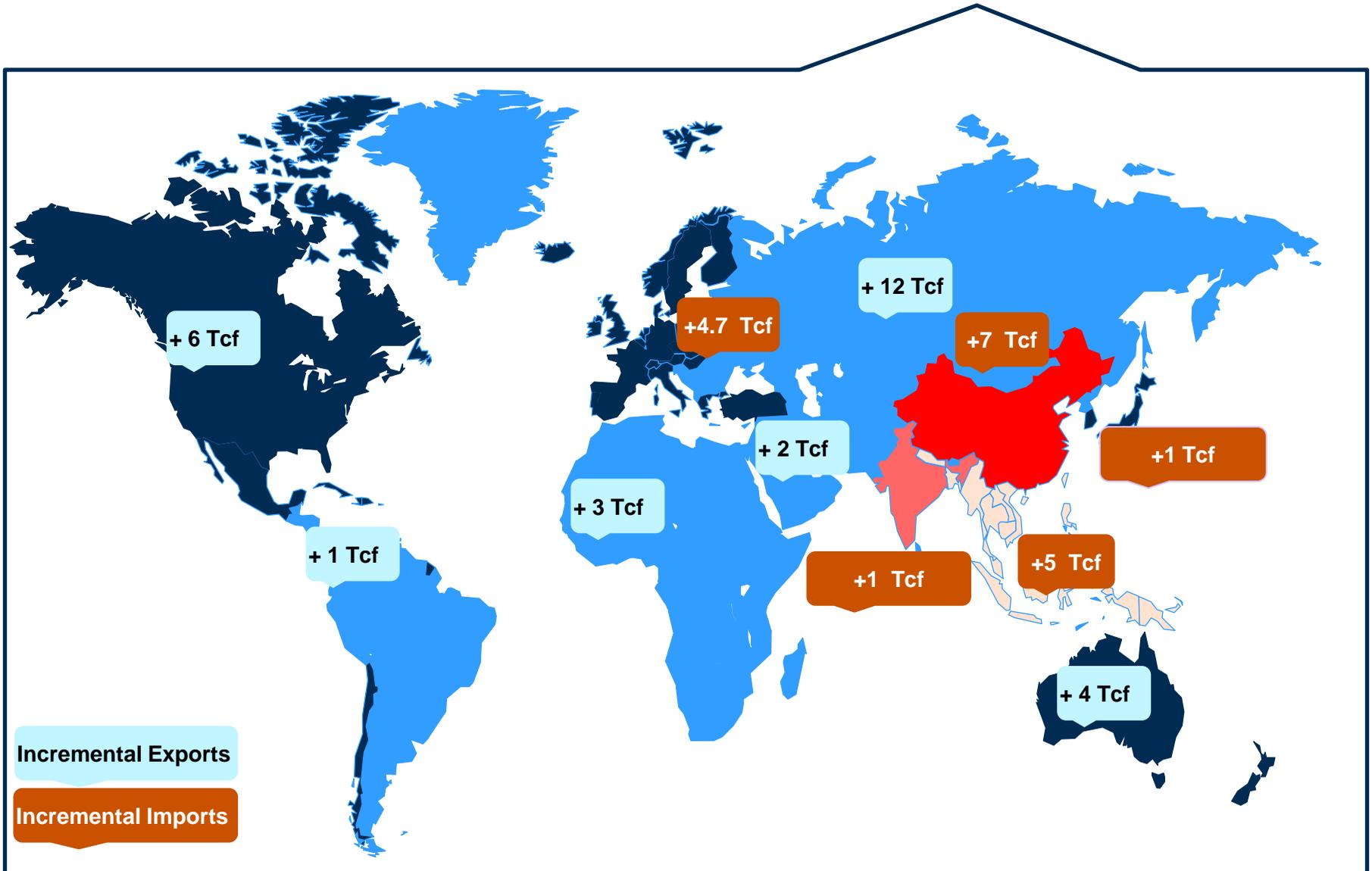


Global Net Trade In Natural Gas Continues To Expand



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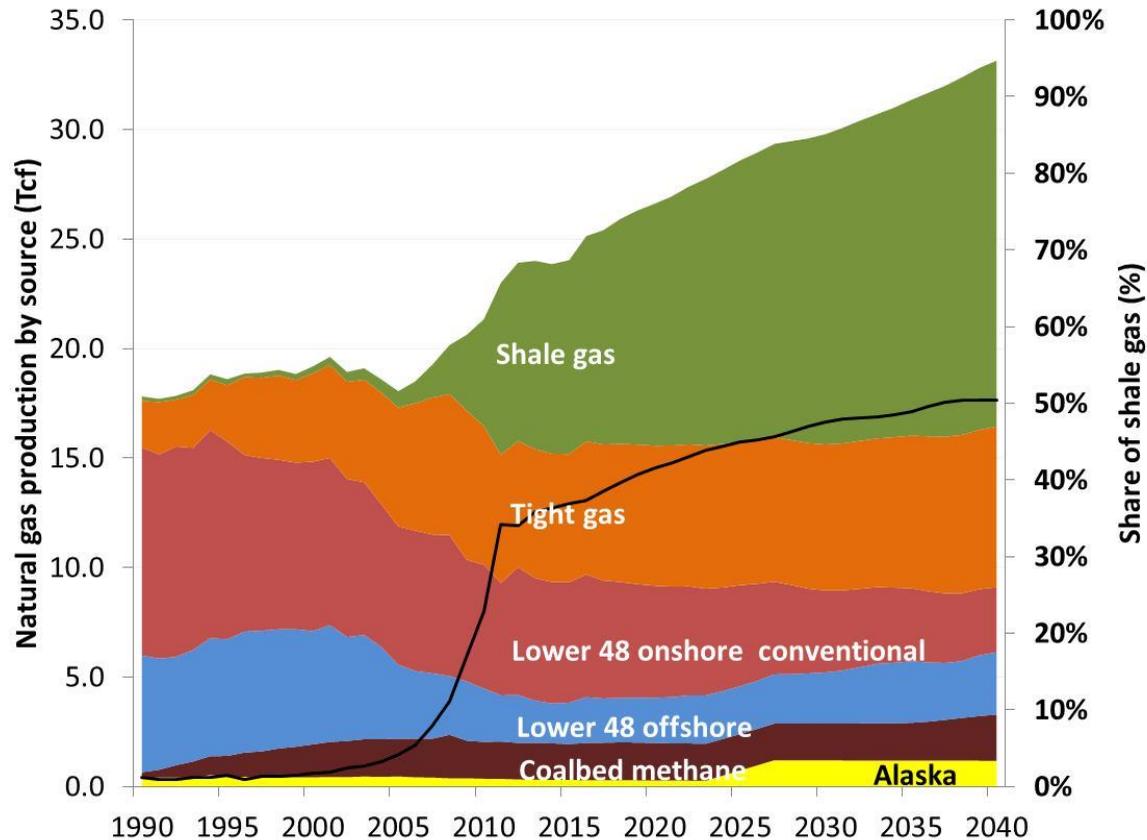
Doubles by 2040:
45Tcf



U.S. Shale Gas Production Will Continue To Grow



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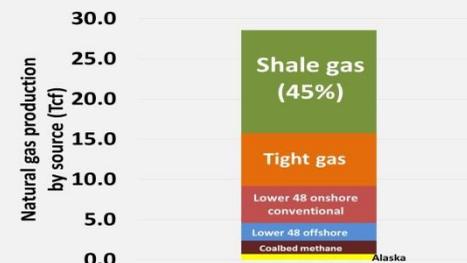
Source: EIA/AEO 2013

- Natural gas production increase by 39% from 2012 through 2040.
- Shale gas increase by 105% from 2012 through 2040.
- Shale gas accounts for 50% of the natural gas production by 2040.

Implications of Shale Gas Boom – Where Will All This Gas Go?



Production
28.6 Tcf



Net Exports
1.6 Tcf

Pipeline Exports



0.5 Tcf

LNG Exports



1.1 Tcf

	LNG Applications	
	Received	Approved
FTA	37.96	33.82
non-FTA	35.11	6.40

Total U.S. Supply = 27 Tcf

Consumption
27 Tcf

Residential



4.4 Tcf

Industrial



10.5 Tcf

Commercial



3.4 Tcf

Transportation



0.2 Tcf

Electricity



8.4 Tcf

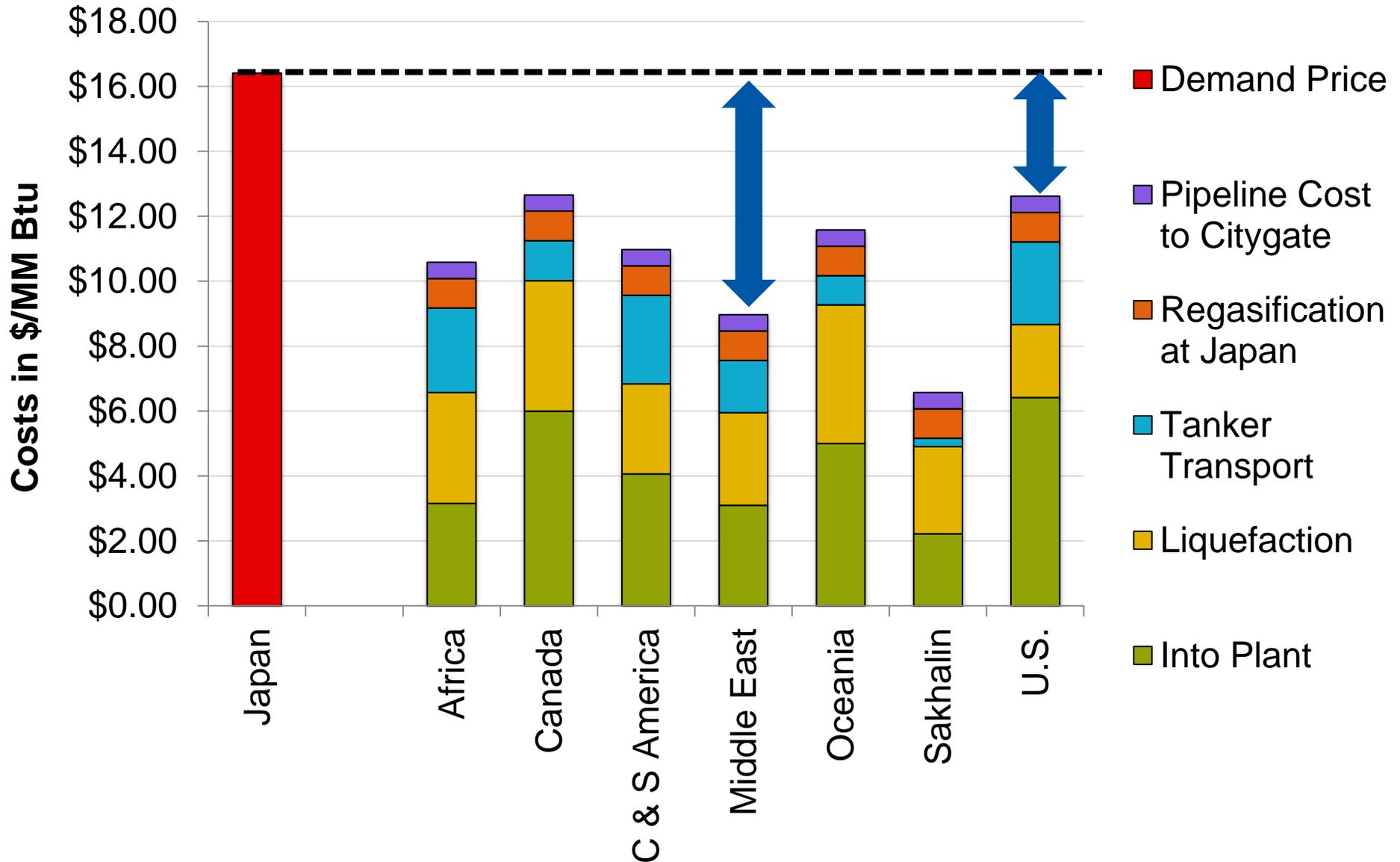
Source: EIA/AEO 2013 for year 2025

U.S. LNG Interests Driven by Potential Profits



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Costs of Delivering LNG to Japan in 2025



Exports to Most Countries Must Be Approved by DOE



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- Under the Natural Gas Act
 - Exports to countries with a Free Trade Agreement (FTA) covering natural gas must be approved “without delay”
 - Includes Canada, some Latin American and Caribbean countries, and South Korea
 - Exports to countries without a FTA must be approved by DOE unless found to be contrary to the public interest

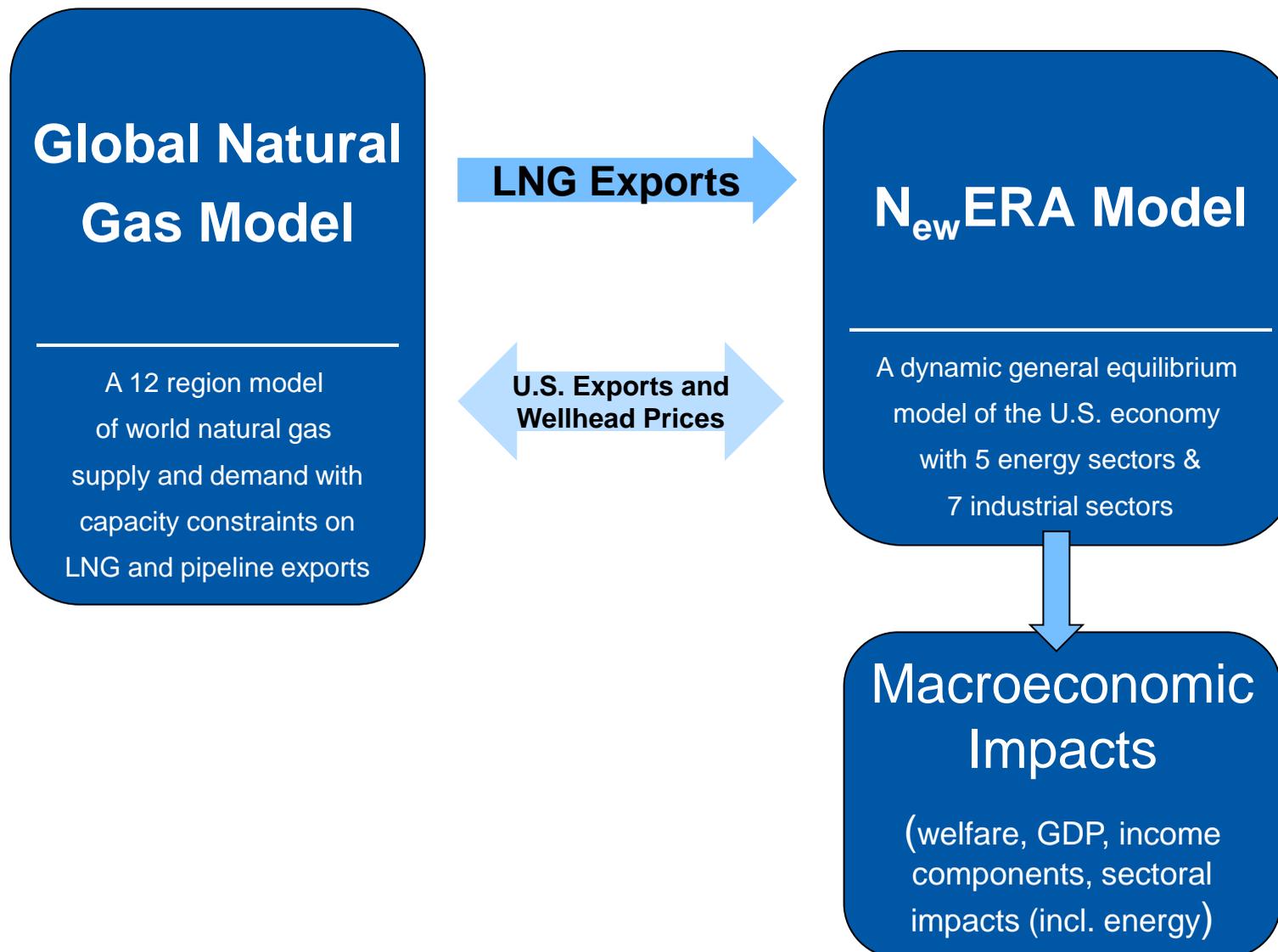
DOE Commissioned NERA to Analyze Economic Impacts of LNG Exports



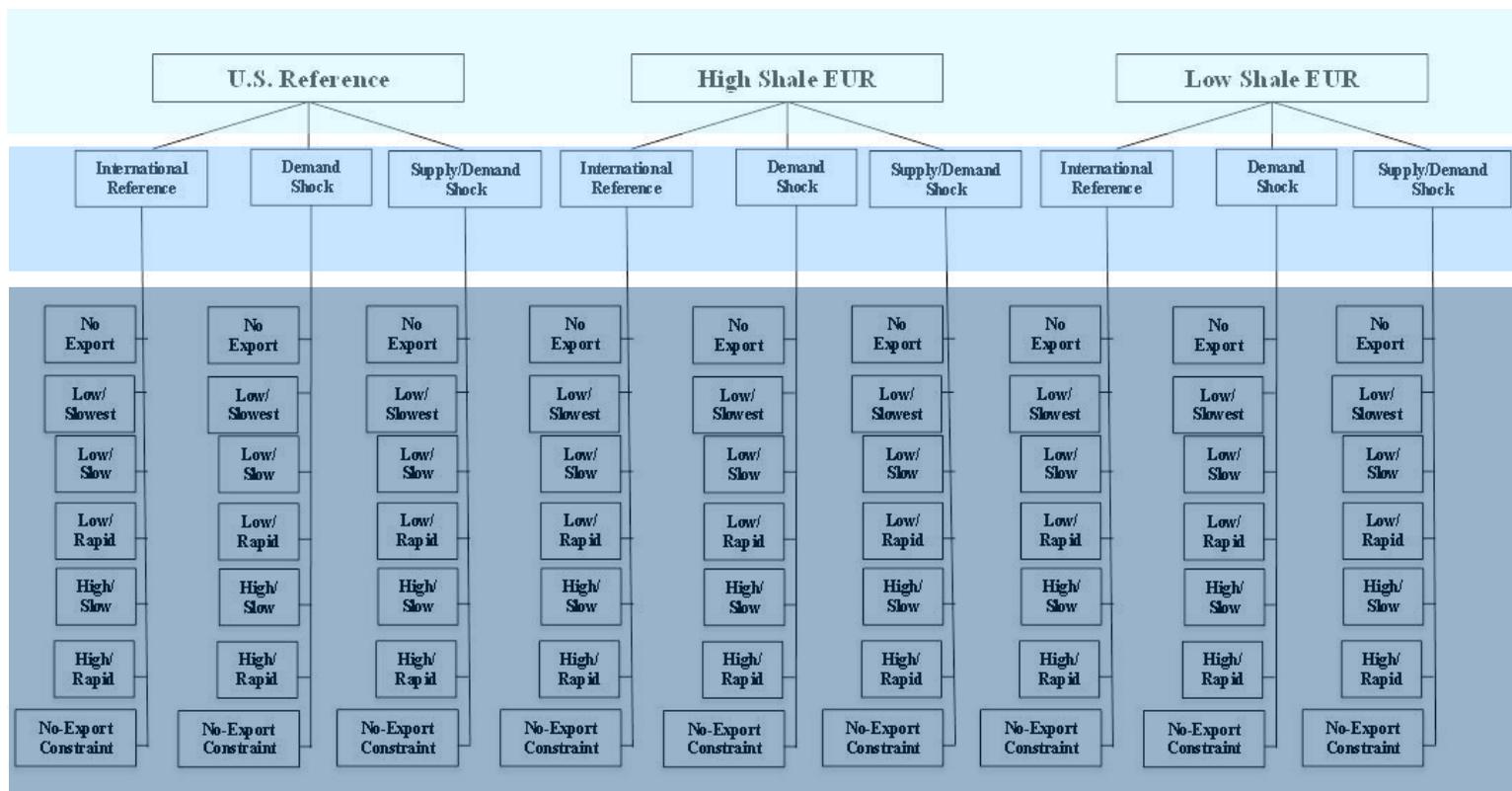
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- NERA built on an earlier EIA Study in which:
 - LNG export levels were specified by DOE/FE
 - Used the *AEO 2011* National Energy Modeling System (“NEMS”).
 - Determined changes in U.S. natural gas supply, demand and prices
- What the NERA study added
 - International natural gas market factors that influence export volumes and the prices at which they can be sold
 - Macroeconomic impacts on the U.S. economy from LNG export expansion
- DOE released NERA study in December 2012 for comment and to be made part of the docket in each subsequent proceeding
 - Over 180,000 comments received
 - Response to comments in decision authorizing *Freeport* project in May 2013

NERA Modeled Dynamics of Domestic and International Natural Gas Markets



Dimensions of the Natural Gas Market Dynamics in the Modeling Framework



U.S. Gas Forecasts

International Market Dynamics

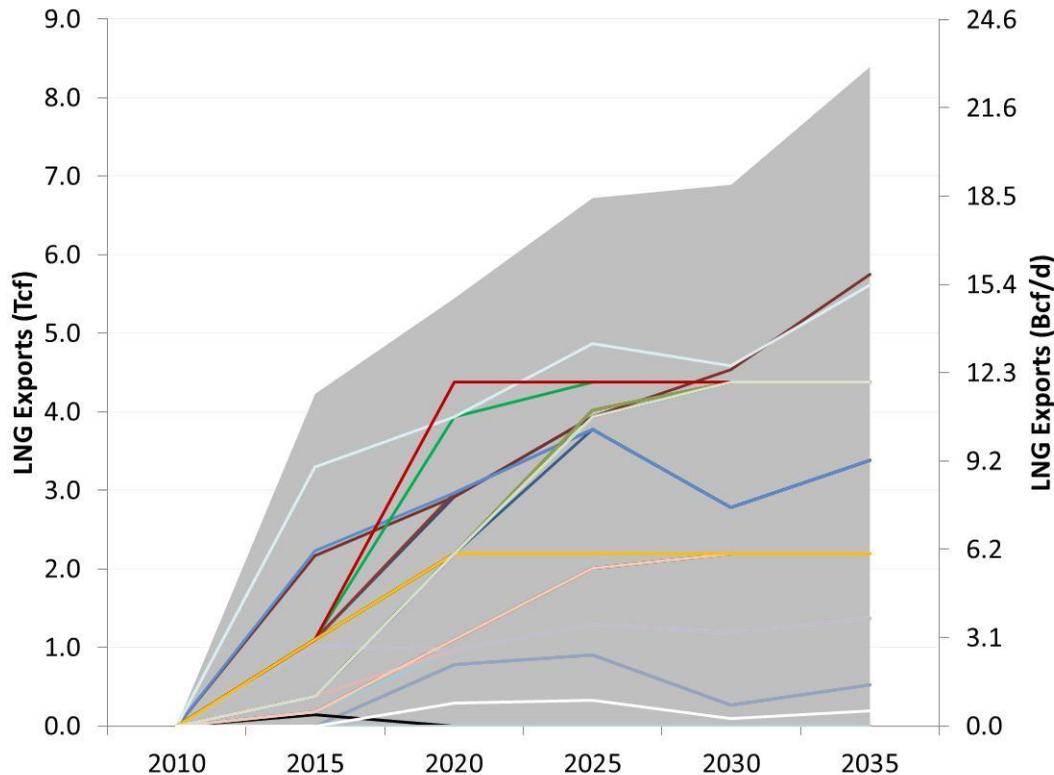
LNG Export Limits

63 Scenarios

LNG Exports Are Subject to Major Uncertainties



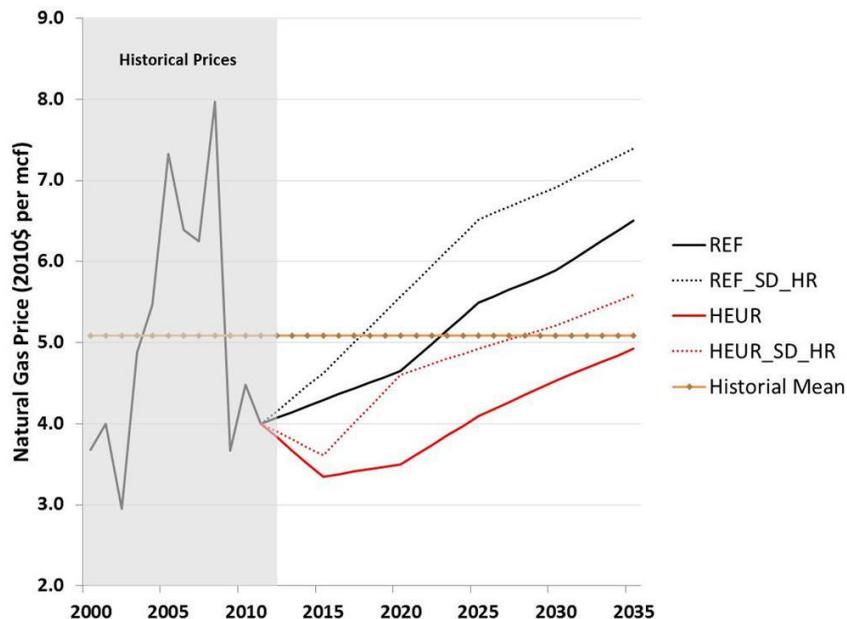
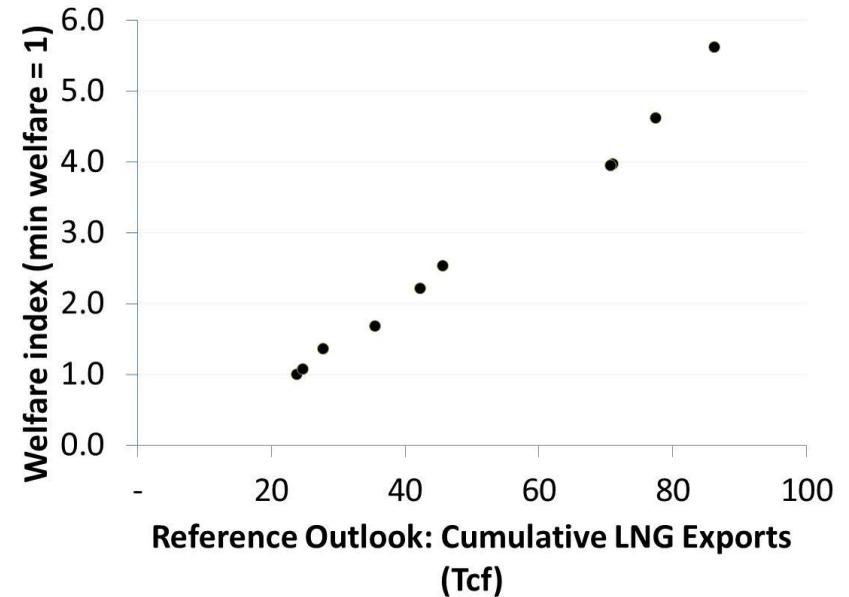
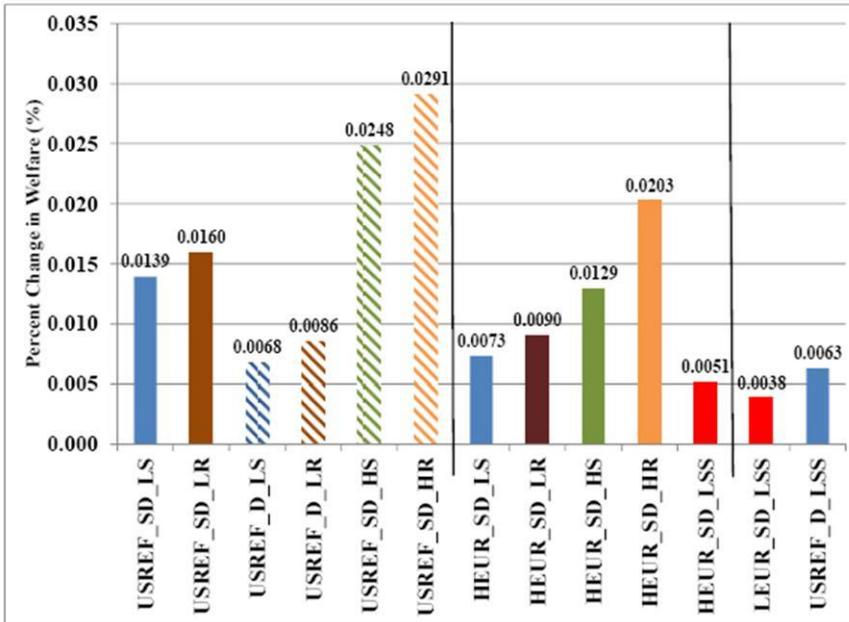
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Source: NERA Study 2012

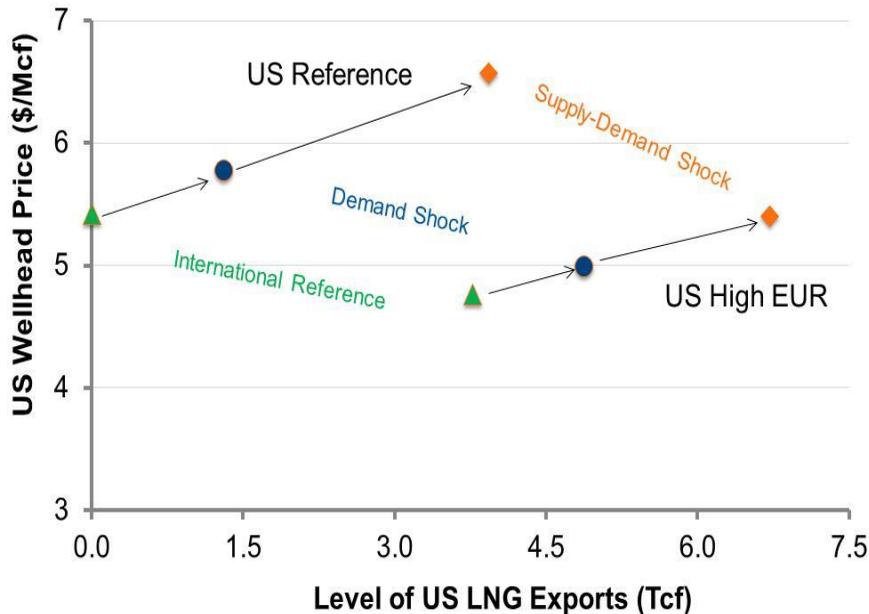
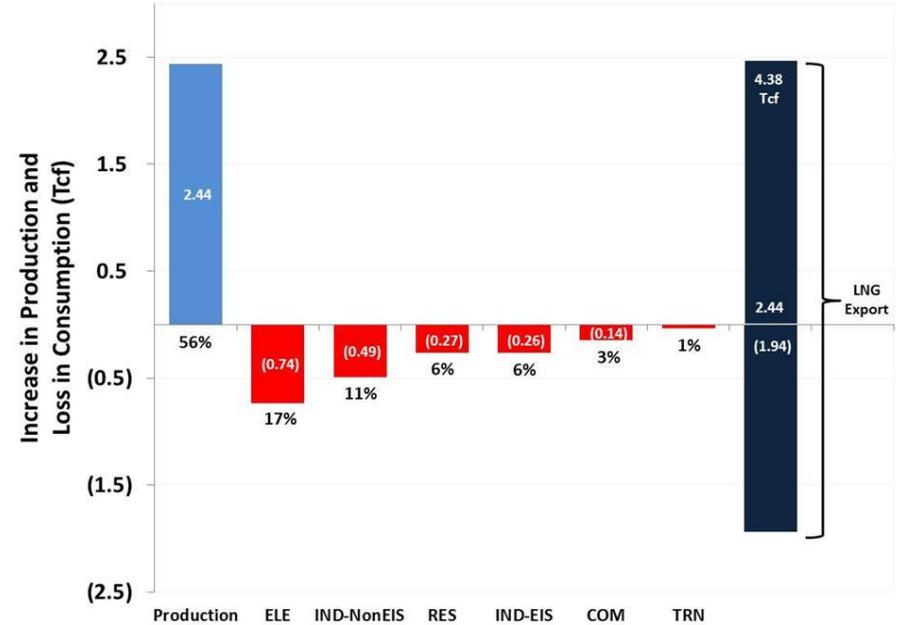
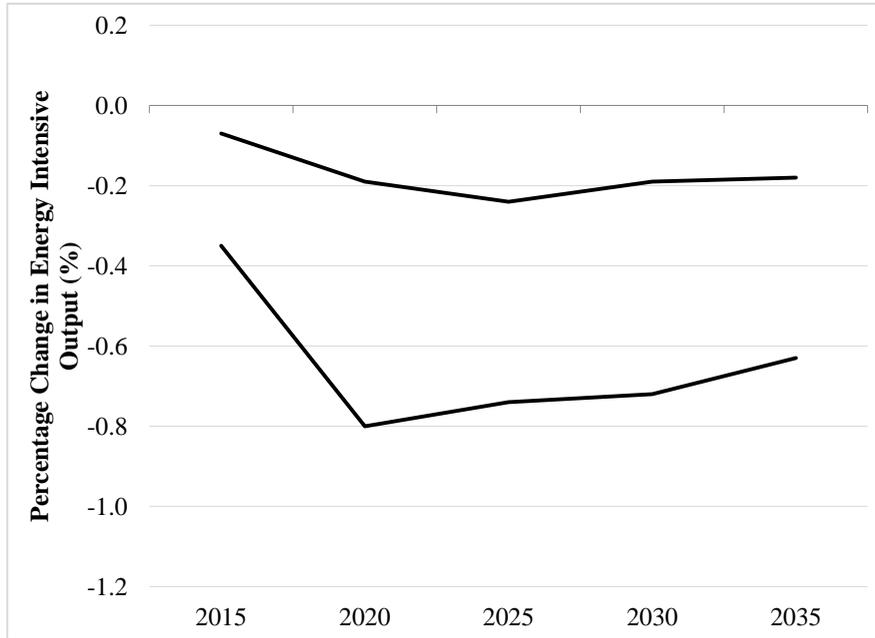
- Under the most favorable conditions, US LNG Exports could grow to 22 Bcf/d (~ 8 tcf) by 2035.
- The range of LNG exports depends upon
 - How demand for natural gas will evolve in Far East (in particular China) and South America.
 - LNG capacity additions in rest of the world.
 - How fast natural gas resource is developed.
 - How policies related to natural gas extraction hinder or support its growth.
 - Whether US can maintain first mover advantage vis-à-vis other global players.
 - How rapidly LNG capacity can be built without straining the capacity of engineering support systems and infrastructure.

Key Findings From the NERA Study



- Across all scenarios, the U.S. was projected to gain net economic benefits from allowing LNG exports.
- Net economic benefits increased as the level of LNG exports increased.
- Natural gas price increases attributable to LNG exports remain in a relatively narrow range across the entire range of scenarios.

Key Findings From the NERA Study



- LNG exports are likely to have a relatively small impact on the manufacturing sector.
- LNG exports are supported by a combination of increased U.S. production and reduced demand mostly in power generation.
- LNG export levels depend upon market uncertainties.

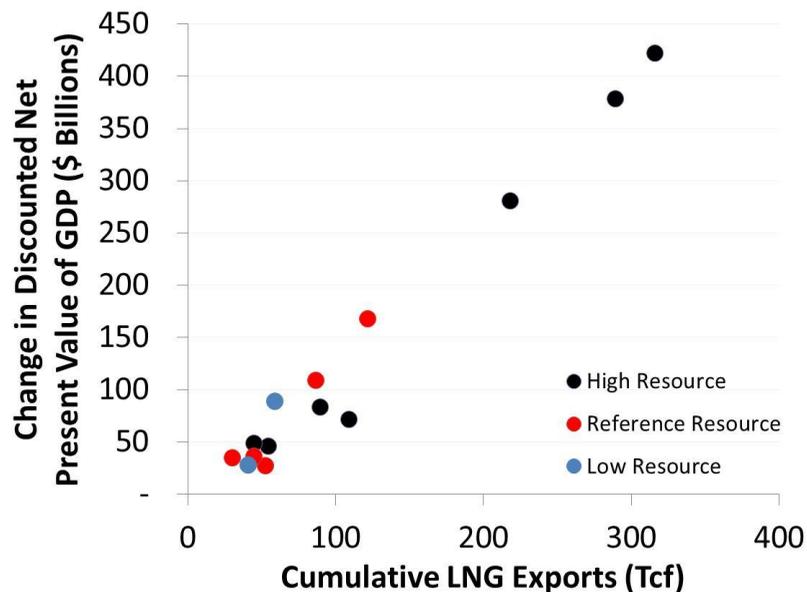
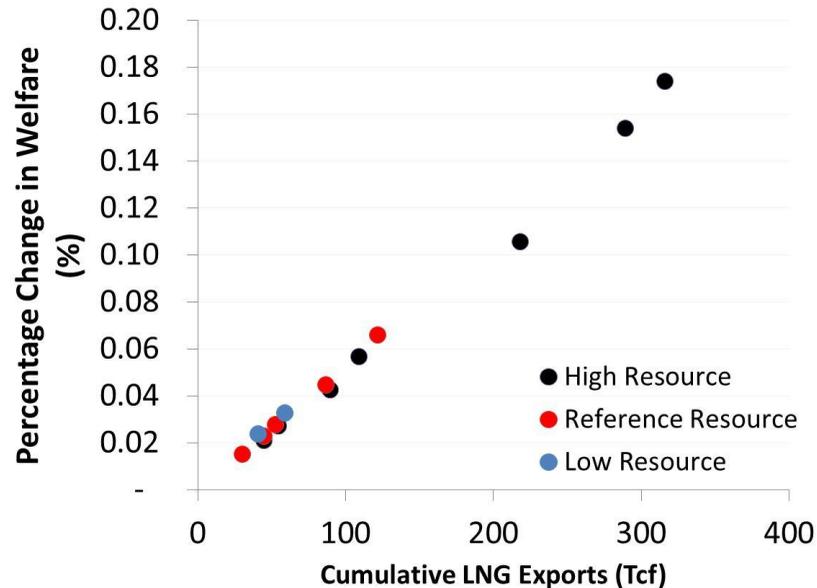
Why Is Any of This Controversial?



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- Conclusions about net benefits of trade
 - Do not depend on the energy intensity or growth rate of manufacturing
 - Do not depend on the natural gas baseline forecast
 - Do not depend on the level of industry detail
 - Do not even depend on the level of exports that comes out of letting supply and demand work

Overview of Results Under Updated Forecasts



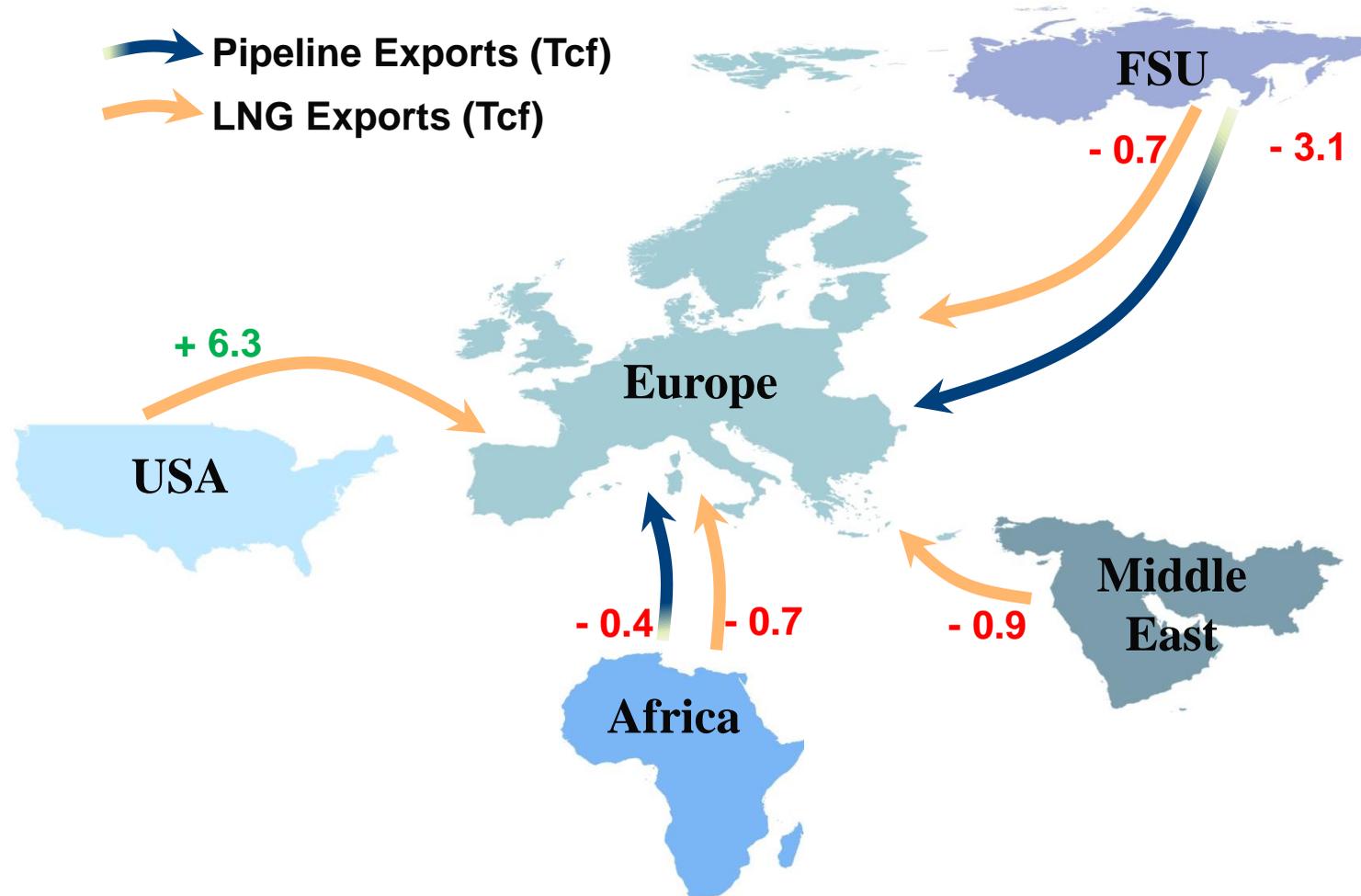
Source: Preliminary results, NERA

- NERA is finishing a new study with new forecasts, more detailed industrial sector, and different intensities.
- Qualitatively, overall macro-economic results and insights are unchanged
 - Across all scenarios, there is net economic benefit to the U.S. economy by allowing LNG exports.
 - Net economic benefits increase as the level of LNG exports increases.

Effects of U.S. Shale Gas Boom on Europe



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European consumption increases by 0.5 Tcf.
Citygate prices drop by \$1.40/Mcf

Relevance of U.S. Experience to Europe – What if Europe Develops Shale Gas?



- Because of its institutions and market structure, Europe is the most likely region to replicate the U.S. shale gas experience
- Development of shale gas in U.S. opens up questions regarding U.S. price competitiveness with other exports
- Development of shale gas in Europe opens up questions about European production costs compared to true cost of imported gas
 - How shale gas might compete with conventional gas or regions that have significant conventional gas reserves (Russia and Middle East)?
 - Will Russia lower its price or move toward competitive pricing to maintain market share?
 - Middle East – will Qatar continue to restrict supplies
 - Availability of U.S. exports
 - Could development of shale gas provide Europe with bargaining power for its imports and ensure stable gas supply conditions?
- Studying these questions would help to assess the possible benefits of shale gas to the European economy



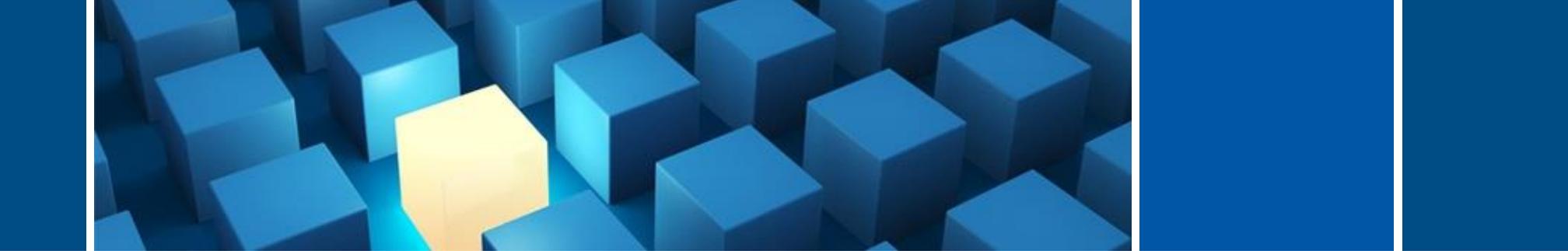
Thank you!

Paul M. Bernstein

Vice President
NERA—Washington D.C.
Work: +1 808 373 7161
Paul.Bernstein@nera.com

Sugandha D. Tuladhar

Senior Consultant
NERA—Washington D.C.
Work: +1 202 466 9206
Sugandha.Tuladhar@nera.com



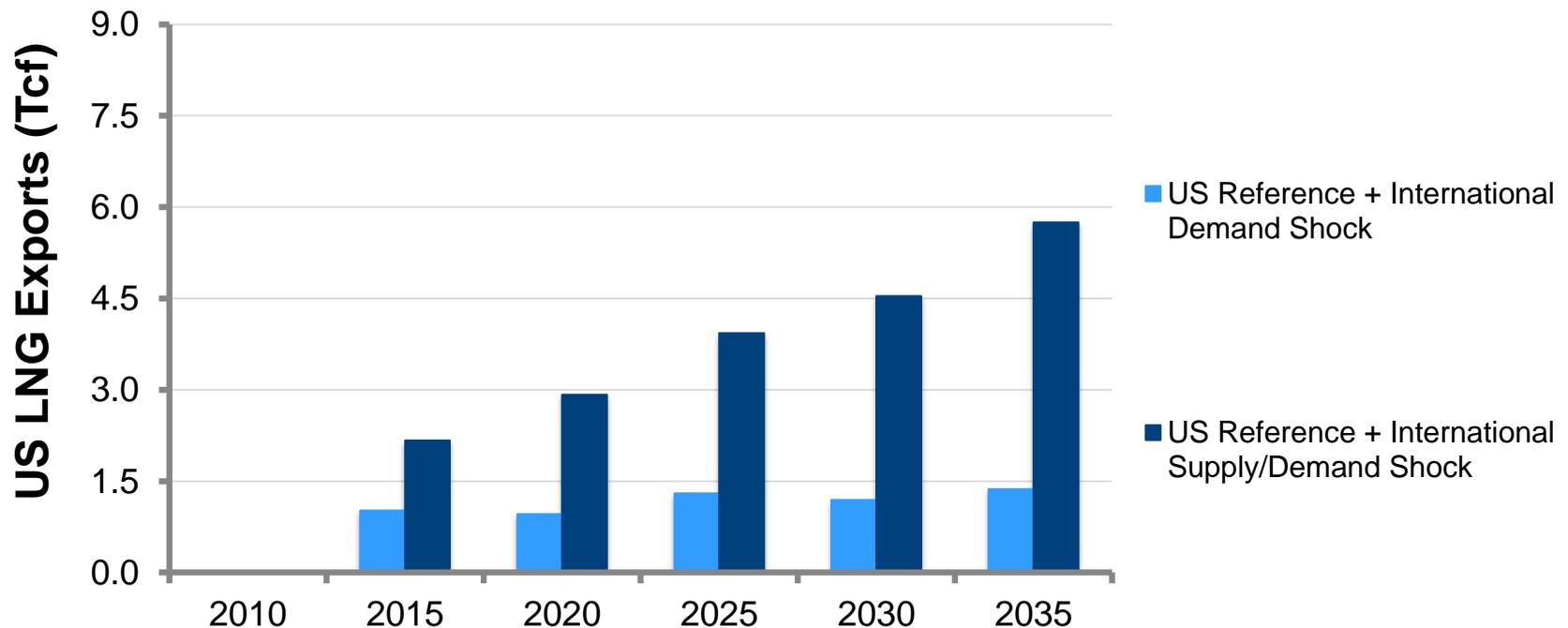
Appendix – Additional Slides

Market Uncertainty: International Shocks Open Opportunity For the U.S.



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- Either greater world demand (**D**) or less world supply (**S**) creates an opportunity for U.S. lower 48 LNG to capture market share.
- If LNG exports are unrestricted, U.S. could export 1.4 to 5.8 tcf by 2035.



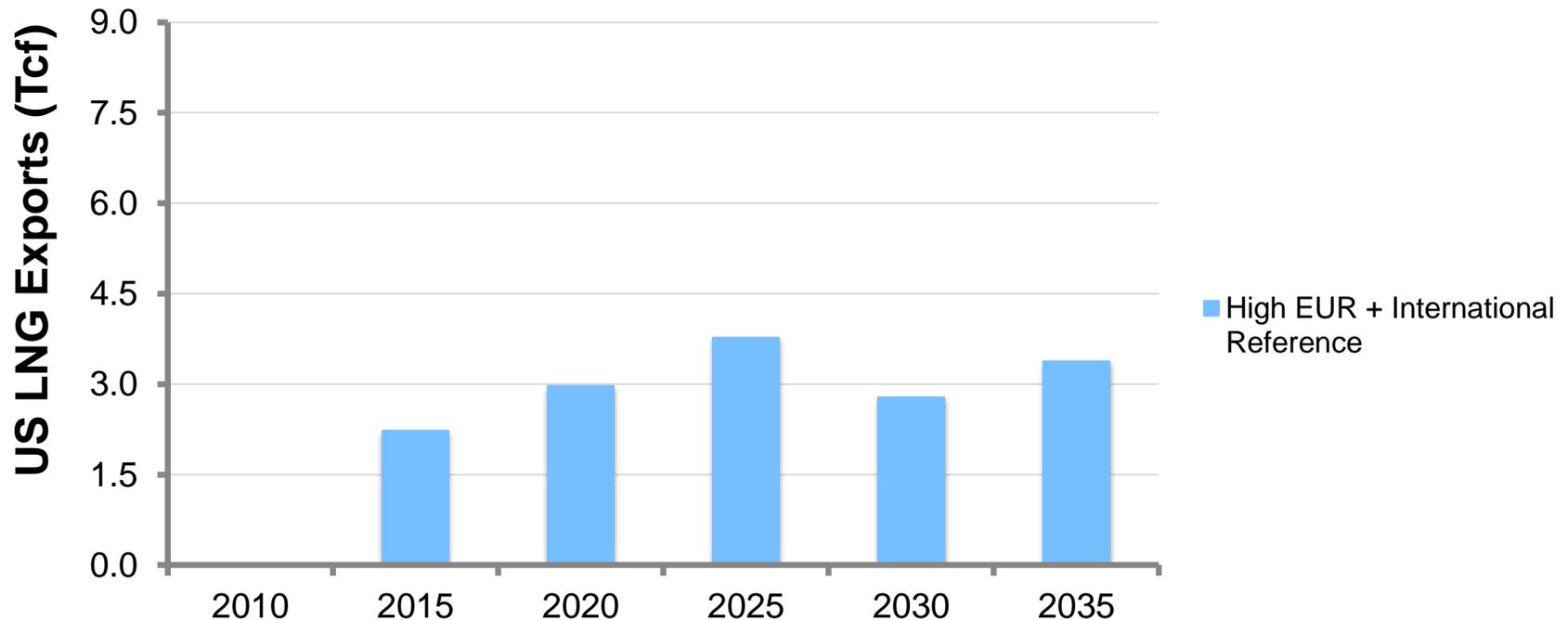
Source: NERA Study

US Resource Base Uncertainty: Abundant Shale Gas Leads to More Exports



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- Similarly should U.S. shale gas prove more abundant than in the Reference case then the U.S. Lower 48 would export LNG.
- If LNG exports are unrestricted and natural gas abundant, U.S. could export 3.4 tcf by 2035 with reference case global demand



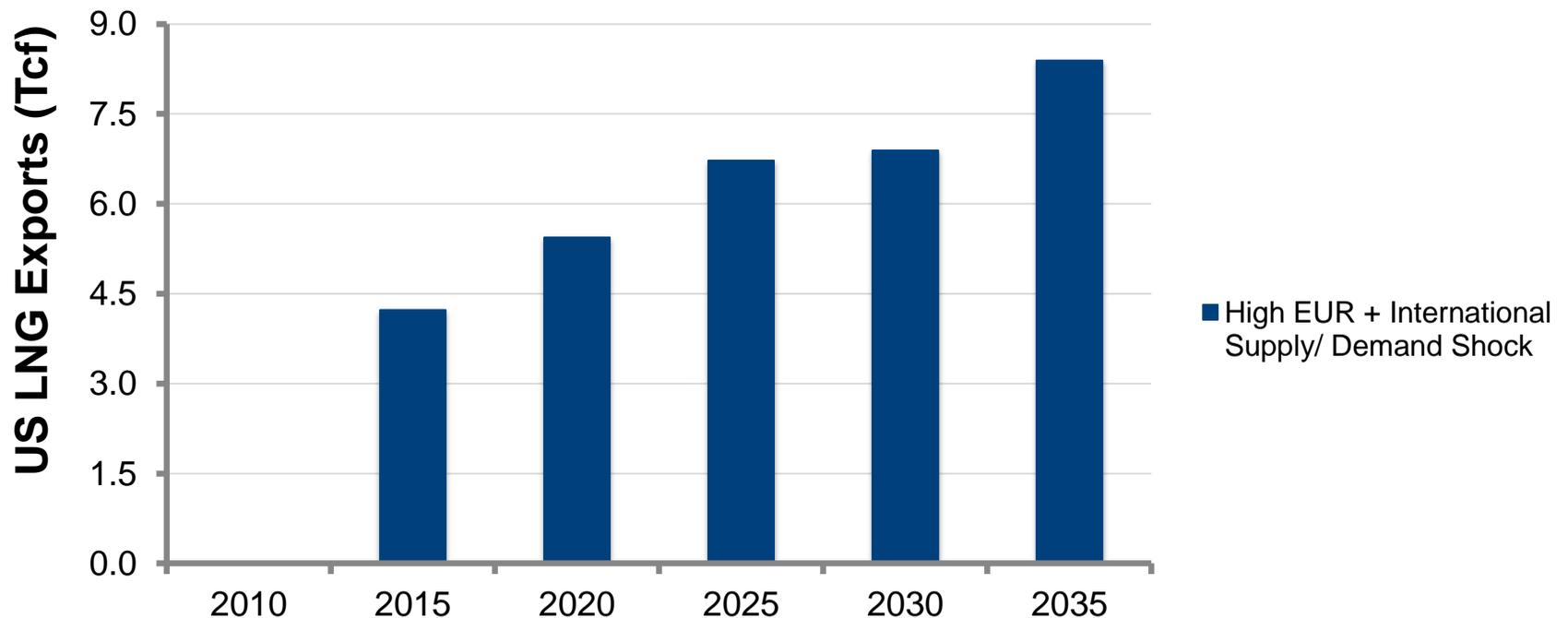
Source: NERA Study

Policy Uncertainty: Export Level Rises Even More If There Is International Demand-Push or Supply-Pull



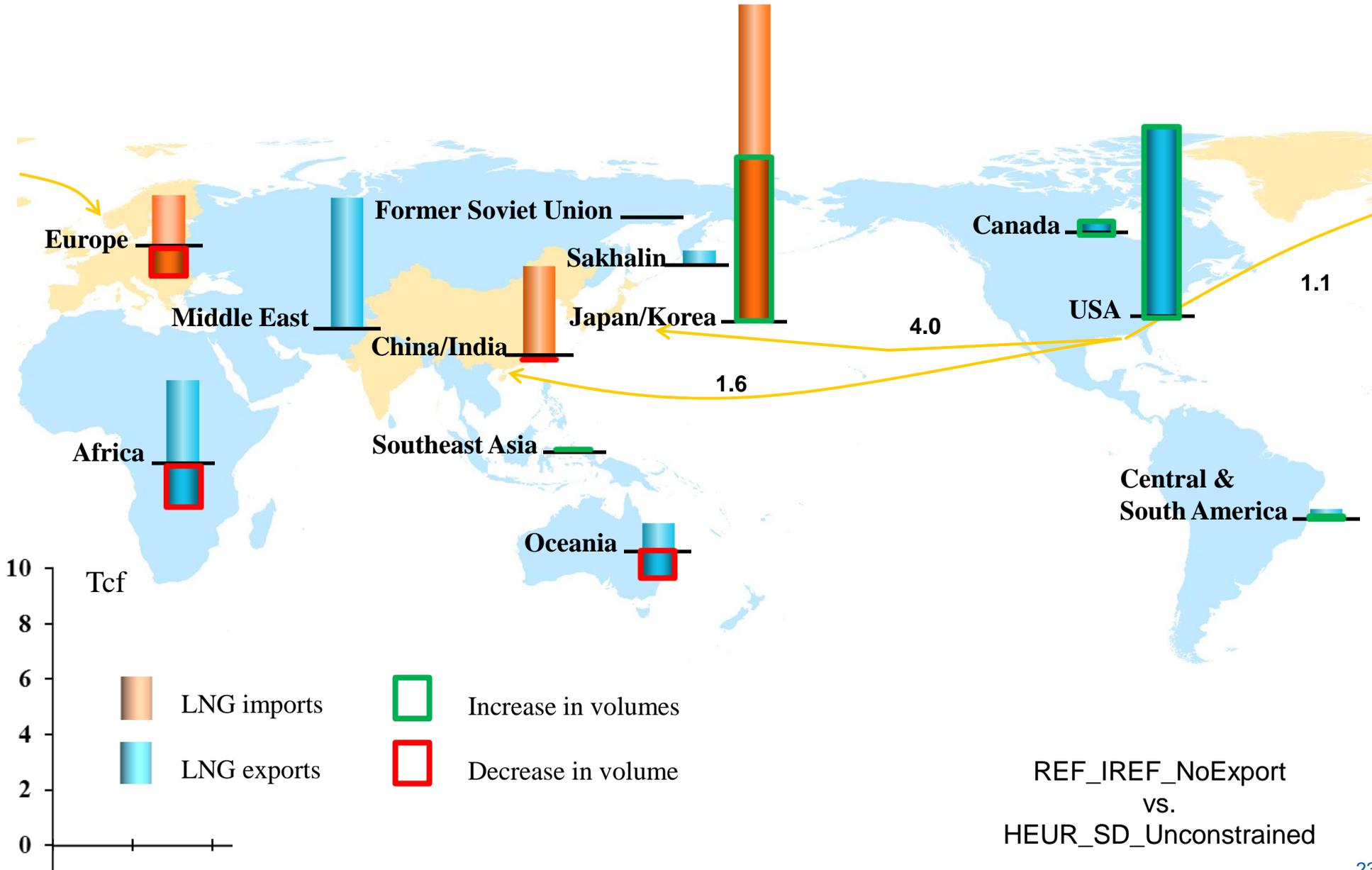
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- Abundant U.S. shale gas (**HEUR**) and greater world demand (**SD**) would result in even greater U.S. LNG exports
- If LNG exports are unrestricted, U.S. could export 8.4 tcf by 2035 (2.6 tcf more than the U.S. REF case)



Source: NERA Study

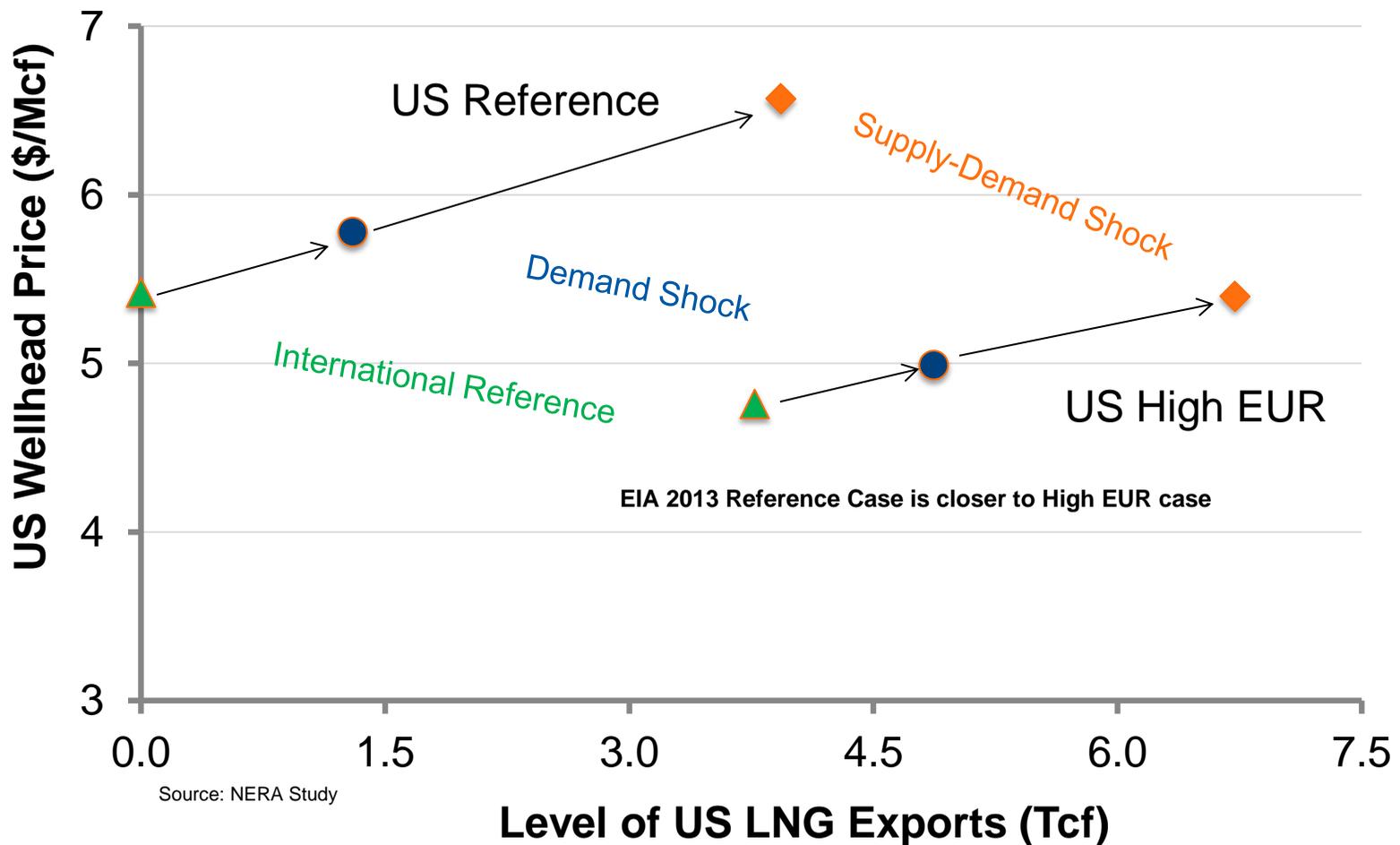
Changes in Regional LNG Supply/Demand in 2025 (Tcf)



Natural Gas Price Uncertainty: Favorable Supply Shrinks Price Increases While Supporting More Exports



Wellhead Price vs. Export Levels in 2025



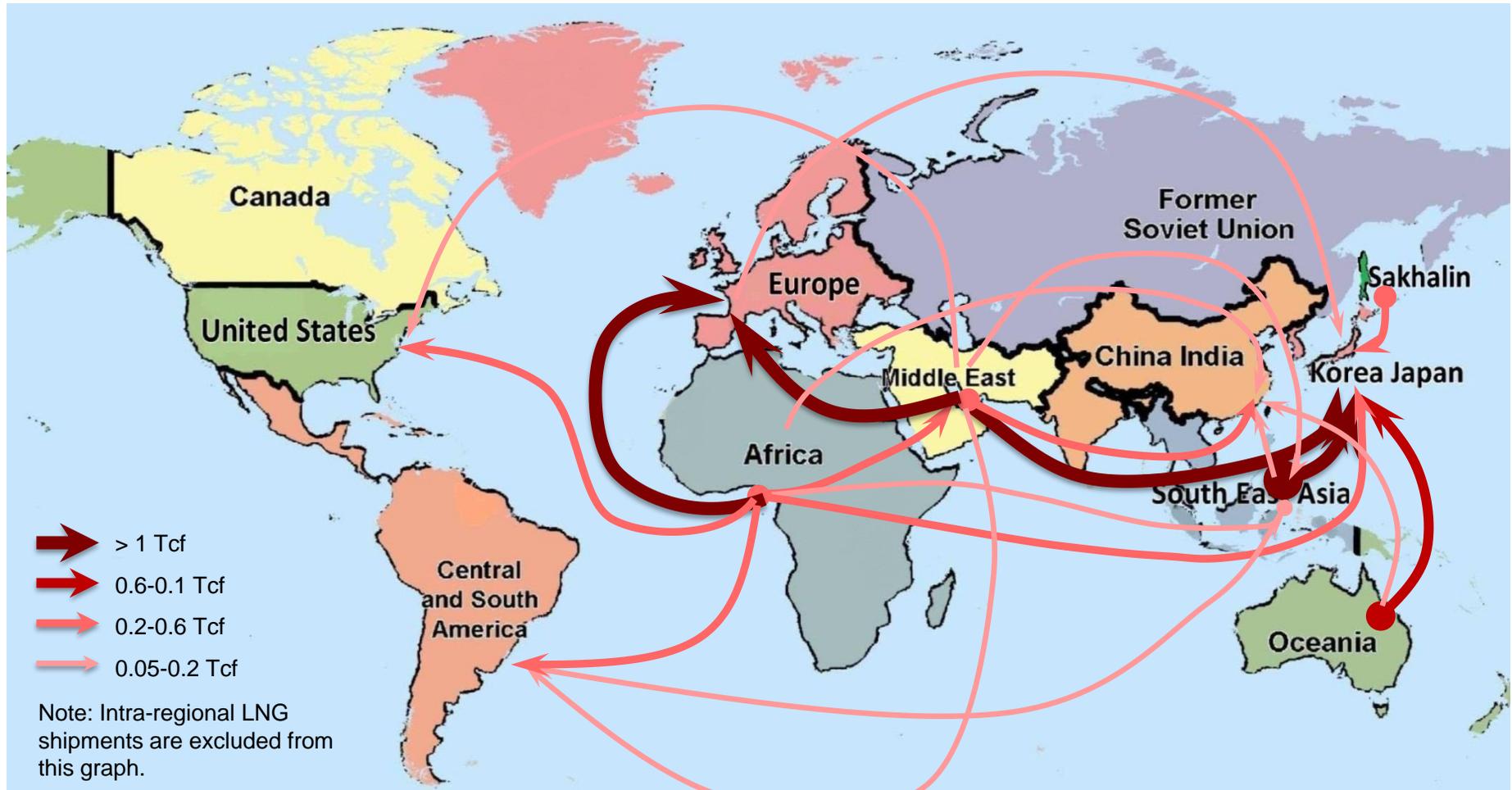
Source: NERA Study

Baseline View: World Is At Balance With No LNG Exports From the U.S.



- We started with the IEO 2011 view that growth in exports from other areas will satisfy global demand with no lower 48 LNG exports
- With this view of the world, conditions are not favorable for U.S. lower 48 LNG exports to displace other projects
 - LNG from North America would not be low enough in cost displace existing or under construction projects in other parts of the world

LNG Flows in 2010



Global LNG demand 9.7 Tcf
Global natural gas demand 113 Tcf

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