

Impact of U.S. LNG on International Gas Prices

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Introduction

The recent development of hydraulic fracturing to release natural gas reserves entrapped in shale has resulted in a U.S. natural gas bonanza.

Question: Will the U.S.'s abundance of natural gas have an impact on world natural gas prices? If so, by how much?

Answer: It depends. (What else can you expect from an economist?)

Question: Will U.S. exports of natural gas raise domestic prices?

Answer: Not likely.

LNG Terminal Economics

Although the supply of natural gas is elastic, it's capability to be delivered isn't.

- ◆ LNG terminals are highly capital intensive projects – big commercial risks
 - >\$29B for Chevron's Wheatstone (Australia) – 8.9 tpa
 - \$5B for Cheniere Sabine Pass – 8 tpa
 - LNG facilities take 4-5 years from initiation to final construction
- ◆ Such projects require a firm base level of capacity utilization for financing
 - Not financed “on the come”
 - Large anchor tenants needed

Bottom line: Most LNG facilities will be built based on long-term contracts, not on playing in the spot market.

Delivered supply elasticity much smaller than commodity supply elasticity.

Current World Supply Arrangements

Most current European and Asian natural gas contracts are long-term, and oil price-indexed

- ◆ Contract durations vary, but distribution of durations and volumes not known
 - Turnover rate for contracts not known either
- ◆ Estimates of percentage market under LT contract vary from 60–80%
- ◆ Fukushima price spike in world natural gas price, but declining U.S. prices over the same period.
 - Short-run appears to be supply constrained

Bottom line: Speed at which long term world market price can change is much slower than short-term price changes.

Non-U.S. Supply Competition Robust

U.S. is hardly the only fish in the pond

- ◆ Canada
 - Also has large shale deposits; projected it could export 30 tpa
- ◆ Australia
 - Large natural gas reserves; two terminals in existence; others under construction and consideration
- ◆ Qatar
 - Exports >60m tpa of natural gas via LNG
- ◆ Malaysia, Indonesia, others

Non-U.S. Supply Competition Robust (cont'd)

- ◆ China
 - May have four Marcellus-sized shale plays – self-supply?
- ◆ Africa
 - Nigeria exports now; investigating expansion
- ◆ Russia
 - Barents field
 - Russia already appears easing its pricing and moving to tying its long-term contract prices to spot natural gas prices

Bottom line: Lots of competitors who can/will react to U.S. moves in this area, even anticipatively.

Whither World Demand for Natural Gas?

Perhaps the single largest unknown is in the world's demand growth for natural gas

- ◆ As of now, the Asian markets are largest source of long-term demand uncertainty
 - Non-nuclear Japan?
 - India
 - China
- ◆ European wild card – non-nuclear Germany?

Bottom line: Very robust demand growth is possible

Possible Future States of the World Under Increased LNG Trading

Rest of World U.S.	De Minimis Change in Prices	Prices Decline
De Minimis Change in Prices	(Status Quo) <ul style="list-style-type: none"> ◆ Not much LNG exported from U.S. (due to development constraints or perceived risk) relative to RoW's demand (oil-indexed contract turnover and growth) ◆ Not much LNG development from other gas exporting countries either, or that gas is contracted at oil-index. ◆ Or, LNG buyers are cartel of existing gas sellers who resell at oil-indexed prices. 	1 <ul style="list-style-type: none"> ◆ Lots of exports to RoW, but <ul style="list-style-type: none"> - Not significantly from U.S. - Possibly subsidized from other gas exporting countries - Or, lots from N. America but not from regions tied to U.S. supply (e.g., remote Alaska) ◆ Or, substantial shale gas development in China, Africa...
Prices Rise	 <ul style="list-style-type: none"> ◆ Not much U.S. LNG exports, so sellers' market (priced to oil). Inelastic supply in U.S. so domestic demand and exports push up cost of U.S. gas (not a very likely situation). ◆ Or, sell a <u>lot</u> of U.S. LNG, but world demand for gas grows faster and buyers reluctant to enter competitively indexed contracts. ◆ Or, sell a lot of U.S. LNG to current sellers of gas to Asia and Europe, who resell it at oil-based prices (gas cartelization). 	2 <ul style="list-style-type: none"> ◆ (Suspected future) (EIA model targeted at this?) ◆ U.S. exports 6-12 bcf/d of LNG (enough to push U.S. supply curve out, but not triggering political constraints) ◆ Competitively priced LNG supply grows fast enough to keep pace with oil-indexed contract rollovers, plus demand growth, pushing RoW away from oil-indexation

De Minimis Change in Prices – U.S. and Rest of World

(Status Quo)

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Prices Rise – U.S.

De Minimis Change in Prices – Rest of World

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De Minimis Change in Prices – U.S. Prices Decline – Rest of World

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Prices Rise – U.S. Prices Decline – Rest of World

(Suspected future) (EIA model targeted at this?)

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Mr. Hanser assists clients in issues ranging from utility industry structure and market power and associated regulatory questions, to specific operational and strategic issues, such as transmission pricing, generation planning, and tariff strategies. He also has expertise in fuels procurement, environmental issues, forecasting, marketing and demand-side management, and other complex management and financial matters.

Over his thirty years in the industry, Mr. Hanser has appeared as an expert witness before the Federal Energy Regulatory Commission (FERC), the California Energy Commission (CEC), the New Mexico Public Service Commission (NMPSC), the Public Service Commission of Wisconsin (PSCW), the Vermont Public Service Board (VPSB), the Public Utilities Commission of Nevada (PUCN), the Connecticut Siting Commission, the Pennsylvania Department of Environmental Protection, and before arbitration panels and in federal and state courts. He has also presented before the National Association of Regulatory Utility Commission (NARUC) and the New York State Energy Research and Development Authority (NYSERDA). He served six years on the American Statistical Association's Advisory Committee to the Energy Information Administration (EIA).

Prior to joining *The Brattle Group*, Mr. Hanser held teaching positions at the University of the Pacific, University of California at Davis, and Columbia University, and served as a guest lecturer at the Massachusetts Institute of Technology, Stanford University, and the University of Chicago. He has also served as the manager of the Demand-Side Management Program at the Electric Power Research Institute (EPRI). He has been published widely in leading industry and economic journals.

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