

The Globalization of Gas: Regional Seasonality, Misplaced Storage, and Emerging Arbitrage

A Multi-Client Study on Global Gas Storage

OVERVIEW

With the rising globalization of gas trade, all market players need to focus on the critical role storage plays as a bridge between seasonal gas demand variations and prices. In its new multi-client study, THE GLOBALIZATION OF GAS: REGIONAL SEASONALITY, MISPLACED STORAGE AND EMERGING ARBITRAGE, PIRA examines how storage's role will change in the years to come, fueled by greater and greater interconnectivity among the world's major regional gas markets.

Until recently, gas markets functioned regionally, with North America, Europe, and Asia all operating independently with unique supply/demand fundamentals. Seasonal gas demand is extremely different in each market, as are the origins of supply. From these differences, varying approaches to meeting seasonal swings in demand emerged based on geography and geology, supply (domestic vs. pipeline vs. LNG imports), and end-use markets. As a result, the infrastructure in each market is different, reflecting the regional needs upon which the industry was originally built.

This regionality is in conflict with a globalizing gas market. Vast new supplies of pipeline gas and LNG are coming, but not necessarily into markets *when* they are needed or *where* they can be stored when not needed. This major shift in the supply/demand balance will have a profound impact on LNG and pipeline gas pricing around the world, leading to questions as to how the world's diverse regional demand centers will evolve into a single global entity, like oil. What will a storage-short Asia do with LNG supplies in the summer? Will North America store gas for Europe and Asia? Will Europe shift from seasonal to maximum gas production to compete with LNG supplies?

PIRA will answer these questions and assess the impact of these emerging forces in THE GLOBALIZATION OF GAS, which comprises a detailed written report, online database, and workshop and which includes these key features:

- **An outlook of the factors driving each region's future LNG and pipeline gas demand.** Demand trends by region/country and by sector will show how different growth rates at different times of the year will affect trade flows and, by extension, gas prices along the forward curve.
- **A detailed look at global gas storage capacity and how it will be utilized going forward.** North America's vast amount of seasonal storage will not only be used for meeting peak seasonal demand in North America, but it will also act as a surrogate location to land gas during low demand periods in markets such as Asia and Europe. This additional storage in North America will free up gas supplies for storage-short Asia and Europe during peak winter demand periods.
- **An analysis of the role of demand seasonality in determining which markets will receive gas and when.** The key factor here is how heavily a particular region or country relies on seasonal gas use based on cooling or heating degree days and how sensitive that gas market will be to variations in temperature versus normal.

- **An assessment of the ideal relationship between storage capacity and seasonal gas demand.** With every country approaching the storage/demand relationship differently, it begs the question of whether or not there is an ideal balance between the two. As domestic production declines, countries will need to build more seasonal storage to hedge against import risks.
- **An expansive database of key industry statistics — actual and forecast — that underpin the analysis found in the report,** including country-level demand, seasonal gas use, existing and future gas storage, and price forecasts.

REPORT OUTLINE

An outline of the written report — a key feature of the study and expected to be some 250+ pages in length ([see full description of deliverables on page 6](#)) — is as follows:

A. Overview of the Role of Storage in the Global Gas Supply/Demand Balance

- a. Key Findings
- b. Conclusions
- c. Effects on Seasonal Gas Pricing and the Forward Curve

B. Seasonality and Gas Demand

- a. Global Gas Demand Profile
 - i. Global Gas Demand
 - ii. Demand by Region (All)
 - iii. Demand by [Country**](#)
 1. [Gas Demand by Sector*](#)
 2. Sector Breakdown by Region
 - iv. Demand and Macroeconomic Drivers
 1. Population and Residential/Commercial Demand
 2. Industrial Production and Industrial Gas Demand
 3. Power Sector Demand and GDP/IP Growth
- b. Gas Demand by Season
 - i. Global Gas Demand by Quarter / by Month
 - ii. By Region
 - iii. Key Countries in Each Region
 1. Ranking Countries/Regional Markets by Level of Seasonal Demand Swing.
 - a. Winter Peaking Markets
 - b. Summer Peaking Markets
 2. Particular Roles of Germany, U.K., U.S. Northeast, South Korea, and Japan.
 - iv. Establishing Seasonal Patterns by Sector for Each Region
 1. Minimum/Maximum Range of Gas Use per Sector
 2. Peak Daily Demand vs. Storage Buffer
 - v. Key Factors by Quarter That Create Deviations from Normal
 1. Hot and Cold Weather
 2. “Shoulder” Months and the Uniqueness of 2Q Demand.
 3. Maintenance (Gas Field or Power Sector)

- vi. The Role of Storage in the Summer versus the Winter
 - 1. Fuel Switchability and Alternatives
- vii. Counter-Seasonal Gas Use
 - 1. Southern vs. Northern Hemisphere Demand
 - 2. Power-Intensive vs. Heating-Intensive Demand
 - 3. Key Summer Peaking Markets and Their Value
- viii. PIRA Seasonal Gas Index
 - 1. Ranking Most Important Markets by Season
- c. Global Demand Growth Outlook by Quarter Through 2012 and Long-Term Outlook
 - i. Global Demand Growth
 - ii. Regional Growth
 - iii. By Country
 - 1. Gas Demand Growth by Sector*
 - 2. Establishing Seasonal Patterns by Sector
- d. Key Uncertainties in Forecast Period
 - i. Will Gas Demand Become More or Less Seasonal and Why?
 - ii. What Will Happen to the Peaks for Summer and Winter Peaking Markets?
 - iii. The Effect of the Industrial Sector's Diminishing Role in the U.S. and Europe
 - iv. Will the Power Sector's Role in Demand Change Be More Seasonal or High Load?

C. The Relationship Between Supply and Storage

- a. Role of Storage as a Piece of Total Supply
- b. Flows of Arbitrage
 - i. The Extent of Swings in Regional and Seasonal Flows
 - ii. Seasonal Patterns and Divergence Based on:
 - 1. Price Differences
 - 2. Seasonal Demand
 - 3. Storage Capacity and Constraints
- c. Contract Flexibility
 - i. LNG vs. Pipeline Contracts
- d. Supply-Side Responses
 - i. Why U.S. Supply Will Not Respond
 - ii. Why European Supply Responds Too Much
 - iii. Premium on Asian Supply Sources (e.g. Pluto, Sakhalin)
- e. What Is the Optimal Amount of Storage for a Given Market?
 - i. Increasing Storage vs. Increasing Peak Import Capacity
 - 1. "Virtual" Gas Storage (Seasonal Gas Production vs. Out-of-Market Storage)

D. Regional Gas Storage

- a. Current Capacity
 - i. North America, Europe, and Asia; Other Regions and Their Roles
- b. History of Storage Utilization

- c. How Full Will Storage Need to Be
- d. Will Storage Always Be Full?
- e. Is There an Appropriate Amount of Storage for a Gas Market?
- f. Future Capacity Additions by Region
 - i. Who Wants to Build and Why
 - ii. Categorizing the Players
 - iii. Gas Storage and Fuel Substitution in Power
 - iv. The Power Sector as a Virtual Form of Storage

E. Types of Storage and Their Distinct Roles

- a. Salt Dome, Aquifer, LNG, Peak Shaving, etc.
- b. Country-by-Country Analysis of Influences on Deliverability
- c. Economics of Building New Storage

F. The Role of LNG in Storage

- a. Floating Storage
- b. Regasification as a Form of Seasonal Optionality

G. The Influence of Storage on the Forward Price Curve

- a. The Summer-Winter Spread
- b. When to Inject More: 2Q vs. 3Q
- c. Henry Hub-NBP Spread
- d. Gas-Oil Spread

***Sectors Covered in the Study**

Power Industrial Residential/Commercial

****Countries Covered in the Study**

Asia:

China India Japan Korea Taiwan

Europe:

Austria Belgium Czech Republic Denmark Finland France
 Germany Greece Hungary Ireland Italy Luxembourg
 Netherlands Norway Poland Portugal Russia
 Spain Sweden Switzerland Turkey U.K.

North America:

U.S. Canada Mexico

South America:

Argentina Brazil Chile

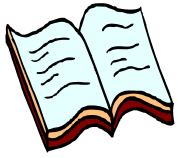
WHO WILL BENEFIT FROM THIS STUDY?

The stakes are high when it comes to making decisions regarding future gas supply, demand, storage, and pricing. Inevitably, market participants will end up on either side of multi-million-dollar gains or losses. THE GLOBALIZATION OF GAS will help market participants keep ahead of the competition through a better understanding of the future interplay between regional gas supply/demand balances, storage availability (and lack thereof), seasonal gas use, and regional gas pricing. **The following market participants will all benefit from this study:**

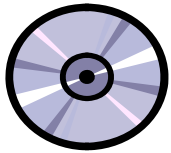
- **Producers** know the importance of gas supply/demand balances that set relative values for pipeline gas and LNG and consequently affect gas price differentials around the world. This study will help them identify the best price for their gas at a given time of year, and where there is a potential to store gas at a minimal cost and maximum netback.
- **Marketers** need to understand the interplay between regional markets and the global gas balance. As more and more LNG enters the markets, it is influencing both spot prices and the forward curve in all major markets. Every day new gas marketers are obtaining access to LNG via tenders or swaps for pipeline gas. Access to storage around the world will be critical in realizing profitability, and THE GLOBALIZATION OF GAS will help gas marketers to understand how the convergence of the world's regional gas markets will influence when is the best time to lift the gas at the best value and where the markets to sell this gas will be located. In any given month or quarter, the story will change immeasurably.
- **Trading companies** want to anticipate regional supply/demand changes and price dynamics. Traders are beginning to secure large sums of LNG and capture the price discrepancies among the world's regional markets. This study's analysis will aid in understanding and planning terminal and shipping infrastructure needs to best capture future trading opportunities.
- **Shipping companies** know that their single largest issue at the moment is that additional tanker availability is outpacing supply; however, that is beginning to change as many new LNG trains enter the market over the next five years. New supply will bring an eruption in LNG trade that will be heavily influenced by seasonal demand and access to storage. THE GLOBALIZATION OF GAS will provide insight into where the gas/LNG will flow.
- **Electric utilities and other end-users** constantly consider how changing gas price dynamics will influence the choice of which fuel is consumed and future capacity decisions. Suddenly, what happens to demand in Spain now matters in Houston and what happens in Tokyo can affect gas prices in the U.K. The study will make end-users better equipped to adapt to seasonal shifts in gas supply and price, and help new project developers make more effective evaluations of gas supply options and project viability.
- **Financial institutions** must make sound evaluations of how changing market conditions will affect the economics and financing of new gas infrastructure investments and marketing ventures. THE GLOBALIZATION OF GAS will allow for more informed decision-making on potential projects; specifically how the chronic shortage of underground gas storage around the world will create a premium on the assets that already exist. New storage projects are being announced weekly, but which ones will be built will depend on where the sites will be, how much access they will have to global supplies, and how much it will cost to supply them with cushion gas.

WHAT DO STUDY SUBSCRIBERS RECEIVE?

For each study purchased, subscribing clients will obtain the following valuable set of services:



WRITTEN REPORT (May 2008). Three (3) copies of the final report (printed and online) that will spell out the findings of the study, the bases underlying those results, and a discussion of key uncertainties that impact the major findings. The report will discuss the Reference Case results by region and possible changes in the market that could affect the underlying results.



DATABASE (May 2008). Three (3) User IDs to access online historical data back through 1995 and forecasts through 2012 in Excel spreadsheets for:

1. **Country-level demand with by-sector breakdown**, including forecasts
2. **Seasonal gas use breakdowns**, by quarter and month where applicable
3. **Existing and future gas storage** with capacity and maximum send out figures
4. **Price forecasts by region** for North America, Europe, and Asia



WORKSHOP (Second Quarter 2008). A one-day briefing to be held after the report and database are released, where the study's authors discuss the key findings and their implications. Subscribers can attend in person — in either Houston or London — or via WebEx from their offices.

FEES AND OPTIONS

THE GLOBALIZATION OF GAS: REGIONAL SEASONALITY, MISPLACED STORAGE AND EMERGING ARBITRAGE can be purchased by both PIRA retainer clients as well as non-clients. Existing PIRA retainer clients receive a reduced price. Companies that order before January 31, 2008, receive a 10% "early bird" discount. Subscriptions allow for three authorized users (3 separate online passwords, printed books, and workshop seats). For detailed service pricing options, see the [Acceptance Form on page 8](#).

ABOUT PIRA ENERGY GROUP

The PIRA Energy Group, founded in 1976, is an international energy consulting firm, offering Retainer Client Services as well as customized consulting on a broad range of subjects in international oil, natural gas (and LNG), coal, electricity, biofuels, freight markets, and related environmental issues. PIRA provides evaluation of key U.S. and international energy issues that impact the behavior and performance of the industry and its various markets and sectors. Currently, more than 500 companies worldwide retain PIRA, including international and national integrated oil and gas companies, independent producers, refiners, marketers, oil and gas pipelines, electric and gas utilities, industrials, trading companies, financial institutions, and government agencies.

THE STUDY TEAM

Ira B. Joseph (Study Leader and Executive Director, International Gas) manages PIRA's Global LNG and European Energy retainer services. In 2001, Ira co-authored PIRA's multi-client study on Atlantic Basin LNG markets. He joined PIRA in 1999 after working at Energy Intelligence Group for over a decade, as editor-in-chief of *World Gas Intelligence* and senior editor of *Petroleum Intelligence Weekly*. Ira holds a B.A. from the University of Michigan and an M.A. in international economics from Johns Hopkins School of Advanced International Studies.

Mickey Kwong (Director, International Gas) is responsible for analyzing North American and Asian gas market fundamentals, including demand, production, and imports, and he contributes to all of the Group's reports. From 1998 to 2006, he was an LNG/natural gas consultant at Poten & Partners, where he advised clients from Asia, Europe and the Americas on pricing, demand, and price risk management. Mickey has a B.B.A. in finance from Baruch College.

Dr. Mark Schwartz (President and Managing Director of the Scenario Planning Group) works closely with PIRA's Global Oil and Natural Gas groups to evaluate the key assumptions underlying their outlooks and to develop plausible alternative assumptions and outcomes, delivered in the Scenario Planning Service. Before joining PIRA in 2002, he was the Chief Economist of ExxonMobil Corp., where he was responsible for developing the company's long-range economic and energy outlook. During his 25 years at Exxon he also had assignments in Upstream Planning, Treasurers, and Corporate Planning functions. Mark holds a Ph.D. in economics from the University of Pennsylvania.

Gregory J. Shuttlesworth (Executive Director, Natural Gas) directs the PIRA North American Gas Group's research covering supply/demand fundamentals. His work focuses on in-depth analysis of how the dynamics of gas production, demand, interfuel competition, and global LNG trade drive prices at Henry Hub and other major U.S. and Canadian pricing points. He is a principal author of retainer client reports that include the *Gas Forecast Monthly* and *Gas Flash Weekly*. Before founding PIRA's Natural Gas Group in 1982, his professional career centered on global petroleum and energy economics. He held the positions of Senior Consultant at the petroleum-consulting firm of Walter J. Levy Associates and Energy Economist at the Chase Manhattan Bank. Greg is a graduate of Johns Hopkins University. He has a B.A., M.B.A., and completed post-MBA studies in econometrics.

Harvey Harmon (Senior Director, North American Natural Gas and Global LNG) has over 25 years experience in the energy industry. Before joining PIRA in 2005 he was Director of Natural Gas Import/Export Activities and Senior LNG Policy Advisor at the U.S. Department of Energy. Formerly, Harvey was responsible for competitor and market analysis for the Global LNG unit of El Paso. He has also consulted for Shell Gas & Power on LNG issues. Harvey holds a M.S. in ocean engineering from the University of Wisconsin and an M.B.A from the University of Texas.

Madeline Jowdy (Senior Analyst, Global LNG) joined PIRA in 2004 after working at Energy Intelligence Group (EIG) as the LNG correspondent for *World Gas Intelligence* and *Natural Gas Week*. She has authored several books on crude oil marketing and natural gas, including versions of EIG's *Top 100 Oil Companies* and *World Gas Handbook*, as well as studies on the Atlantic Basin LNG trade and shipping. Madeline has a B.A. in economics and international relations from American University and completed a master's program in Middle East Studies at Georgetown's School of Foreign Service.

ACCEPTANCE FORM

(Company Name) _____ wishes to subscribe to the multi-client study THE GLOBALIZATION OF GAS: REGIONAL SEASONALITY, MISPLACED STORAGE, AND EMERGING ARBITRAGE for ____ number of users. We understand and agree that the fees are as follows:

	PIRA Client, 3 Users	PIRA Client, Add'l Users	Non-Client, 3 Users	Non-Client, Add'l Users
Standard Fee*	\$21,500	\$1,000 each	\$25,000	\$1,250 each
<i>Before Jan. 31, 2008*</i>	<i>\$19,350</i>	<i>\$900 each</i>	<i>\$22,500</i>	<i>\$1,125 each</i>

* New York City-based companies, please add 8.375% sales tax; Long Island-based companies, please add 8.625% sales tax; all other New York State companies, please add the county-appropriate sales tax.

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Note: *The Globalization of Gas* will contain no confidential technical information, to the best knowledge of PIRA. However, except for information that is or becomes available to the public in printed publication, or is already in the possession of subscriber or developed independently by subscriber, or is received by subscriber in good faith from a third party, any information in the study is for the sole and confidential use of the subscriber. Subscribers agree to use reasonable efforts to protect the confidential nature of the information supplied to them as part of this study.