



## BRIDGING THE METHANE GAP: RESOLVING THE GROWING GAP BETWEEN NATURAL GAS SUPPLY AND DEMAND

Study Prospectus and Invitation to participate in this new multi-client study

### ► THE METHANE GAP

By 2003, U.S. natural gas demand was poised for explosive growth after the construction of 200 gigawatts of new power production capacity since 1998. As the power sector turned to natural gas to fulfill growth in electricity demand, domestic supply of natural gas began to decline. In 2003, rising demand by the power sector could only be met by reducing demand in the industrial sector through higher gas prices. Since then, prices have stayed high, as the industrial and power sectors have competed for the available gas supply. Episodically, both sectors have competed against the power sector in Europe, as low hydro supplies and rapid declines in UK gas production have motivated purchasers across the Atlantic to bid away LNG supplies headed for the United States.

The industrial demand destruction caused by the explosion in power sector demand for natural gas in 2003 was viewed as temporary. LNG terminals were under construction and the industry worried that the new supplies would flood the market and depress prices. The past 30 months have shown supply to be even more at risk than experienced in 2003. Prices have been higher and more volatile, and demand highly inelastic on a short-term basis. The gap between demand and supply has widened suddenly and broadly several times, swinging prices as high as \$15 per mmBtu.

There are a growing number of signposts that point to more of the same, including the possibility that Lower 48 U.S. natural gas production may be declining at an accelerating rate. There are also indications that LNG supplies may not be plentiful. If these signposts prove to be accurate predictors, the consequence of these events could be higher, more volatile, long-term gas prices and increased competition between gas-intensive industries and utilities that would bring dramatic shifts in demand patterns. How will this emerging "methane gap" be resolved over the next 10 years and beyond?

### **GLOBAL INSIGHT IS OFFERING PARTICIPATION IN A NEW AND IMPORTANT MULTI-CLIENT STUDY: *BRIDGING THE METHANE GAP.***

#### **SOME OF THE SPECIFIC QUESTIONS BEING ADDRESSED INCLUDE:**

- How long can the high level of drilling for conventional and non-conventional reserves offset the decline in gas production in existing fields?
- How steep might the decline rate of gas production be?
- What will be the demand response for natural gas?
  - Will industrial demand continue to increase, remain relatively flat with improvements in efficiency, or decline rapidly because of high and volatile prices?
  - How will the power generation sector (that has become so wedded to gas as a fuel) respond and make the best use of gas at these high prices? What generation source will fill the gap that natural gas was poised to fill?
- What will be the implications of climate change and other environmental constraints and mandates?

## ► STUDY DESIGN

Since the U.S. natural gas market is facing myriad uncertainties and constraints, the study will evaluate the prospects for demand, supply, and price under three scenarios. The proposed parameters of the scenarios are summarized below. The major premises for the study will be finalized in a workshop allowing opportunity for clients to interact with the study team.

	Reference Scenario	Accelerated Decline Scenario	Environmental Constraints Scenario
<b>Lower 48 Gas Production</b>	Trend decline in Lower 48 conventional production; successful shift to nonconventional	Accelerating decline rates for Lower 48 conventional supply	Same as Reference Scenario
<b>LNG Supply to North America</b>	Possible supplies constrained by competition	Probable and possible supplies constrained by competition	Same as Reference Scenario
<b>Environmental Constraints on SO<sub>2</sub>, NO<sub>x</sub>, and Mercury (Hg)</b>	Clean air rules, CAIR, CAMR; no carbon fee or tradable permits program	Same as Reference Scenario	CAIR, CAMR; Carbon constraints from mandates, sequestration requirements, or a carbon fee
<b>Nuclear</b>	Current capacity plus 5 GW of uprates between 2010 and 2020	Same as Reference Scenario	Current capacity plus 5 GW of uprates between 2010 and 2020; significant capacity is added after 2020
<b>Renewable Power Generation</b>	States adopt 10% (includes hydro) renewable portfolio standards	Same as Reference Scenario	States adopt 15% (includes hydro) renewable portfolio standards that rises to 20% by 2030

## ► STUDY COVERAGE

- This study will use a scenario approach that will develop and analyze alternative scenarios that span the major uncertainties in the outlook for natural gas over the time period 2006–30. Consistent with the parameters of the three scenarios, annual projections will be provided for:
  - Gas production volumes and cost estimates by basin for conventional gas, non-conventional gas, frontier gas
  - Natural gas demand projections by region by sector
  - In the industrial sector, demand projections for the energy-intensive industries
  - Power sector coverage including capacity, utilization, heat rates, and demand by region
  - The U.S. market demand for LNG, supplies of LNG for the United States under two scenarios of supply availability, and the adequacy of those supplies relative to expected demand
  - Natural gas prices for significant pricing points in the United States and Canada
  - The price relationship between LNG, EU gas, and U.S. gas, and the conditions under which the United States would be a price taker or a price setter

## ▶ **BENEFITS TO SUBSCRIBERS**

### **WHAT IS THE VALUE OF THE METHANE GAP STUDY TO BUSINESS DECISIONS AND POLICY MAKERS?**

The study offers a comprehensive, mid- to long-range quantitative analysis of the North American natural gas market. It takes into consideration the key supply, demand, and pricing factors including:

- Analysis of conventional Lower 48 gas supply and, specifically, decline rates in production that appear to be accelerating more rapidly than commonly assumed
- Explicit consideration of non-conventional sources of gas including deep offshore, frontier, arctic, tight formations, and LNG
- Tests of assumptions regarding LNG imports that are commonly offered as the panacea solving North America gas shortage problems
- Explicit consideration of the Alberta tar sands formations
- Demand side responses that will likely occur in industrial and electric utility sectors from high gas prices and potential shortages

The study design utilizes a scenario approach where three alternative and distinctive scenarios are developed, quantified, and analyzed. Study participants will play an active role in defining these scenarios, to ensure capture of real-world uncertainties, technology advancements, and risks. The results of the study will include the elements listed under the **Proposed Table of Contents**, (see IVa. on the next page).

## IVd. BRIDGING THE METHANE GAP: PROPOSED TABLE OF CONTENTS

### SUPPLY BY BASIN

#### DETAILED ANALYSIS OF KEY BASINS

- Rocky Mountain
- San Juan
- Permian
- Mid continent
- Gulf Coast onshore
- Gulf Coast offshore

#### ■ Basin Specific Information

- Resources
- Reserves
- Production
- Wells
- Rigs
- Key fields indicating accelerated decline profile

#### ■ Industry Activity and Cost Indices

### LNG SUPPLY

#### ■ U.S. LNG Terminals

- LNG Terminals, Existing, Construction, Expansion, Likely

#### ■ European LNG Competition to U.S.

- European Demand for LNG
- European Pricing

#### ■ Liquefaction Projects

- Existing and construction
- Probable
- Possible
- Probabilistic weighting of U.S. supply for each scenario

### NATURAL GAS TRANSPORTATION

- Mapping of basin supply to demand region by pipeline corridor
- Pipeline Capacity
- Volumes
- Expansions

### DEMAND BY REGION AND SECTOR

#### ■ Gas Demand in the United States

- Sector and Region

#### ■ Demand by Energy-Intensive Industry

#### ■ Capacity Build for Power Sector by Technology

#### ■ Gas Demand for Canada

- Oil Sands Requirements

### PRICE FORECAST BY PRICING POINTS

#### ■ Natural Gas Prices for all major pricing points, United States and Canada

- Basin
- Citygates
- Market Hubs
- LNG Terminals

## ► STUDY RESEARCH AGENDA

**GLOBAL INSIGHT IS UNDERTAKING THIS ANALYSIS IN ORDER TO ADDRESS SEVERAL ISSUES CONFRONTING THE U.S. NATURAL GAS MARKET, THE MOST IMPORTANT OF WHICH CAN BE SUMMARIZED AS FOLLOWS:**

- North American natural gas production peaked in 2001. How steep will the decline rate be? What is the potential for non-conventional sources of gas?
- Increased reliance on resource plays implies a large scale drilling effort with low production rates per well, almost a manufacturing process. What prices are required to sustain the industry effort?
- Increased dependence upon LNG introduces competition with Europe for available supplies. What price will the United States need to pay to attract supplies?
- Natural gas was expected to play a significant role in meeting the nation's environmental goals—goals that are constantly being raised. Looking forward to the next presidential election, will U.S. environmental goals be raised again? What impact will that have on power markets? On natural gas markets?
- Energy-intensive industrial output has declined sharply in response to the surge in natural gas prices. Can more industrial sector demand be destroyed?
- For 20 years, natural gas markets have worked without long-term contracts for supply. Can this be sustained?

To address these and related issues, and determine their impact on natural gas prices, Global Insight will simulate its U.S. Energy Model including **new in-depth analysis** of the major uncertainties facing the natural gas market.

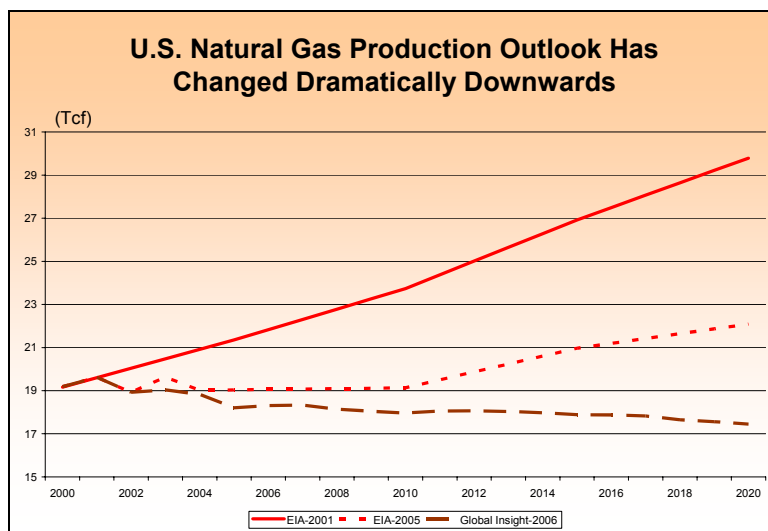
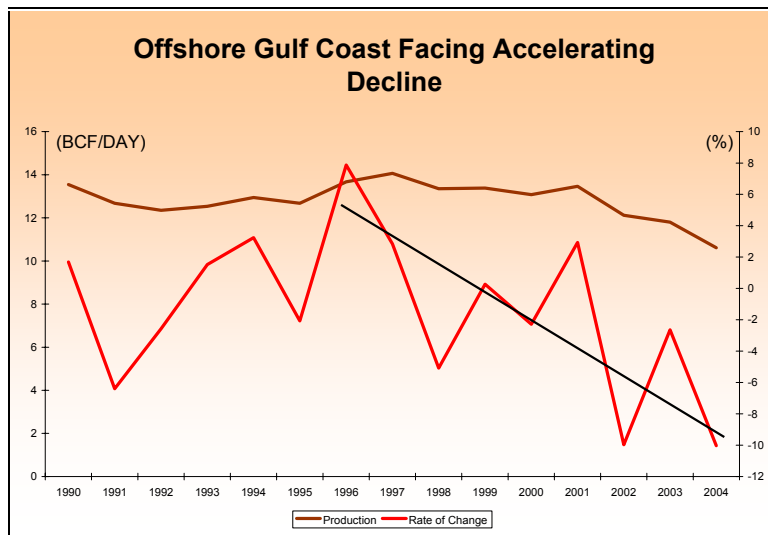
### **LOWER 48 PRODUCTION**

Natural gas production has not responded to rising prices in any significantly positive way despite a doubling of industry activity. While the number of wells is increasing, production continues to decrease. With several explanations offered for this phenomenon of reduced productivity, it is unclear that production will either be sustained or limited to small decreases. Might a prolonged period of accelerated decline ensue?

To address this question, Global Insight's energy team will provide the evidence to support both an outlook for a shallow decline and an outlook for accelerated decline through robust analysis of the supply side. Global Insight will assess the basin aggregates for resources, reserves, reserve additions, wells, production per well, and reserve/production ratios for the following basins: Rocky Mountain, San Juan, Permian, Midcontinent, Gulf Coast onshore, and Gulf Coast offshore.

The forecast of basin indicators will reflect two scenarios for decline rates: gradual decline and accelerated decline. A representative field in each basin will be examined for its historical pattern of decline to determine an upper and lower bound for the rate at which decline rates are changing over time. The scenario values for gradual decline and accelerated decline will be drawn from within these parameters and applied to conventional production. A separate analysis of the contribution of resource plays and their inherent production patterns will be examined in each basin.

The production forecast will reflect the decline of existing production and the new sources of supply from the number of rigs, wells drilled, and production per well for each vintage. Total industry capability will be examined and a constraint imposed reflecting rig availability. The number of wells that can be drilled under the industry capacity constraints and economic conditions will be determined.



## LNG SUPPLIES

While three-to-six new LNG trains are completed each year, the United States has little of this LNG contracted to meet its growing requirements. European end users have been willing to sign long-term contracts indexed to oil prices. With numerous pipeline and LNG proposals to choose from, there is little concern that Europe will meet its requirements.

The United States has no such assurance of steady LNG supplies. Currently, international energy companies looking to serve the U.S. market must develop LNG gasification projects, buy tankers, and arrange for LNG terminal capacity—all without firm end-market contracts. However, the LNG developed for the U.S. market has no destination clause and can be routed to the most favorable market. As a result, the United States is in the position of bidding for LNG on a cargo-by-cargo basis.

To address the question of the LNG supplies that are likely to be available to the U.S. market, and the adequacy of those supplies relative to expected demand, Global Insight will present its view of:

- U.S. LNG terminal capacity—current, planned, and expansions
- European demand for LNG and developments in European contracting for LNG supplies
- Global liquefaction projects in existence, under construction, probable, and possible
- A probabilistic weighting of U.S. supplies of LNG for two scenarios

## INDUSTRY SECTOR ANALYSIS

With gas consumption in energy-intensive industries shown to be especially vulnerable to high gas prices, the following industries and their reaction to sustained high gas prices will be analyzed in detail.

- |   |                                   |
|---|-----------------------------------|
| <input type="checkbox"/> ethylene and propylene | <input type="checkbox"/> aluminum |
| <input type="checkbox"/> ammonia                | <input type="checkbox"/> steel    |
| <input type="checkbox"/> methanol               | <input type="checkbox"/> paper    |
| <input type="checkbox"/> other chemicals        | <input type="checkbox"/> glass    |
| <input type="checkbox"/> cement                 | <input type="checkbox"/> food     |

Energy-intensive industry—especially the chemical industry—has been the first and foremost to adjust to rising natural gas prices. Will this trend continue? How will these industries respond?

Global Insight's energy team, working with Global Insight's U.S. and international industry experts, will provide valuable insights into the changing structure of energy-intensive industry, revealing the emerging reaction function of these industries to prolonged high gas prices. This analysis will take into account other structural shifts evolving in these industries in the United States.

## **POWER SECTOR ANALYSIS: ENVIRONMENTAL GOALS AND REGULATIONS**

More than a dozen years after the last set of amendments to the Clean Air Act was passed, some of the more controversial provisions are just now nearing implementation. Several attempts have been made to enact new legislation, but as those have dissolved in Congress, the EPA has stepped forward with the CAIR (Clean Air Interstate Rule) and CAMR (Clean Air Mercury Rule) requirements for phased reductions in emissions. Taking CAIR/CAMR as the framework for the study, the environmental uncertainty to be addressed by this study will be the possibility of the regulation of greenhouse gas (GHG) emissions.

For this analysis, we are focusing on the impact of specific legislation to limit greenhouse gas emissions from the power sector. To investigate the impact of GHG legislation on the natural gas market, the Environmental Constraints scenario includes the following assumptions:

- Renewable energy resources (wind, solar, hydro, biomass, and others) rise to 10% of total power supply by 2015; 15% by 2020; and 20% by 2030. This is implemented through regulations and incentives at the state level and eventually a federal renewable portfolio Standard extended over all states and continued throughout the forecast time horizon (and beyond).
- New nuclear generation becomes part of the solution, but not until after 2015. The assumption is that an additional 5 GW of net nuclear generation is added between 2010 and 2020. For this scenario, nuclear safety, waste disposal, proliferation control measures, and technology assumptions are assumed to be satisfactorily dealt with and strong public objections resolved.
- Carbon constraints from mandates, sequestration requirements and possibly a carbon fee.

What will be the impact of measures to limit carbon dioxide emissions from the power sector? What technologies will be available by 2015? What role will gas play?

## **RESOLVING THE GROWING GAP BETWEEN NATURAL GAS SUPPLY AND DEMAND**

**Global Insight, with input from study participants, will prepare and analyze three scenarios to answer the question, How will this emerging “methane gap” be resolved over the next 10 years and beyond?** While the general thrust of each scenario is understood, Global Insight will conduct an in-depth examination of the predetermined elements, uncertainties, driving forces, and prime movers shaping these scenarios.

**Evolutionary Change:** A trend decline in lower 48 conventional production is partially offset by a successful shift to non-conventional production. Supply constraints tighten as North American natural gas production undergoes a gradual decrease with the result of periodic demand destruction in the industrial sector and economic obsolescence of much of the existing gas-fired generation capacity.

**Accelerated Decline:** Rapid decline in existing conventional gas fields puts pressure on drilling activity to offset. Supply volumes decline rapidly and are not made up by intensive drilling activity. Prices remain high.

**Environmental Constraints with Climate Change:** Even though U.S. natural gas supply is declining, demand is managed by mandates such as renewable portfolio standards and new technologies that are aggressively pursued.

## PROJECT TEAM MEMBERS AND CONTACT INFORMATION

The “Bridging the Methane Gap” project team comprises several senior members of the Global Insight Energy Group.

**James A. Osten, Principal:** Osten has more than 25 years’ experience in energy analysis with Global Insight, where he is responsible for North American Gas Analysis. His expertise includes LNG, risk management, and fundamental analysis. He has been the director of numerous studies in global energy markets. Osten has received economics degrees from the University of Wisconsin and Boston College.

**Mary Novak, Managing Director:** Novak has more than 20 years’ experience in energy analysis with Global Insight. Her expertise covers all aspects of North American and European energy economics. Novak hold economics degrees from the Catholic University of American and University of Maryland.

**Kevin Lindemer, Executive Managing Director:** Lindemer has more than 30 years of experience in energy analysis and project management with Global Insight, CERA, and Irving Oil. His expertise is focused in international oil and gas markets, including LNG, refined products, and petrochemicals. He holds an MS in Economics.

**Bill Severns, Senior Consultant:** Severns has more than 25 years’ experience in petroleum engineering, project management, and corporate strategy. He is an expert on North American and international gas supply, including exploration, field development, and production optimization. He holds engineering degrees from University of Missouri and Colorado School of Mines, and an MBA from MIT.

Other key contributors to the team include:

**Margaret Rhodes**, Senior Economist, U.S. Energy; **Tom Runiewicz**, Principal, Steel Service; **Ron Whitfield**, Consultant, Petrochemicals; **Frantz Price**, Managing Director, Industry Practices; and **John Dean**, Senior Associate, North American Coal.

**For more information or to become a participating client in this study – please contact:**

**Jim Osten**

Global Insight Energy  
781-301-9120  
jim.osten@globalinsight.com

**Peter McNabb**

Global Insight Energy  
416-682-7314  
peter.mcnabb@globalinsight.com

## THE POWER OF PERSPECTIVE

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CONTACT US		Web: <a href="http://www.globalinsight.com">www.globalinsight.com</a>	E-mail: <a href="mailto:info@globalinsight.com">info@globalinsight.com</a>
<b>NORTH AMERICA</b>		<b>EUROPE</b>	<b>MIDDLE EAST AND AFRICA</b>
<b>U.S./Canada</b> 1.800.933.3374		<b>Frankfurt</b> +49 (0)69.20973.0	<b>Pretoria</b> +27 (0)12.665.5420
<b>Mexico</b> 1.800.687.2565		<b>London</b> +44 (0)20.7452.5000	
		+44 (0)20.8544.7800	
		<b>Milan</b> +39 02.86481.1	
		<b>Paris</b> +33 (0)1.55.45.2600	
			<b>ASIA</b>
			<b>Beijing</b> +86 10.6853.9875
			<b>Shanghai</b> +86 21.6122.1208
			<b>Singapore</b> +65 6430.6621
			<b>Tokyo</b> +81 (0)3.5219.1314