Global Gas Markets and Macro Fundamentals

Anchorage, AK
August 5-9, 2013
North Slope Gas & LNG Symposium
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**Drivers of Energy and Gas Demand**

How Gas Differs from Oil
Outlook for Natural Gas Demand
Outlook for LNG Supply and Demand
What Drives Energy Growth?

Drivers of Energy Demand

- Economic Growth
  - Structure of the economy:
    - Share of GDP from services v. industry
    - Heavy industrial v. light industrial

- Population and Demographics
  - Population growth
  - Age of the population
  - Urbanization

- Energy Efficiency
  - Vehicle usage
  - Appliances
  - Power plants

- Energy Targets
  - Carbon emissions

Drivers of Energy Supply

- Domestic Resource Availability
  - Hydro
  - Coal
  - Oil
  - Gas

- Import/ Export Infrastructure
  - Pipelines
  - Port Infrastructure
  - Ability to pay constraints

- Government Policy
  - Energy subsidies
  - Energy security
  - Promotion of renewables

- Geopolitics/ Strategic Considerations
Economic Growth

Relationship between energy demand and GDP

Energy Intensity per GDP

Energy Demand per GDP

Energy intensity: one measure of efficiency
Demographics

Population growth: declining?

Demographics: aging populations

Energy intensity per capita: Increasing, flat, or decreasing?
What Drives Gas Demand?

Overall Energy Demand Growth

Fuel Switching: Substitution of oil with gas
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Different Demand Drivers

Transport is the largest source of oil consumption (53%). Gas use is more diversified; power is the largest gas consumed (40%).
And Different Supply Sources

Middle East supplies one-third of oil and second-fastest growing region

N. America supplies 27% of gas and Russia 18%; Asia-Pacific fastest growth
Gas Trade Small (31%) But Growing

Oil trade 3.3X larger than gas trade

Transportation constraints and infrastructure investment limit trade
Limited Trade Creates Regional Markets

Divergence of regional prices post-2008 driven by rising production in North America (Henry Hub) and rising oil prices (Japan)
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Drivers of Energy and Gas Demand
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**Outlook for Natural Gas Demand**
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Gas Importance Increasing

**Global Energy Supply**

- Oil
- Coal
- Gas
- Other
- Nuclear
- Hydro

**Global Electricity Supply**

- Coal
- Gas
- Hydro
- Nuclear

Gas share has risen from 19 to 22%

Gas share has risen from 15 to 24%
- Eurasia (Russia) and Middle East most dependent on gas
- OECD average is 24% versus 21% for world
- Asia and, particularly, China very under-exposed to gas
- If China used gas at the OECD rate – 23.8% – global demand in 2010 would be 17% higher
Growth at 2.3% per Year Driven by Asia…

Global demand growth of 2.3% p.a.

+175 bcf/d = ~3X US 2010 demand
... And by Power

Power accounts for 41% of demand

Power makes up 43% of growth

Gas Demand by Sector

- Other
- Petchems
- Commercial
- Residential
- Transport
- Industry
- Power

CAGR (2010-2030)

2.5%
1.9%
4.0%
1.5%
1.1%
4.9%
2.5%

Gas Demand Growth by Sector

- Global 2030
- Other
- Petchems
- Commercial
- Residential
- Transport
- Industry
- Power

Global 2010

- 297 bcf/d

Global 2030

- 472 bcf/d

Power

- 75 bcf/d

Other

- 15 bcf/d

Petchems

- 17 bcf/d

Commercial

- 7 bcf/d

Residential

- 12 bcf/d

Transport

- 15 bcf/d

Industry

- 34 bcf/d

Power

- 75 bcf/d

Other

- 15 bcf/d

Petchems

- 17 bcf/d

Commercial

- 7 bcf/d

Residential

- 12 bcf/d

Transport

- 15 bcf/d

Industry

- 34 bcf/d

Power

- 75 bcf/d
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Outlook for Natural Gas Demand

Outlook for LNG Supply and Demand
Large Infrastructure Investments Shape Business

**Traditional model**
- JVs between buyers, sellers, IOCs
- Long-term contracts indexed to oil / products
- Buyer bears volume risk, seller price risk

**New model**
- Upstream-downstream connections
- Flexibility in contracts to manage risk and capture upside
Growing Number of Markets

Incremental LNG Demand by Country

Post-2000 importers account for 25% of demand

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LNG Dependence Varies Significantly

Reliance on LNG imports ranges from 99% (South Korea) to 1% (Netherlands)
Asia accounted for 2/3 of growth since 1990 and will make up 2/3 of new demand.
Middle East Most Important Supplier

Over half of new supply since 1990 has come from the Middle East

LNG Exports by Region, 1990-2012

- Europe: +46 mmt (4% p.a.)
- Americas: +119 mmt (10% p.a.)
- Middle East & Africa: +17 mmt (14% p.a.)
- Asia-Pacific: +3 mmt (6.4%)
- Capacity: +209 mmt
Lots of Supply Competition

*All values are in millions of tonnes per annum (mmtpa)*
Not All Proposals Move Forward

Of total proposed capacity (~950 mmt tons), ~56% expected online by 2030
North America LNG Projects

- **Valdez LNG T1-4 (AGPA)**
- **Kitimat LNG T1-2**
- **Kitimat LNG (Floating)**
- **Oregon LNG T1-2**
- **Jordan Cove LNG (Liq.)**
- **Southcentral Alaska LNG T1-3**
- **Western Canada LNG (Altagas) (Floating)**
- **Prince Rupert LNG T1-3**
- **LNG Canada T1-4**
- **Pacific Northwest LNG T1-2**
- **BC LNG T1-2**
- **West Coast Canada LNG T1-3**
- **Goldboro LNG**
- **Kenai LNG**
- **Cove Point LNG (Liq.)**
- **Goldboro LNG**
- **Elba Island T1-2 (Liq.)**

Legend:
- Green: Existing
- Yellow: Under Construction
- Red: Stalled
- Purple: Canceled
- Orange: FID Reached
- Turquoise: FEED Completed
- Gray: In FEED
- Pink: Pre-FEED
- Light Blue: Proposed

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## Companies Rushing to Sign Up for US L48-Based LNG

#### Contracts for Volumes or Capacity from US Lower 48 Projects

<table>
<thead>
<tr>
<th>Project</th>
<th>Buyer</th>
<th>Contract Status</th>
<th>Volume (mmtpa)</th>
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#### Recontracted Volumes from US Lower 48 Projects

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## Each Region Faces Unique Risks

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<td>Unitization of gas resources &amp; ownership structure&lt;br&gt;Government Capacity</td>
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Balanced Market—But Contracts Needed to Close Gap

**Global LNG Demand and Supply**

- Middle East and Africa
- Americas
- Europe
- Asia
- LNG Supply

**Global LNG Demand and Supply**

- Gap
- Preliminary Contracts
- Firm Contracts
- Demand

### Global LNG Demand and Supply

- **2012**: 9 mmt
- **2015**: 153 mmt
- **2020**: 284 mmt
- **2025**: 400 mmt
- **2030**: 600 mmt
Implications for Alaska LNG Prospects

- Large opportunity to meet rising gas demand
  - Growth from economics, population
  - Growth from fuel switching
  - LNG trade increasing

- Alaska well-positioned geographically

- Alaska faces different set of risks than other regions

- How can Alaska move to the head of the queue?