Prospects for North American LNG Exports

How Much and How Soon

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Prospects of North America LNG exports

- Changing game of global LNG
- G2M2® Global Market Model Design
- G2M2® Gas Market Forecast
What the shape of global gas?

• The dynamics of natural gas & LNG are changing in all aspects
  – Changing positions of players
  – Prized markets have suddenly become uncertain
  – Bigger bets and higher stake
Supply side: changing positions

- **Incumbents**: Russia and Middle East with eroding positions
- **Challengers**: Australia, East Africa and North America

### Incumbents
- **Pipeline Gas**
  - Russia
  - Norway
  - Turkmenistan
  - Algeria

- **LNG**
  - The Middle East
  - North and West Africa
  - Malaysia, Indonesia and Australia

### Challengers
- **Russia**
  - Russia — to Asia?
  - Azerbaijan — to Europe?
  - Turkmenistan — to Europe?
  - Iraq — to Turkey? Europe?
  - Iran — to South Asia? Europe?

- **North America**
- **Australia**
- **East Africa**
  - Australia (major new projects)
  - North America (USA and Canada)
  - East Africa (Mozambique, Tanzania)
The Prize:

• Market growth in Asia by new buyers:
  – China
  – India
  – Pakistan
  – Southeast Asia

• Market share in Europe

• Emerging markets
  – Africa
  – The Middle East (UAE, Jordan, and Kuwait)
  – South America
Global LNG game is getting more complex…

• **Bigger game:**
  – **Increasing in size:** 2006: 176 million tons vs. 2016: 260 million tons
  – **Increasing in numbers of players:** 2006: 28 countries (15 importing, 13 exporting); 2016: 58 countries (39 importing, 19 exporting)

• **Evolving rule:**
  – Long term contracts are expiring
  – Higher short term and spot trade

• **Higher stake:** Huge capital being spent and more political activities
  – China’s commitment for coal-to-gas
  – Government policy support on diversified gas imports

How will this game turn out?
G2M2®
Global Market Model Design

- Geo-Political Units
- Big country splits
- Basic GPU structure
- Pipelines
- LNG transport
• **What type of model is G2M2?**

  • A *partial equilibrium model* of global natural gas, with detailed *network* which connects gas supply to demand through both *pipeline network* and *LNG shipping*.

  • The model computes prices that balance supply and demand over all market nodes in the network.
G2M2 Geo-Political Units

113 countries modeled:

- Most countries in G2M2 represented as a single geo-political unit (GPU)
- But some are too big, so are sub-divided
Russia GPUs based on Federal Districts
G2M2 Supply / Demand Area: GPU
GPU = Geo-Political Unit (Country or Sub-Country Area)
Pipe A – four pipe segments, representing crossing four GPUs.
G2M2 LNG Tanker Flow Model

1. Liquefaction / Export Region (GPU 1)
   - Liquefaction Capacity
   - Liquefaction Costs

2. Import Region (GPU 2)
   - Regas Capacity
   - Regas Costs
   - LNG storage

3. Import Region (GPU 3)
   - Existing contracts
   - Nautical miles
   - Available tankers by size for receiving ports

LNG Tanker Shipment from 1 to 2
LNG Tanker Shipment from 1 to 3
LNG Tanker diversion from 3 to 2
LNG Transport Cost

The tanker *Day Rate* is a function of utilization:

\[ A + B \times \frac{U}{(1 - U)} \]

Example shows day rate multiplier for \( A = 1, B = 0.5 \)

Note that the multiplier would be infinite at 100\%.
Global gas production and consumption
• Inter-regional LNG flows
• Global Demand for North American LNG
• LNG Prices/Destinations
Production by Region – Challengers threatening the incumbents

Major producers of gas:
- North America
- Russia and Middle East

Fast growing regions:
- Australia
- Africa
Deliveries to Consumers by Region - The changing prize

The Prize:

- Asia and north America adds largest incremental demand
- Africa has the highest growth rate.
Inter-regional LNG Flows

Asia market - challengers taking over: Australia, North America, Russia, and Africa
Europe – changing dynamics supported by growing North America LNG
Emerging market – economics prevails from current political constraints.
Regional Gas Prices

- Sufficient spreads of prices encourage increasing LNG trades.
- Asia the traditional marginal market, with emerging markets competing for incremental imports, in the long term.
- America remains one of the most cost competitive suppliers.
## Global Demand for North American LNG

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### US and Canada LNG Export Demand (bcf/day)

- **CAN-W**
- **USA-CP**
- **USA-SA**
- **USA-WSC**

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Conclusions

• LNG game has much more potential
• North America will become the top LNG exporter in the world, serving Asia and Europe, with sharp ramp-up in next 5 years.
  – 2016-2026, incremental 15 bcf/d
  – 2026-2040, another 7 bcf/d
Thank you!

- GPCM: flagship platform for North America Market Model adopted by industry for 20 years.
- G2M2 Global Market Model: the answer to ever-changing game of global gas
- Please contact RBAC for details for Special research and academic license program.
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