Transition of natural gas pricing mechanisms in Asia

Principal Research Fellow, ACRI, UTS
Senior Fellow, Energy Studies Institute, NUS
Dr Xunpeng Shi
Struggles in Australia east costal gas market (1)

1. World’s 1st LNG Exporter faces gas shortage!

Gas outlook in Eastern Australia 2018

<table>
<thead>
<tr>
<th></th>
<th>Expected domestic demand (PJ)</th>
<th>Upper band domestic demand (PJ)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply</td>
<td>1901</td>
<td>1901</td>
</tr>
<tr>
<td>Domestic demand</td>
<td>642</td>
<td>695</td>
</tr>
<tr>
<td>LNG demand</td>
<td>1314</td>
<td>1314</td>
</tr>
<tr>
<td>Projected shortfall</td>
<td>55</td>
<td>108</td>
</tr>
</tbody>
</table>


Struggles in Australia east costal gas market (2)

Gas shortage (cont.)

• “Domestic industrial users of gas were receiving few, if any, real offers of gas”
• “Domestic suppliers were either unwilling or unable to make firm offers for gas supply for 2016 onwards”
• ACCC (December 2016)
• “…where genuine offers for supply have been made, they are generally on a ‘take it or leave it’ basis with no scope for further negotiation…Most users said that they had been given very short deadlines for responding to offers, generally ranging from 2-5 days.”
• ACCC (September 2017)
Struggles in Australia east costal gas market (3)

2. Domestic gas market prices were higher than LNG delivered to Japan!

(i) Wholesale Spot Gas Price Ex-Brisbane; (ii) Netback Price Ex-Gladstone based on JKM Spot Price; (iii) Netback Price Ex-Gladstone based on an Assumed Oil-Linked Contract (13.8 per cent Slope Applied to the Historical Monthly Average Brent Prices Assuming USD 3/Mbtu Liquefaction Cost); and (iv) JKM Spot Gas Price

Monthly Average Wholesale Nominal Gas Prices (A$/GJ) 2011 to 2017

3. Matured market economy but state intervention!

- **Australian Domestic Gas Security Mechanism**

  - Allows for control of gas exports when Minister responsible believes there will be a domestic gas shortfall.
  - State intent is to ensure adequate domestic gas supplies by requiring gas exporters to limit exports or find offsetting sources of new gas.
  - On 27 September 2017 Prime Minister Turnbull announced an agreement with three largest gas exporters from Eastern Australia that commits the exporters to meet any gas shortfall in 2018 by contracting gas supplies to wholesale consumers at fixed prices and to provide sale, sale offers and bids to customers to ACCC.

Australia gas market case studies

“Making Cents” of the Eastern Australian Gas Market

R. Quentin Grafton,¹ Xunpeng (Roc) Shi²,³ and Ian Cronshaw¹

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Reforming the Eastern Australian gas market

Xunpeng (Roc) Shi¹,² | R. Quentin Grafton³
Prevailing Australian LNG trading arrangements

- Long term contracts (20-30 years)
- Destination clause (limitation) (resell not allowed)
- Take-or-pay: Minimal amount to be paid regardless of delivery
- Oil indexation: traded gas/LNG price set as a fraction of crude oil price (with 4-8 months lag)
Since the late 1980s

Source: Poten & Partners

GAS PRICING MECHANISMS

GoG/Hub vs. Oil-Indexation

Asia – oil-linked LNG
Europe – a hybrid
North America – a spot market
Challenges to oil indexation

- Gas being an independent fossil fuel
- Indexation to others not fair
- Price difference
- Hubs emerging
- U.S. LNG coming
- Global gas on gas is not EA
EAST ASIA'S QUEST FOR GAS TRADING HUBS

Motivations

Asia Premium (IEA, 2014)

Pricing power (Tong et al., 2014)

Inter-hub competition (IEA, 2013)

East Asia in the process of creating its own regional gas pricing through the establishment of gas trading hubs.
Establishing a liquid hub takes time and commitment

Requires at least 5 and probably 10 + years?

- Third Party Access to Pipelines/Regas Terminals
- Balancing Rules & Standardised Trading Contracts
- Price Discovery and Disclosure
- Bi-Lateral Trades
- Futures Exchange
- Non – Physical Players enter
- OTC Brokered Trading
- Liquid Forward Curve Develops
- Indices derived for LT Contracts

Based on Experience in US, UK and Continental Europe:
- This could take 10 years in Asia.
- It requires the commitment of government, suppliers and system operators.
- An over-supplied market with strong competition accelerates the process.
- Hub pricing and no DS are favorable for EA
- Hub initiatives are not mutual-exclusive: Shanghai or Tokyo hub price benchmark produce similar impact
- Removal of DS more significant than change of price benchmark
- Later removal of DS costs more
Oil price changes are the most important contributor to the dynamics of natural gas prices in Japan and Germany.

- The contribution of oil price changes has declined significantly (decoupling).

- Asian premiums not mainly caused by Asia's different market fundamentals and is more likely due to oil indexed pricing mechanisms than to market fundamentals.
There are more bubbles in Japan (most) and the EU relative to the US (hub pricing preferred).

Oil indexation system (e.g., in Japan) has higher prices, higher volatility, and more frequent pricing bubbles.

This tendency became stronger after the 2008 global financial crisis (financialized).

The US hub gas prices clearly different from the international crude oil markets.
Investigates whether the natural gas markets are integrated in East Asia.

Structure Vector Auto-regression model (SVAR) and monthly LNG price data of four East Asian importers

Evidence suggests country-specific heterogeneities dominate the dynamics of LNG prices.

There should be multiple LNG benchmark trading hubs at the time being
Risk transmission mechanism between energy markets: A VAR for VaR approach

Yifan Shen\textsuperscript{a}, Xunpeng Shi\textsuperscript{b,c,d,*}, Hari Malamakkavu Padinjare Variam\textsuperscript{d}

- Directly focusing on the quantile interdependency structure of the energy market return distribution.

- New statistics in \textbf{Cross-Quantilogram} and \textbf{multivariate quantile regression} model (VAR for VaR) to study risk spill over and the structure of interdependency in left tails of price return distributions.

- The shocks in the oil market substantially affect the Value at Risk (VaR) in the natural gas market.

- The extreme losses and gains (e.g., 1\% and 99\% quantile pair) are more likely to transmit across the market, compared to the moderate losses and gains (e.g., 5\% and 95\% quantile pair, 10\% and 90\% quantile pair).
Impact of China’s gas market liberalisation on Australia’s LNG exports

- If Australia-China LNG contracts change from oil indexation to hub indexation from 2020 (new) or 2025 (existing):
  - Australia LNG export will decline 4.1% from 2020-2035

- If the contracts further remove Take-or-Pay condition
  - Australia LNG export between 2020-2035 will decline 9.4%

- In both cases, Australia total profits from the natural gas sector during 2020-2035 will decline 11%.

X Shi, HMP Variam, 2015. China’s Gas Market Liberalisation--The impact on China–Australia gas trade. Chapter 7 in Song et al. (eds), China’s Gas Market Liberalisation--The impact on China–Australia gas tradeX Shi, HMP Variam
China's Domestic Transformation in a Global Context,137-174
Research questions (1)

- **Do we need the pricing transition (Necessity)?**
  - Impact of low oil prices: market failure
  - Market fundamentals and premium
  - Cost saving: Optimization of shipping

- **How to make the transition (Operation)?**
  - Hub construction (European experience, theoretical framework)
  - Financial market (Dojima Rice Exchange);
  - **How to create derivatives markets?**
  - Chinese gas market: reform; uncertainties;
  - Australia experience (unsuccessful): case study; theoretical study

- **What are likely scenarios in East Asia**
  - Where could benchmark prices be generated: SWOT analysis
  - ASEAN gas market integration: scenarios and impact
  - Gas market fragmentation
Research questions (2)

- What are the impact (Consequences)?
  - **Commodity market**
    - Potential changes: hub indexation, DES, TOP;
    - Hub indexation and DES free on global trade: logistics optimization
    - Optimization: contract terms (ToP); firm behaviors
  - **Financialization of gas as a commodity**
    - Risk spillover
    - Bubble, Market financialization
    - **Other issues:** minimal liquidity
  - **Academic questions:**
    - Impact on producers/investment
    - Impact on consumers/welfare
    - Market design
    - Transportation liberalization
    - Financial questions
Gas research publications

- **Necessity: Impact of pricing transition**

- **Operation: Market design**

- **Consequence: Financialization**

- **Case study**
About Me

Energy economist, with regional expertise in China, ASEAN & East Asia

- Principal Research Fellow, ACRI, UTS, 2016-
- Senior Research Fellow, Energy Study Institute, National University of Singapore, 2014-
  - Chutian Scholar, Hubei University of Economics, 2018-

Career Highlights

- President, Chinese Economic Society Australia (CESA), 2016-2018
- Deputy head of Energy Economics, ESI, NUS. 2015-7-2016.12
- Chief Researcher, Brunei National Energy Research Institute, 2013-2014
- Energy Economics, Economic Research Institute for ASEAN and East Asia, 2009-13
- Various management and professional positions in China’s leading energy institutes, 1997-2005
- Managed East Asian Summit Energy Cooperation Taskforce Energy Market Integration (EMI) study, 2009-2013
- Consultant /Member for ADB, or UN EACAP Expert Group, 2013-2017