China Gas Market Outlook And Opportunities for Japan
Content

- **China Gas Demand**
  - China Gas Supply
  - China Gas Reform Outlook
  - Emerging Tier-2 LNG Players in China
  - Opportunities for Japanese Companies
China Gas Demand Is Estimated to Exceed 208 bcm in 2016, an 8% Year-on-year Growth

China Gas Demand by Sector 2011-2016E

China Gas Demand Change by Sector (2016 vs. 2015)

2016 gas demand incremental is estimated to be 15 bcm, mainly pushed by power and centralized heating sector and recovery of industrial demand thanks to price down since end 2015

Source: SIA Energy
Demand Hit Historical High in Dec 2016, Showing Stronger Seasonal Characteristics

China Monthly Apparent Gas Consumption

China Apparent Gas Consumption Seasonality

Peak-valley monthly difference in 2016 reached 6.6 bcm, 1.1 bcm higher than that in 2015.

Source: SIA Energy created from the NDRC and China Custom data
Similar Story Will Continue in 2017, and Growth Is Expected to Return to Double-Digit Rate

China Gas Demand by Sector 2016E

Drivers:
- a) continuing contracted LNG imports push
- b) large gas power capacity will come online, especially in Guangdong and Jiangsu
- c) industrial gas demand and users are cultivated with infrastructure development

2017 Gas Demand Forecast by Sector

- Total Demand: 232 bcm
- Residential: 13%
- Industrial: 43%
- Gas power and centralized heating: 23%
- Transport: 7%
- Commercial, public service and other: 9%
- Loss: 5%

Source: SIA Energy
Primary Energy Target of China’s 13th Five-Year Plan

Primary Energy Mix in 2015

- Coal: 58%
- Oil: 17%
- Gas: 10%
- Non-fossil fuel: 15%

Total Energy Consumption 4.3 billion tsce

Source: NDRC, SIA Energy

Primary Energy Target in 2020

- Coal: 58%
- Oil: 17%
- Gas: 10%
- Non-fossil fuel: 15%

Total Energy Consumption 5 billion tsce

Source: NDRC, SIA Energy
Gas is the Biggest Beneficiary of 13th FYP’s Incremental Energy Consumption

Incremental Energy Consumption in 13th Five-Year Plan by Fuel

Source: NDRC, SIA Energy
China Gas Demand Outlook 2030

China Gas Demand Outlook 2030

Gov’t Target

Source: SIA Energy

SIAenergy.com
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Domestic Conventional Gas Production Saw a Moderate Increase in 2016 Amid Low Oil Prices

Domestic Gas Production 2011-2016

2016 Gas Production Change by Province

Sources:
- SIA Energy

IEEJ © IEEJ 2017
China 2017 Gas Supply Growth Will be Led by TOP Import LNG and Pipeline Gas, and Domestic Shale Gas
Gas Imports by Source (1/3)

China Gas Monthly Import by Source

Source: SIA Energy created from China Customs data
Gas Imports by Source (2/3)

Import Volume Changes by Source (2016 vs. 2015)

- Imports from Australia ramped up, pushed by the executing of new long-term LNG contracts.
- Imports from Uzbekistan resumed in 1Q2016, after several times of interrupting in 2015.
- Imports from Turkmenistan increased, contributed by the demand of peak shaving in 1Q and expansion of Central Asia China Gas Pipeline (CACG) line.
- China imports the first cargo from US contiguous in this August (registered at China Custom in September).

Source: SIA Energy created from China Customs data
LNG Imports from Australia Accounted for 46% of the Total

China Annual LNG Imports by Source

China Active LNG Contracted Volume by Source (End 2016)

Source: SIA Energy created from China Customs data

Source: SIA Energy
China’s city-gate price regulation follows closely with Central Asian pipeline gas import costs. Imports at Rudong LNG terminal represent the 16% slope oil-indexed contracts signed in seller’s market. Imported LNG became more cost competitive in coastal areas since 2H2015.
NOCs Marketing Pressure is Mounting: Volume more than Price

China Contracted LNG Volumes by Player

- **Active contracted volume by end 2014**
  - CNOOC
  - PetroChina

- **Contracted volume incremental 2015-2017**
  - Sinopec
  - JOVO

- **Contracted volume incremental 2018-2020**
  - ENN
  - Huadian

Near 20 mmtpa contracted volume comes online in the period

Source: SIA Energy

*Contracts only include SPAs and HOAs, but exclude upstream equity volume*
Under the pressure of over 21 mmtpa TOP obligation in 2016, CNOOC has almost halted spot purchase and diverted some cargos to other markets. SIA has observed substantial import increases from CNOOC’s Ningbo, Zhuhai, Fujian terminals this year, indicating the positive results of its negotiation/compromises with downstream clients.
PetroChina has less over-contract burden compared with its two NOC peers. It has been active in spot and swap purchase taking the advantage of low spot LNG prices during the non-peak seasons, while pushing Qatar LNG offtake obligation to the winter.
Sinopec’s minimum TOP volume is approximately 5 mmtpa in 2016, an impossible mission for the company. Sinopec resold part of its contracted cargos to PetroChina, CNOOC and other Asian LNG importers, and played as an aggressive new entrant in domestic market, especially through trucked LNG distribution. Following the commissioning of APLNG Train 2, more resell from Sinopec is expected in 2017.
Trucked LNG Market Share Rapidly Expand, Competing and Complementing with Pipeline Distribution

China Trucked LNG Supply (2014 – 2016)

Source: SIA Energy
Higher oil price will be needed to boost investment in domestic unconventional gas, especially coal-based synthetic gas (SNG) & shale gas.
China Gas Supply Outlook 2030

China 2030 Gas Supply-Demand Balance

Source: SIA Energy
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Current Government Controlled Reference Prices for Non-Residential Pipeline Gas at Provincial Gates

Nov-2015 Adjusted City Gate Reference Price for Non-residential Gas
unit: CNY/cm

IEEJ © IEEJ 2017
How China’s Gas Pricing Reform Has Evolved

- **2011**: Pilot reform in Guangdong & Guangxi for WEP-2
- **2013**: Nationwide expansion of oil-linked import parity netback pricing
- **2014-2015**: Converge base & incremental non-residential city gate prices
- **2016**: Seasonal pricing emerges; fertilizer feed gas price deregulated; Pilot reform of Fujian WEP-3 city gate price liberalization
- **2017-2018**: Remove of regulated non-residential city gate prices nationwide

- **Cost Plus**
- **Oil-linked Import Parity Netback**
- **Market Pricing?**
Unfolding Price Reforms in 2016

- Revamped pipeline tariff-setting regime with new regulations
- Abolished city gate pricing regulation in Fujian: West-East Pipeline (WEP) gas will not be subject to government-set benchmark price, instead, they will be negotiated and determined exclusively by seller and buyer
- Introduced market-based rates for storage services & storage gas procurement/sales
- Deregulated prices for fertilizer producers
- CNPC announced 10-15% city gate price hike during winter season (Nov. 20, 2016 to Mar. 15, 2017)
Next Reforms are Focused on Breaking Three Layers of Supply Monopolies and Regulate Midstream Tariffs

- **Onshore Conventional**
  - Control lifted in Fujian

- **Pipeline Imports**
  - No TPA access to NOC pipelines and terminals

- **LNG Imports**

- **Unconventional Gas**

- **Offshore Gas**

- **Regasification**

- **Terminal Associated Pipelines**

- **Inter-provincial Pipeline (direct supply)**

- **Inter-provincial Pipeline (non-direct supply)**

- **Provincial Grid Distribution**
  - Monopoly in Wholesale & Transport
  - Exclusive Marketing Rights

- **City Gas Distribution**

- **Trucked LNG**

- **Associated Pipelines**

- **Pipeline Imports**
  - Onshore Conventional
  - No TPA access to NOC pipelines and terminals

- **Power**

- **Industrial**

- **Commercial**

- **Transport**

- **Residential**

Source: SIA Energy
Establishing a Pricing Hub Takes Time and Commitments

1. Third Party Access to Pipeline/LNG Terminals
2. Supply Competition
3. Price Discovery & Disclosure
4. Non-physical Players Enter
5. OTC Brokered Trading
6. Standardized Trading Contract
7. Futures Exchange
8. Liquid Forward Curves Developed
9. Indices Derived for Long Term Contracts
Shanghai Oil & Gas Exchange, Despite Having Strong Government Backing, There is Still a Long Way to Go
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- China Gas Demand
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- **Emerging Tier-2 LNG Players in China**
- Opportunities for Japanese Companies
# We See a Conflicting Story in LNG Imports

<table>
<thead>
<tr>
<th>Supply Source</th>
<th>Supplier</th>
<th>Risk to Cut</th>
<th>Reasons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domestic Onshore Conventional Gas</td>
<td>CNPC, Sinopec</td>
<td>Red</td>
<td>• Sichuan sour gas will still grow, but face marketing and infrastructure challenges; Ordos gas may slow due to budget cut</td>
</tr>
<tr>
<td>Domestic Offshore Conventional Gas</td>
<td>CNOOC</td>
<td>Yellow</td>
<td>• Existing production will continue, but Liuhua 29-1 and Lingshui deepwater development may be delayed</td>
</tr>
<tr>
<td>CBM</td>
<td>CNPC, CNOOC</td>
<td>Green</td>
<td>• Small production, developed infrastructure, but challenging economics under low prices</td>
</tr>
<tr>
<td>Shale Gas</td>
<td>Sinopec, CNPC</td>
<td>Red</td>
<td>• Shale gas success has political significance to NOCs</td>
</tr>
<tr>
<td>SNG</td>
<td>Sinopec, CNOOC, Other</td>
<td>Red</td>
<td>• Huge environmental challenges</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>• LNG marketing will be prioritized over SNG; Xin-Yue-Zhe south part will be first built to market Sichuan gas</td>
</tr>
<tr>
<td>Central Asian Pipeline Gas</td>
<td>CNPC</td>
<td>Green</td>
<td>• Take or pay, but with Chinese financing, terms will be more flexible</td>
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<tr>
<td></td>
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<td>• Price is not competitive at Eastern coast at $50/b oil</td>
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<tr>
<td>Myanmar Pipeline Gas</td>
<td>CNPC</td>
<td>Yellow</td>
<td>• Myanmar gas is not competitive at Southwest or South coast</td>
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<tr>
<td></td>
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<td></td>
<td>• Take or pay, small volume (with phase II delay), pipeline under-utilized</td>
</tr>
<tr>
<td>Russian Pipeline Gas (Power of Siberia)</td>
<td>CNPC</td>
<td>Green</td>
<td>• Cost is competitive but upstream and financing challenges remain</td>
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<tr>
<td></td>
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<td>• Project will be delayed to post-2022</td>
</tr>
<tr>
<td>Contracted LNG</td>
<td>CNOOC, CNPC, Sinopec</td>
<td>Red</td>
<td>• Take or pay</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>• Over-contracted, NOCs have to resell at least 2 mmtpa to international market, or default</td>
</tr>
<tr>
<td>Under-construction LNG Terminals</td>
<td>2nd Tier Players</td>
<td>Green</td>
<td>• Demand driven (market pull)</td>
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<td></td>
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<td>• Competitive price</td>
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</tbody>
</table>
### Who Are the Emerging 2nd-Tier LNG Importers

**Who are taking actions?**

- **Provincial Gas Grids**
  - Zhejiang Energy
  - Yudean

- **City-gas Operators**
  - Beijing Gas Group Co., Ltd.
  - ENN Energy
  - Guangzhou Gas Group Co., Ltd.

- **Gas Power Plants**
  - CHD (China Huaneng)
  - Yudean

- **LPG Distributors/Oil Players**
  - JOVO Energy
  - ZhenHua Oil

- **Integrated Players**
  - Pacific Oil & Gas
  - GCL

**Who may take actions?**

- **China Gas**
- **Towngas**
- **China Resources Gas**
- **Hanas**

Source: SIA Energy
Unlike NOCs, Tier-2 Players Are Mostly Downstream Driven

<table>
<thead>
<tr>
<th></th>
<th>E&amp;P Conven.</th>
<th>Shale Gas</th>
<th>SNG</th>
<th>Long Distance Pipeline</th>
<th>Storage</th>
<th>SSLNG</th>
<th>LNG Imports</th>
<th>LNG Distrib’n</th>
<th>City-gas</th>
<th>Gas Power</th>
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<td>CNPC</td>
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<td>Sinopec</td>
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<td>Shenzhen Gas</td>
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<td>Guangzhou Gas</td>
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<td>Beijing Gas</td>
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</tbody>
</table>

Core operations | Developing position | Nascent position | Little presence; not a focus

Source: SIA Energy
They Come at the Right Timing

Global glut in LNG

- Below $5/mmbtu DES spot price during the non-winter seasons
- ~11.5% slope vs. oil parity contracts signed by the NOCs
- Higher level of flexibility in delivery destination, take-or-pay obligation, contract duration, etc.

Domestic reform underway

- Anti-corruption campaign handicapped the NOCs
- Direct sales is encouraged to bring down end-user gas cost, boost gas consumption
- TPA is encouraged by law; further reform is under way
- Investment approval for LNG import terminals may be delegated to the provincial gov'ts
Although Tier-2 Players Are Still Weaker than NOCs in Many Perspectives, They Are Learning and Growing Fast

- Second-tier Players
  - Secured market, often the premium market with high affordability
  - Close to end users
  - Established distribution channels

- NOCs
  - Weaker central government support
  - Strong local government support for bringing supply and infrastructure competition
  - Local tax payer

- Lack of professional team
- Undetermined about pricing preference & term vs spot purchase
- Prefers HOAs to SPAs to start with

- Financial Capability
  - Private players have weaker balance sheet and lower credit rating compared to NOCs
  - But large state-owned power GENCOs have deeper pockets

- Infrastructure Access
  - Difficult terminal TPA access
  - Self-operated terminals often have berth capacity constraints
  - No pipeline access except for provincial grid companies

- Professional Experience
  - Source: SIA Energy
TPA at Existing LNG Terminals Proved to be Challenging

In spite of the low utilization of existing terminals, there were only six TPA cases executed, five of which were Beijing Gas, only one for private player. Major challenges include: 1) Very few LNG terminals offer TPA, on ad hoc basis; 2) TPA mostly offered to large state-owned city gas; 3) Facing HQ resistance; 4) No regas and pipeline access; 5) Windows to private players are offered in lowest demand months.
In Addition to the Three Under Construction Tier-2 LNG Terminals, Many More Have Been Proposed
Questions From the Sellers: Who Are Ready to Sign SPAs? What’s Their Purchasing Power?

- 1 mmtpa 20-yr SPA with BP
- 1 mmtpa 10-yr HOA with Chevron
- 0.6 mmtpa equity entitlement from PNW
- 0.5 mmtpa 20-yr HOA with PETRONAS
- 0.65 mmtpa 10-yr SPA with Chevron
- 0.5 mmtpa 10-yr SPA with TOTAL
- 0.28 mmtpa 5-yr SPA with Origin
- 0.5 mmtpa 5-yr HOA with PETRONAS
- 0.5 mmtpa 5-yr SPA with Pacific Oil & Gas
- 10 spot cargo from Engie
- 0.5 mmtpa 5-yr HOA with PETRONAS
- 0.5 mmtpa 5-yr KTA with Chevron

Site selection and market study
Provincial level approval
NEA approval (for large-scale greenfield)
Under construction
Commissioning
Terminal Preparation
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Japan and China Share Critical Common Ground and Have Opportunities to Collaborate Along the Entire Value Chain

Japan
• Better financial credit
• More experience in international trade
• More experience in liquefaction
• Clean technology

China
• Growing domestic gas consumption
• Large domestic production
• More diversified gas sources

- Domestic energy security concern as large importer
- Domestic market reforms
- Over-contracted LNG and desire for contract renegotiation
- Overseas value chain participation
- Regional development opportunities
- Regional pricing hub

Growing domestic gas consumption

Large domestic production

More diversified gas sources

Domestic energy security concern as large importer
Domestic market reforms
Over-contracted LNG and desire for contract renegotiation
Overseas value chain participation
Regional development opportunities
Regional pricing hub

Better financial credit
More experience in international trade
More experience in liquefaction
Clean technology
Opportunities in Physical and Paper Trading

- **Chinese Market**
  - Spot LNG trading
  - Small terminal demand aggregator

- **Regional Market**
  - LNG re-distribution
  - Contract re-negotiation
  - FOB/US tolling model

- **Regional Hub**
  - Regional pricing
  - Paper market
  - Forward curve and price index
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PU Jun, Senior Analyst, jun.pu@sia-energy.com, Mobile: +86 18614068329

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• **Annual Retainer & Subscriptions**
  - China Energy Policy Service
  - China Oil Market Service
  - China Gas Market Service
  - Company Strategy Service

• **Multi-Client Studies**
  - China 2030 National and Regional Gas Supply and Demand Balance (2016)
  - China Gas Infrastructure Status and Reform Recommendations (2016)
  - China Gas Power Market Study (2015)
  - Yangtze Waterways Transportation LNG Demand Outlook (2015)
  - Benchmarking LNG Seller’s China Marketing Strategies
  - Tier-2 Chinese LNG player profiles and power mapping
  - Tier-2 Chinese E&P player profiles and power mapping

• **Maps**
  - Printed wall maps for China oil & gas infrastructure
What We Do – Bespoke Consulting Services

• Policy Advisory, Political and Geopolitical Analysis
  • Five Year Plans, Reforms, Policy Advisory
  • China 2030 Gas Strategy (for government)
  • Loan-for-oil/gas deals
  • South China Sea geopolitics
  • China-Russia and China-Central Asia

• National Oil Company (NOC), State-Owned Company (SOE) Analysis
  • Chinese NOC engagement strategies
  • Second-tier oil and gas companies
  • Chinese oil and gas service companies
  • Power mapping & decision making process
  • Domestic and overseas investments

• Market Studies
  • Crude, oil products and natural gas
  • Market outlook of supply, demand, imports, prices, infrastructure, competition...
  • ...at national, regional, provincial and sub-provincial levels
  • Service sector market outlook and demand drivers

• Market Entry, Growth Strategies and Partnership Strategies
  • Upstream (conventional oil & gas, CBM, shale gas), midstream, downstream gas, downstream oil, service sector
  • Competitive landscapes
  • Partnering strategies with Chinese NOCs, Energy SOEs, NSCs and private companies

• Fiscal Terms and PSC Analysis
  • Operational and fiscal term design for China-foreign shale gas PSC
  • Onshore conventional PSC model contracts
  • EOR PSC model contract

• Seminars and Trainings
  • Capacity-building for Chinese companies
  • Seminars on China’s market & policy environment for foreign companies

• Other
  • Commercial due diligence
  • Financial modeling & valuation