

Cooperation to Drive the Potential Growth in Northeast Asian Gas Market

Northeast Asian Natural Gas and Pipeline Forum
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Content

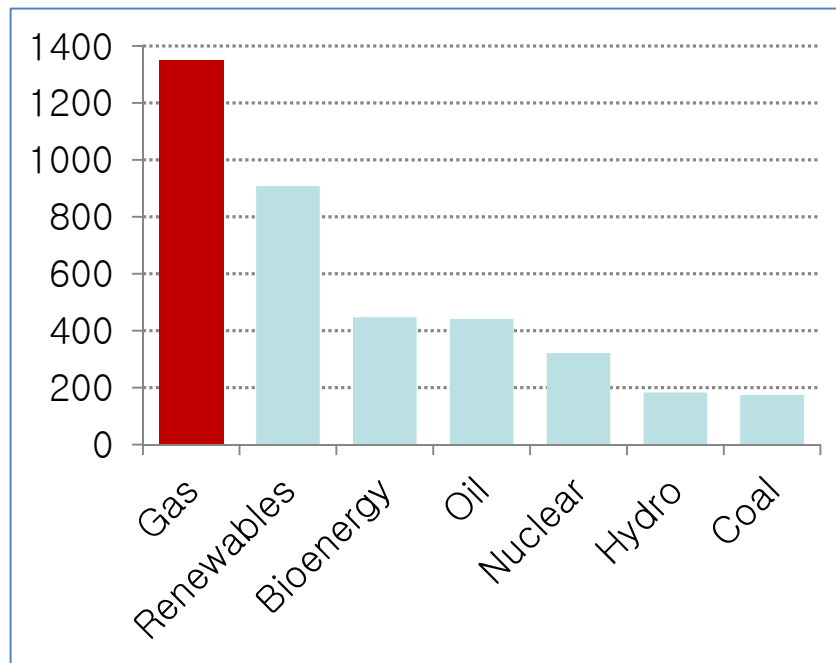
1. The Linchpin of Global Gas Market Growth
2. Challenges for Northeast Asian Gas Market
3. Opportunities of Natural Gas Cooperation in Northeast Asia
4. Conclusion

1. Northeast Asia, the Linchpin of Global Gas Market Growth

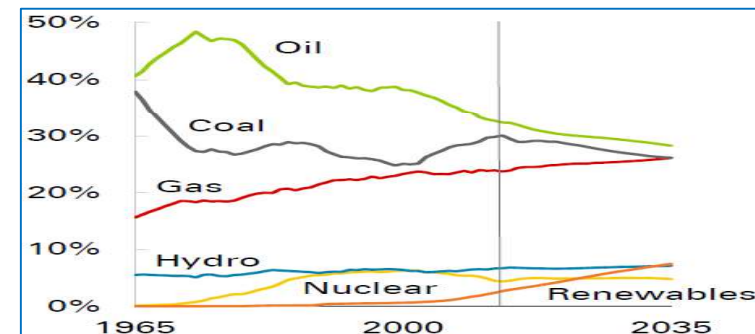
Natural Gas, Spearheading Global Energy Demand

- ❶ Greater Role and Importance of Natural Gas Driven by Global Climate Compact and World-wide Implementation of Energy Transition Policies
 - Annual average increase in demand(2016~2040) : fossil fuel(0.3%) vs. natural gas(1.5%)
 - Natural gas is projected to account for 35% of the global energy demand growth between 2016 and 2040: Spearheading energy demand growth
 - Natural gas is forecast to become the 2nd most consumed primary energy source: 2035→ 2020

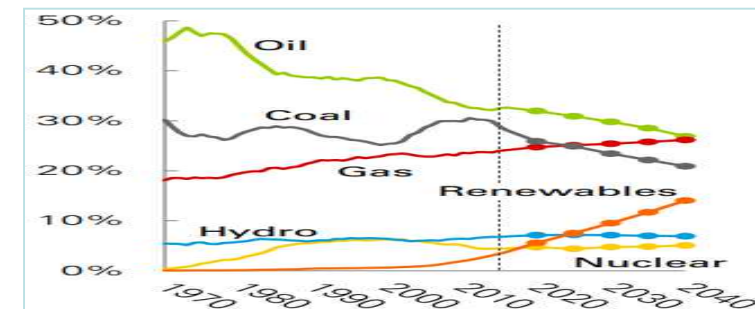
<Incremental Energy Demand (2016~2040)>



Source: IEA (2017)



Source: BP (2015)

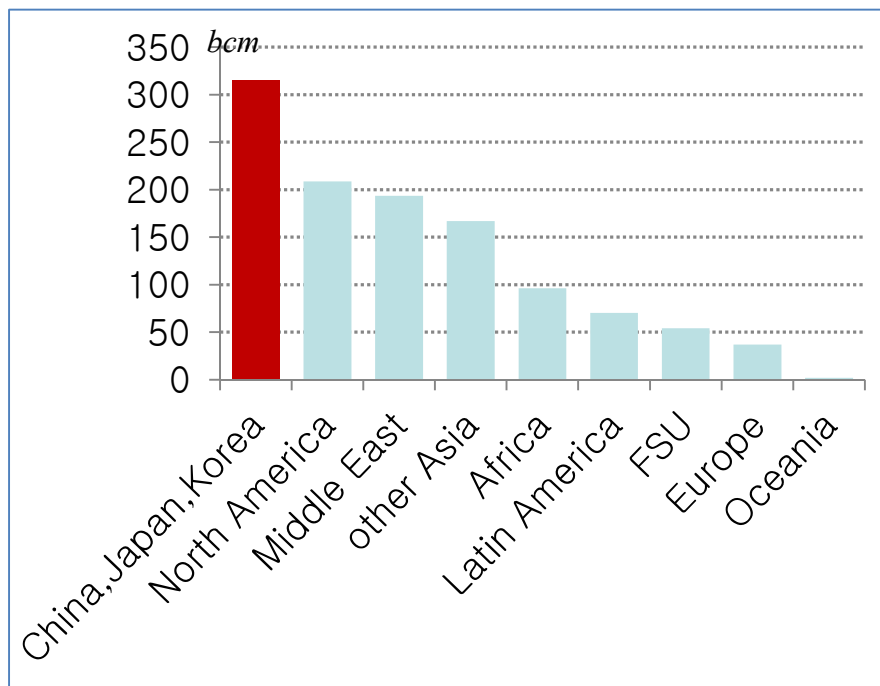


Source: BP (2018)

NEA, Leading Global Energy Demand Growth

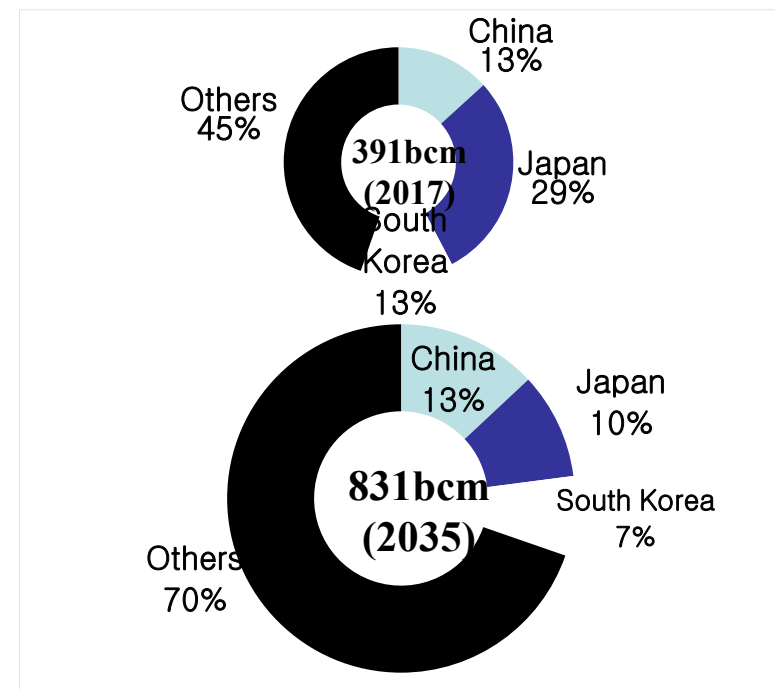
- Northeast Asia Projected to Play Major Role in Ramping up Global Natural Gas Demand
 - Annual average increase in gas demand (2018~2035) : Global (1.6%) vs. NEA (3.4%)
 - Northeast Asia is forecast to account for ¼ of the global natural gas demand growth between 2018 and 2035: spearheading gas demand growth
 - NEA's take-up in Global LNG demand: 55%(Year 2017) → 30%(Year 2035)
: NEA is expected to exert huge influence continuously

<Incremental Natural Gas Demand (2018~2035)>



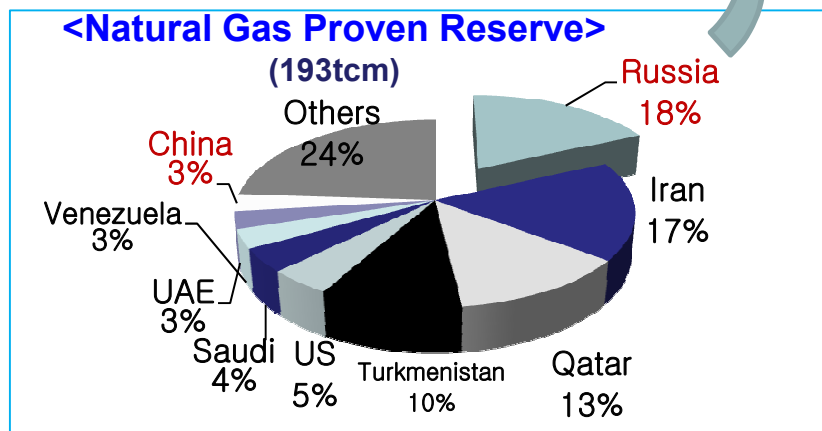
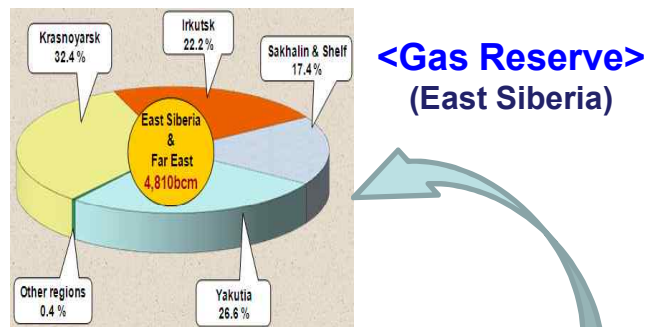
Source: WoodMackenzie (2018)

<LNG Demand (2017 vs. 2035)>



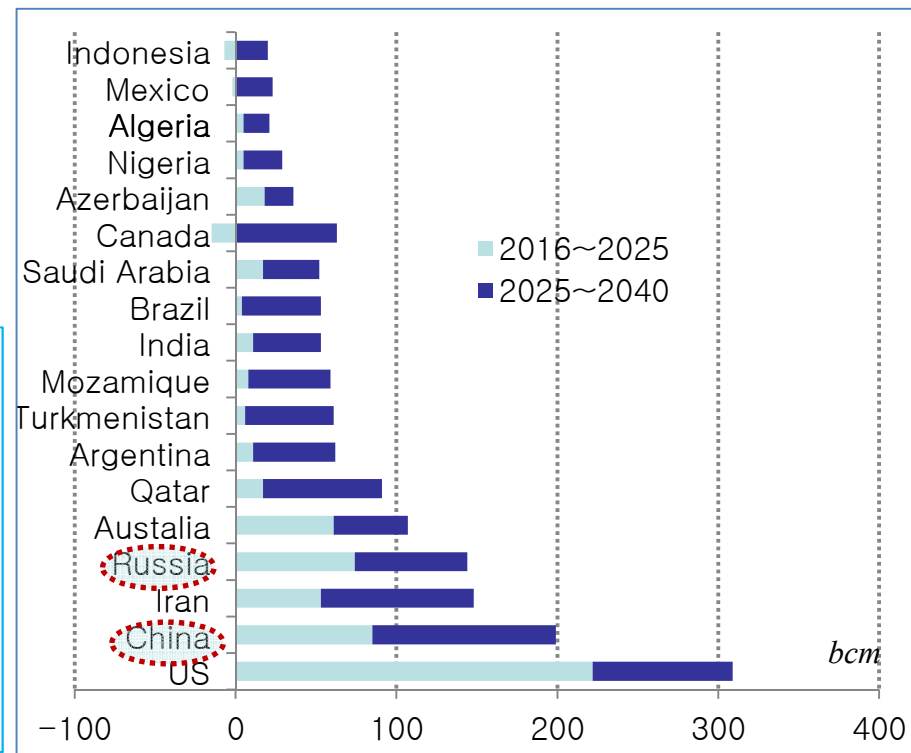
NEA, Ramping up Global Natural Gas Supply

- Northeast Asia Forecast to Accelerate Increase in Global Natural Gas Supply
 - Enormous potentials for increased gas supply : undeveloped large-scale nonconventional gas reserves in East Siberia and China
 - 1/5 of global natural gas supply growth is projected to come from Northeast Asia between 2016 and 2040: driving natural gas supply growth



Source: BP (2018)

<Incremental Natural Gas Production (2016~2040)>



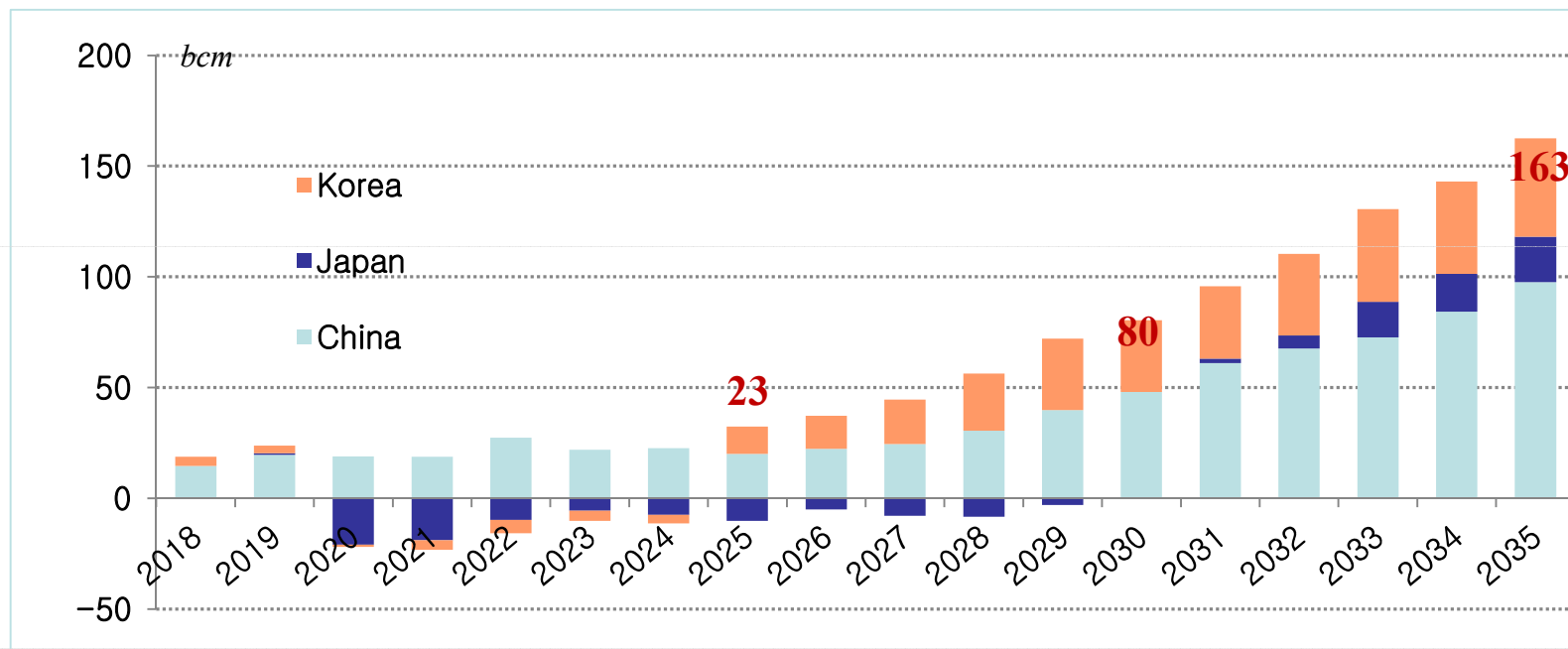
Source: IEA (2017)

2. Challenges for Northeast Asian Gas Market

Effective Procurement of Long-term Volumes

- ❶ Northeast Asia Need to Stably Procure Large Volumes of Natural Gas Given its Rapid Demand Increase
 - Gas volumes to be procured : 23bcm (Year 2025), 80bcm (Year 2030), 163bcm (Year 2035)
 - Catalyze competitions to develop potential LNG and piped gas projects to secure the aforementioned necessary volumes
 - Establish a stable gas supply system by diversifying natural gas supply source

<Need to Secure Natural Gas in Northeast Asia>

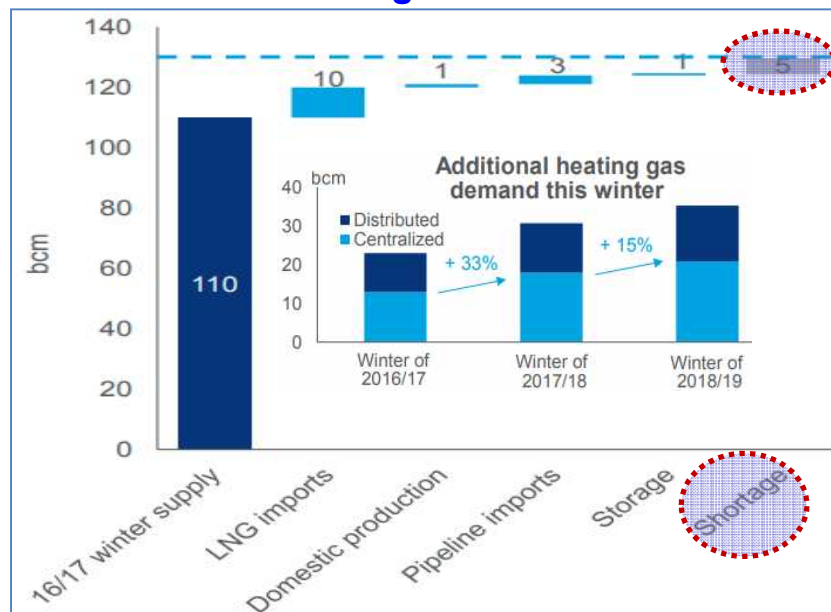


Source: WoodMackenzie (2018)

Response to Short-term Gas Demand Volatility

- ❶ Northeast Asia Need to Prepare for Spike in Short-term Gas Demand Stemming from Market Uncertainty, and Increased Demand Fluctuations during Winter Season
 - China: experienced shortage last winter when its Energy Transition Policy was fully implemented, which can be recurring down the road
 - Japan: any disruption to the planned resumption of nuclear power plant's operations can lead to a sudden increase in short-term gas demand
 - Korea: gas demand for power generation under Korea's 13th Energy Plan increased significantly compared to the 12th plan, leading to greater gas demand uncertainty

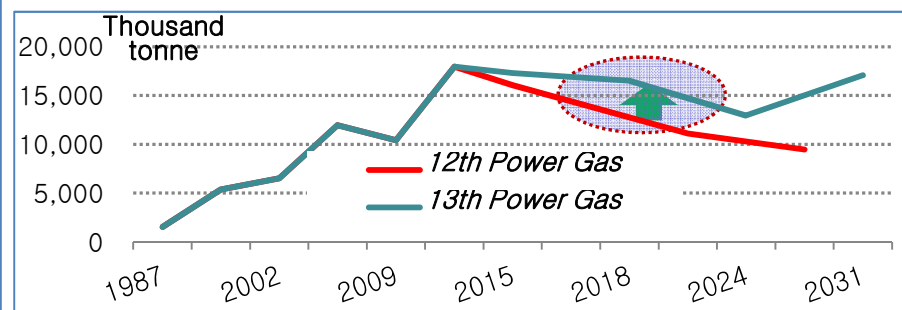
<Natural Gas Shortage Last Winter in China>



<Nuclear Plants Restart Schedule in Japan>

Plant Name	Company	Capacity	Status	Restart date	Likely fuel to be impacted
Genkai-3	Kyushu Electric	1,180	Planning to restart	Mar-18	Coal/gas
Genkai-4	Kyushu Electric	1,180	Planning to restart	Apr-18	Coal/gas
Ohi-3	Kansai Electric	1,180	Planning to restart	Jul-18	Oil/gas
Ohi-4	Kansai Electric	1,180	Planning to restart	Aug-18	Oil/gas
Shimane-2	Chugoku Electric	820	NRA safety inspection	Feb-19	Oil/gas
Onagawa-2	Tohoku Electric	825	NRA safety inspection	Apr-19	Oil/gas
Shimane-3	Chugoku Electric	1,373	Under construction	Jan-20	Oil/gas
Tomari-1	Hokkaido Electric	579	NRA safety inspection	Apr-20	Oil/gas
Tomari-2	Hokkaido Electric	579	NRA safety inspection	May-20	Oil/gas
Tomari-3	Hokkaido Electric	912	NRA safety inspection	Jan-21	Oil/gas

<Korean National Plan for Power Gas Demand>

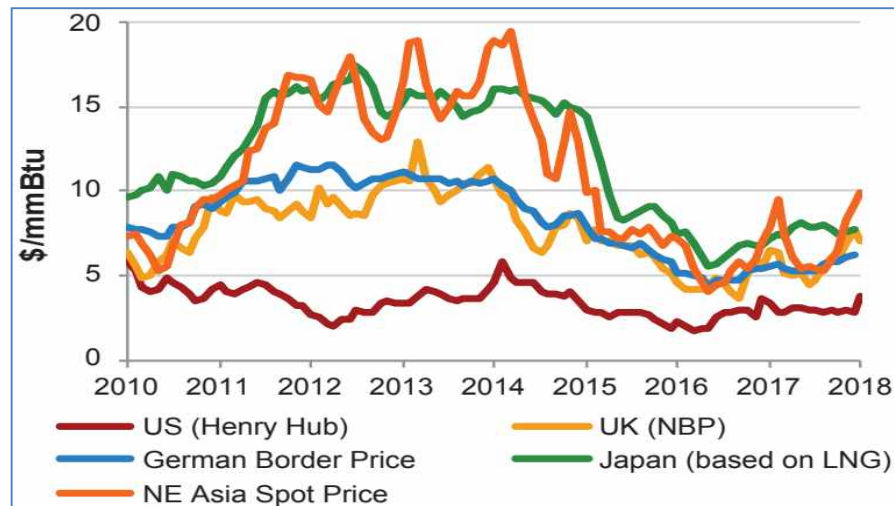


Source: WoodMackenzie (2018), MOCIE (2017)

Establishment of Highly Competitive Pricing System

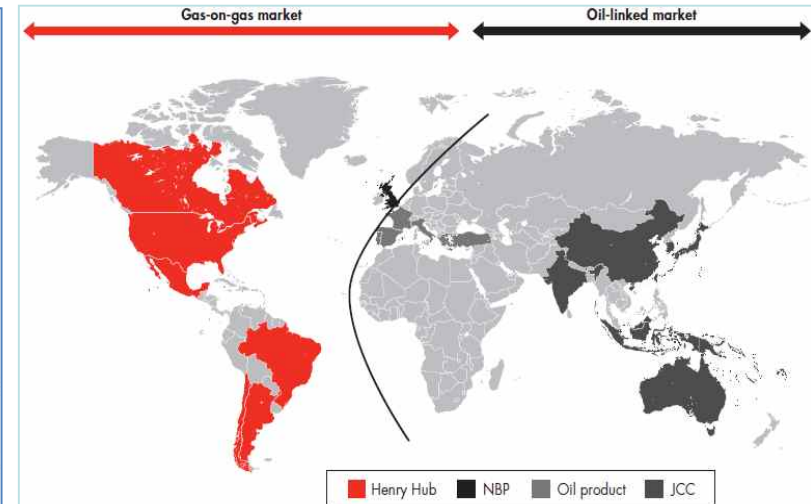
- ❶ NEA Need to Challenge Asian Premium Charging NEA Higher Prices than Other Regions
 - NEA is paying the highest gas prices despite the fact that NEA accounts for over 50% of global LNG demand
 - It is attributable to insufficient gas supply sources and adoption of oil-indexed gas pricing scheme, which divided the global gas market into North America and Europe
 - It is necessary to apply various gas pricing schemes such as HH, NBP, and Hybrid to establish a highly competitive gas pricing system
 - Ultimately, a market-indexed pricing system should be established, which reflects demand and supply in the NEA gas market

<Regional Gas Prices>



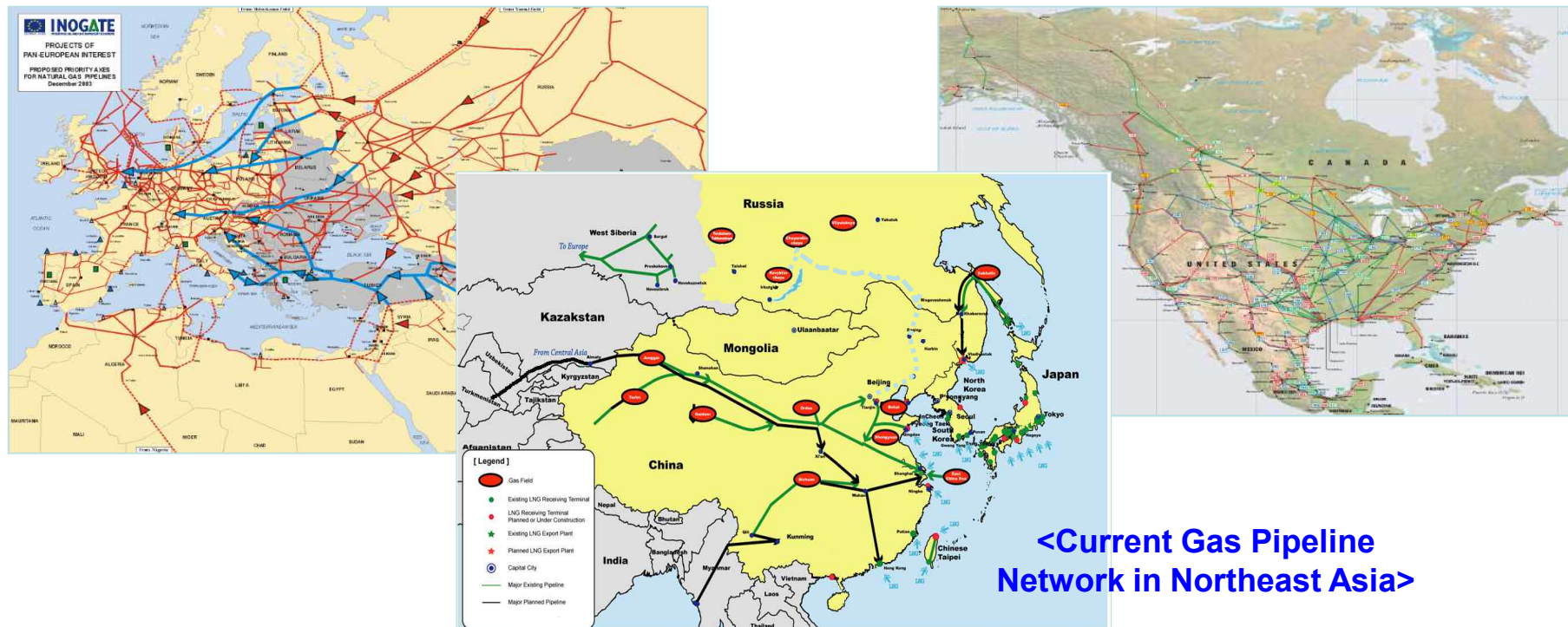
Sources: IGU (2018)

<Regional Gas Market>



Expansion of Cross-Border Gas Pipeline Networks

- NEA Need to Increase Connectivity of Gas Use by Expanding Gas Pipeline Networks
 - NEA lacks Cross-Border gas pipeline networks, which is comparable to North American and European gas markets
 - Expand inter-country gas pipeline networks in NEA on the back of the ongoing China-Russia Gas Pipeline Construction Project
 - Need to effectively connect large-scale gas pipelines with interconnectors
 - By doing so, NEA can better ensure stable gas supply and greater flexibility to strike demand and supply balance

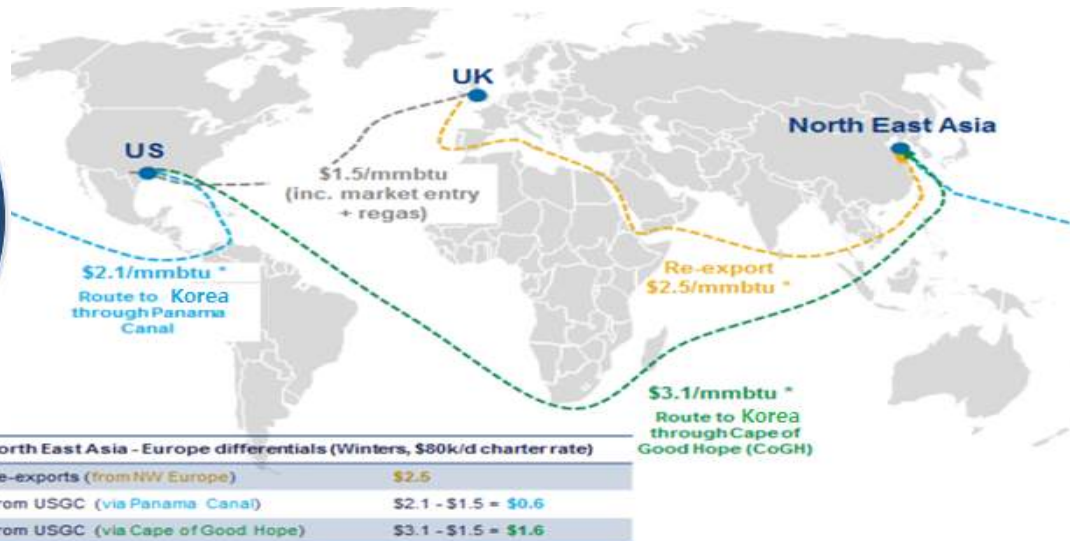
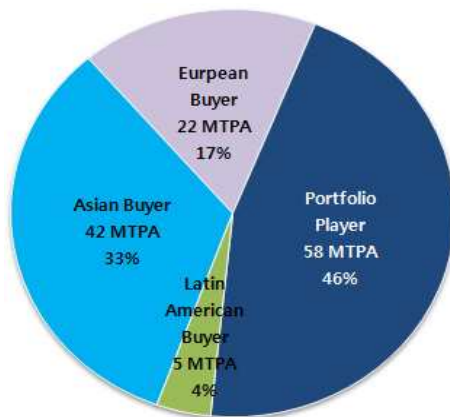


3. Opportunities of Natural Gas Cooperation in Northeast Asia

Cooperation in LNG Trading Business

- 🕒 LNG Trading, the Most Feasible Area for Short-term Cooperation
 - A great majority of LNG trading in NEA are location swap transactions
 - In recent 3 years, location swap transactions take up less than 1% of the total LNG transactions made between Korea, China, and Japan
 - As US LNG trading with greater flexibility increases, the number of swing suppliers and location swap transactions is expected to rise significantly
 - To prepare for such changes, KOGAS, JERA, CNPC, and others have established their respective LNG trading arm in Singapore
 - Subsequently, NEA will have greater opportunities for cooperation in LNG trading

<Contracted volume of U.S LNG by region>

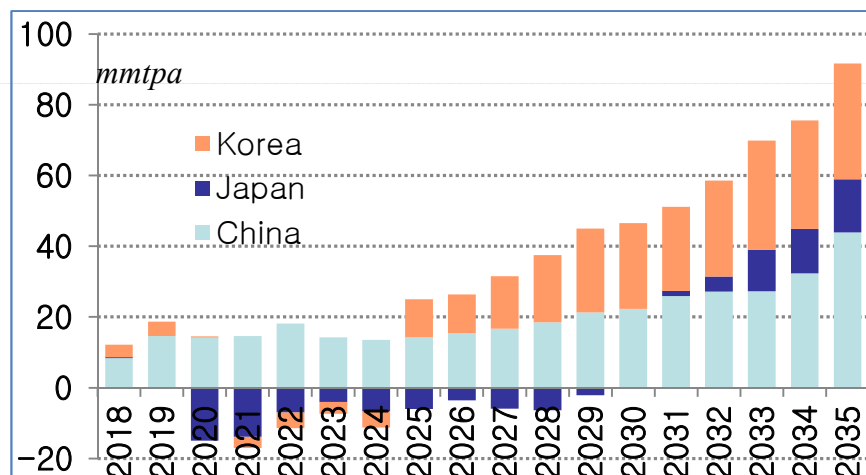


Source: WoodMackenzie (2018)

Cooperation for Greater LNG Contract Flexibility

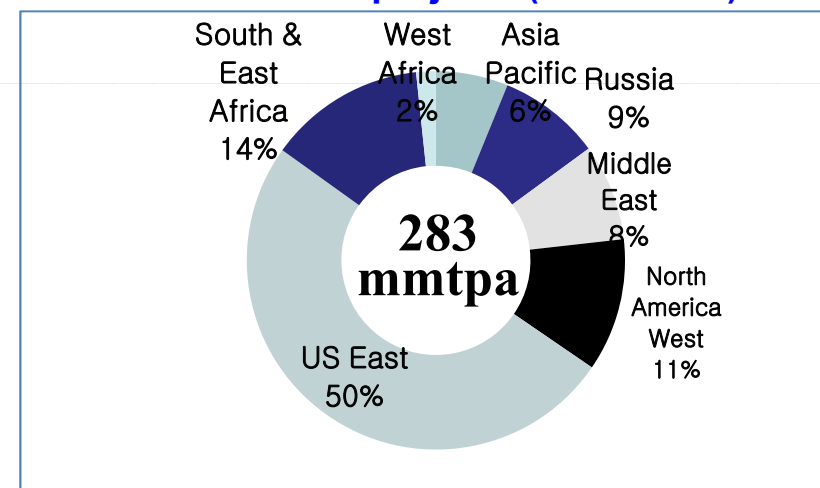
- ➊ Greater LNG Contract Flexibility, Optimal Area for Short and Mid-term Cooperation
 - Aim to increase the flexibility and liquidity of LNG trading by improving rigid contractual terms and conditions
 - An annual average of 15 to 50 million tons of LNG will be needed additionally for the next 15 years in NEA
 - Cooperate to improve rigid contractual terms such as Take or Pay and Destination Clause
 - KOGAS, JERA, and CNOOC agreed to collaborate for improvement of LNG contract terms and conditions
 - Dramatically increase the commercial flexibility of LNG contracts by targeting potential LNG development projects as new procurement sources through purchasing power

<Uncontracted LNG volumes>



Source: WoodMackenzie (2018)

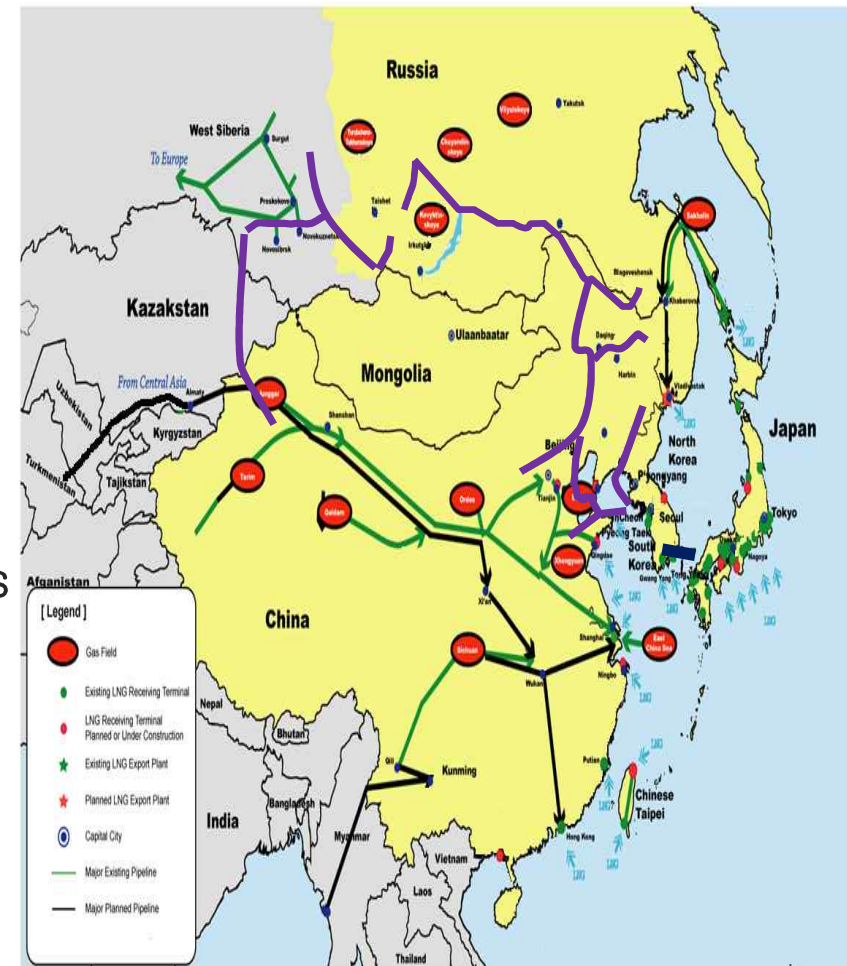
<Possible LNG projects (2023~2028)>



Cooperation in Joint Dev. and Use of Gas Resources

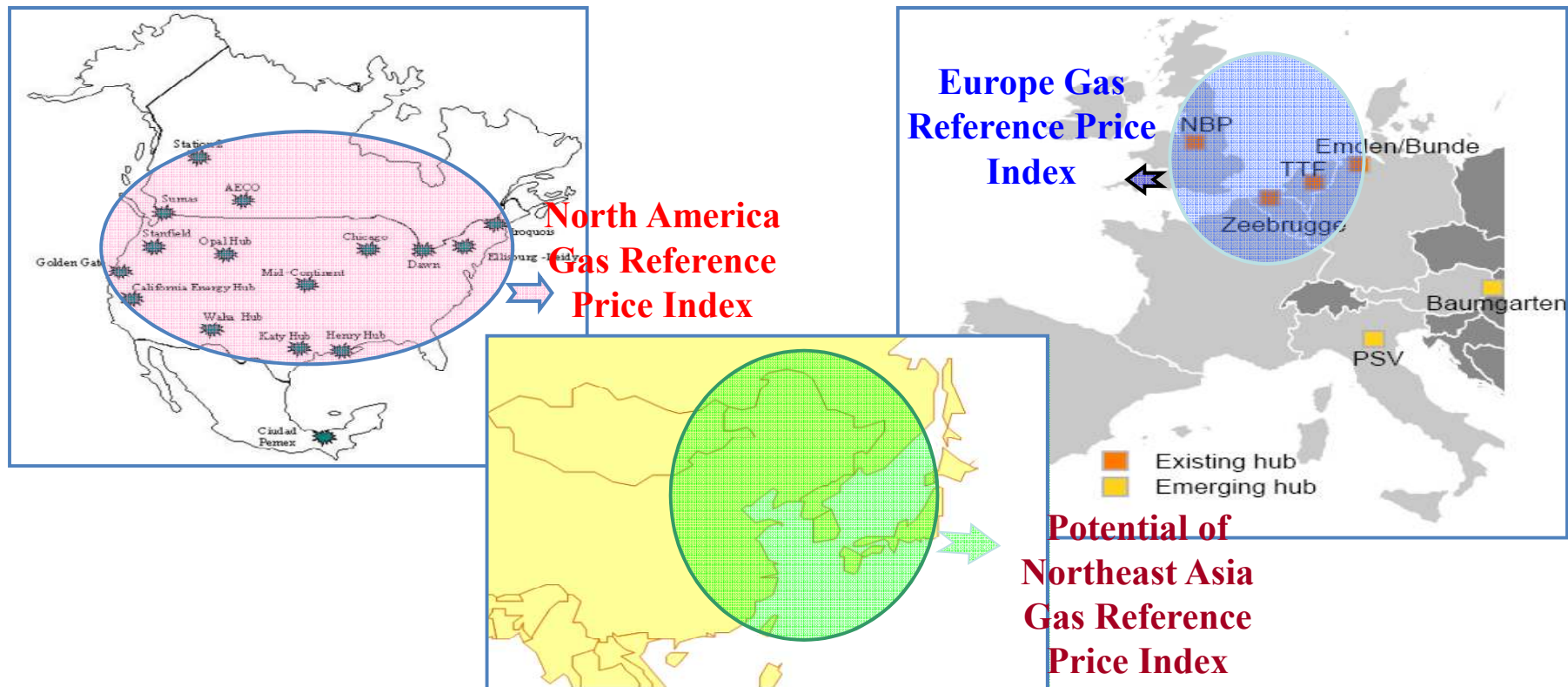
Joint Development and Use of Gas Resources in NEA, Mid to Long-term Cooperation Area Requiring Certain Amount of Time

- Increase supply stability and flexibility to strike demand and supply balance by jointly developing Piped Gas Projects and jointly using their offtakes, promoting the connectivity of gas use in NEA
- Expedite LNG projects and diversify gas supply sources by securing big buyers through joint development of LNG projects in non-NEA regions and joint gas procurements
- Expand technology cooperation in areas such as liquefaction process, LNG tanks, and pipeline integrity

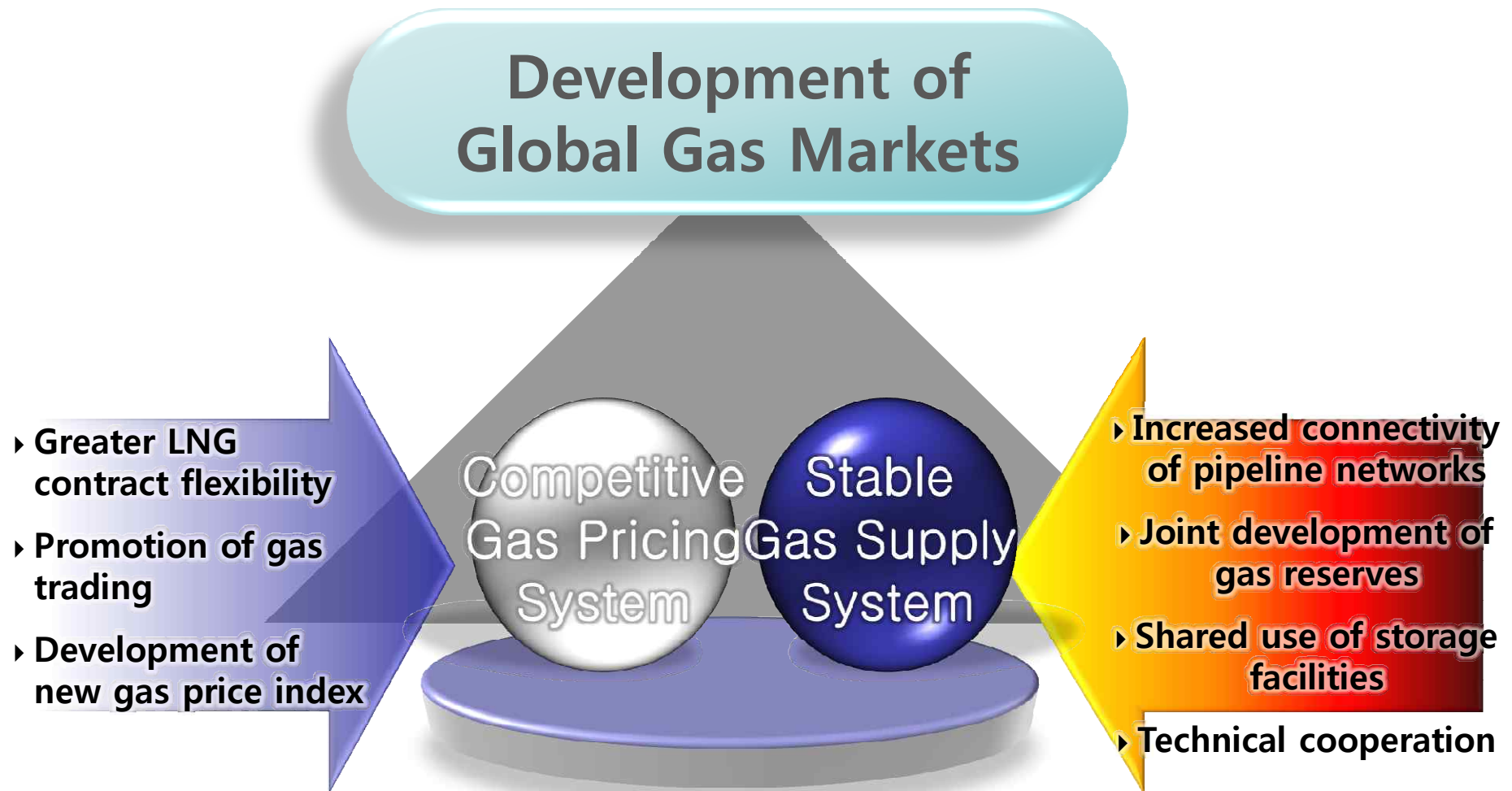


Cooperation in Development of Gas Price Index

- ❶ Cooperation to Develop Gas Price Index Reflecting Demand and Supply in NEA's Market
 - Promote gas transactions in NEA by catalyzing LNG trading and increasing the connectivity of gas pipelines in the region
 - By doing so, development of a gas price index faithfully reflecting NEA's market situation will be facilitated
 - Subsequently, a gas trading hub will be formed in NEA, enabling the development and advancement of NEA's gas market through active gas transactions



Conclusion



Natural Gas Cooperation in Northeast Asia

Thank you