Natural Gas Demand Potential and Infrastructure in the EAS Region

Prof. Hidetoshi Nishimura

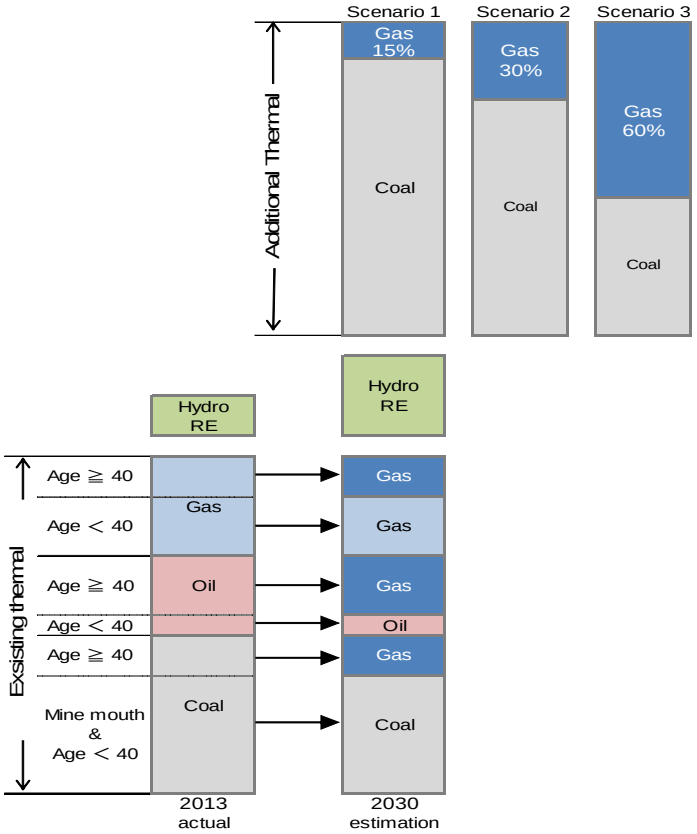
2-Nov-2017
Bangkok

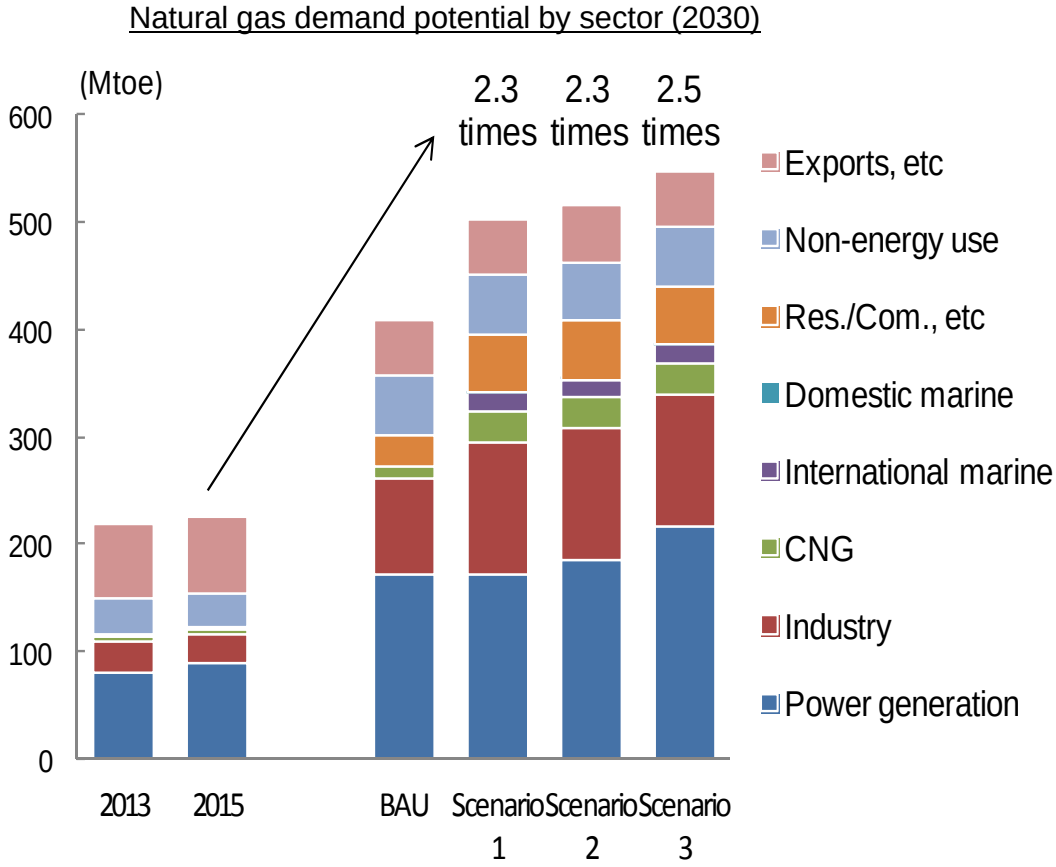
www.eria.org

Economic Research Institute for ASEAN and East Asia

Large Gas Demand Potential in ASEAN + India

- 3 Scenarios as to the share of natural gas in the additional thermal power plants (15%, 30%, 60%)
- Natural gas demand for ASEAN + India in 2030 may expand by 2.3 to 2.5 times compared with 2015
- By sector, the power generation sector has the largest potential, followed by the industrial sector.





Key Assumptions for Non-Power Sectors in ASEAN + India

Industry Sector

- Reference share of Natural gas in Industry sector: 33%

Share of Natural gas at BAU	Target share	Country
Share >=33%	Share at BAU + 5%	Indonesia, Malaysia
10%< Share <33%	1.5 times of Share at BAU (Max. 33%)	Myanmar, Singapore, Thailand, Viet Nam
Share <=10%	2 times of Share at BAU	Brunei, India, Philippines,

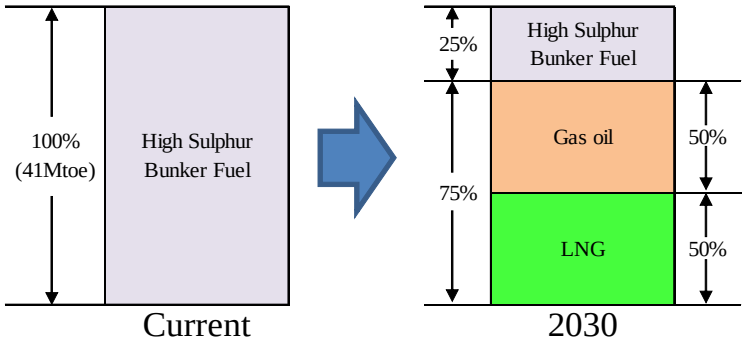
Road Transport (CNG)

- Annual growth rate of CNG consumption in the country is assumed as twice of BAU scenario

Country	2013/2000	2030 BAU/2013	Potential
Brunei	-	-	1% of Oil demand
India	28%	8%	16%
Indonesia	2%	7%	14%
Malaysia	-	1%	2%
Myanmar	41%	3%	6%
Philippines	-	21%	42%
Singapore	-	2%	4%
Thailand	73%	2%	4%
Viet Nam	-	-	1% of Oil demand

International Marine

- Three quarter of high sulphur bunker fuel is expected to be substituted with other fuel in 2020.
- Half of the low sulfur fuel to meet IMO standard is assumed to be LNG



Residential, Commercial and Others

- A quarter of oil demand in BAU scenario will be replaced with natural gas, except for Laos and Cambodia

Economic/Environment Benefit of Natural Gas.

Power generation

Case	Fuel import cost			Construction cost	CO_2 emission	
	LNG: USD 11.9/MMBtu (Billion USD)	LNG: USD 9/MMBtu (Billion USD)	LNG: USD 6/Mbtu (Billion USD)	(Billion USD)	(Million tons-CO_2)	
Scenario 1	**+0.7**	**+0.5**	**+0.4** *	* **+0.1**	**+6.4**	**(+0%)**
Scenario 2	**+7.5**	**+4.9**	**+2.2**	**-0.5**	**-55.8**	**(-2%)**
Scenario 3	**+20.7**	**+13.3**	**+5.6**	**-1.7**	**-176.5**	**(-6%)**

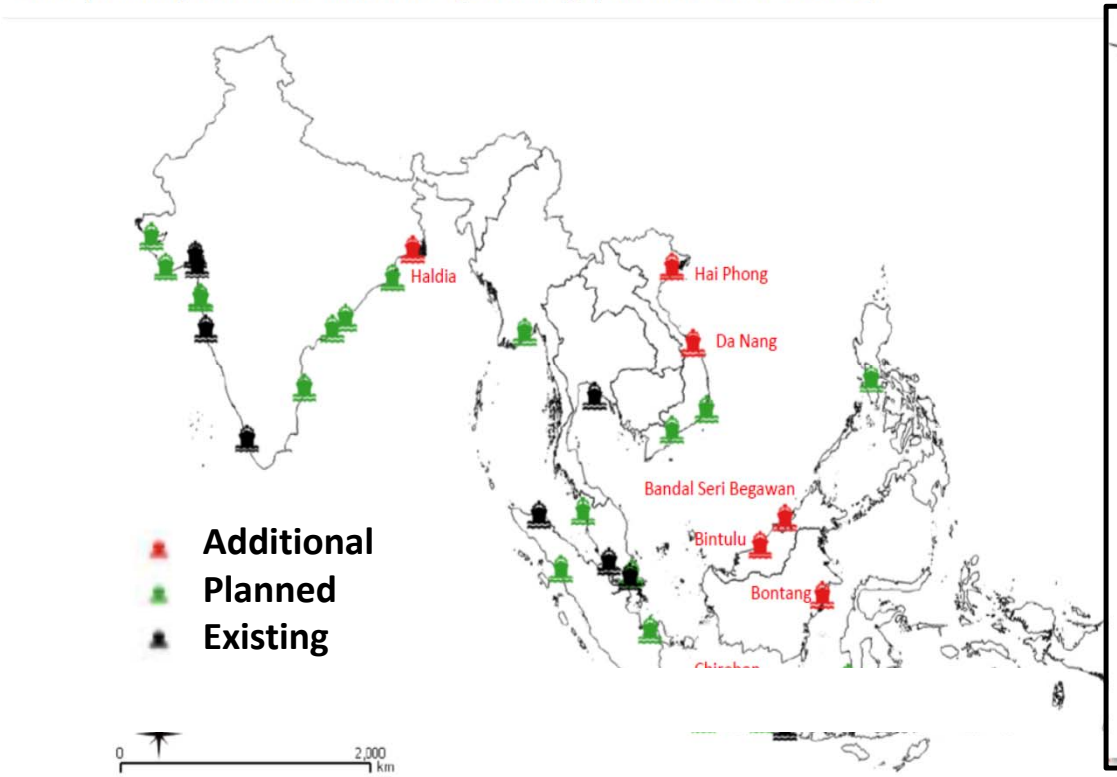
Other sectors total

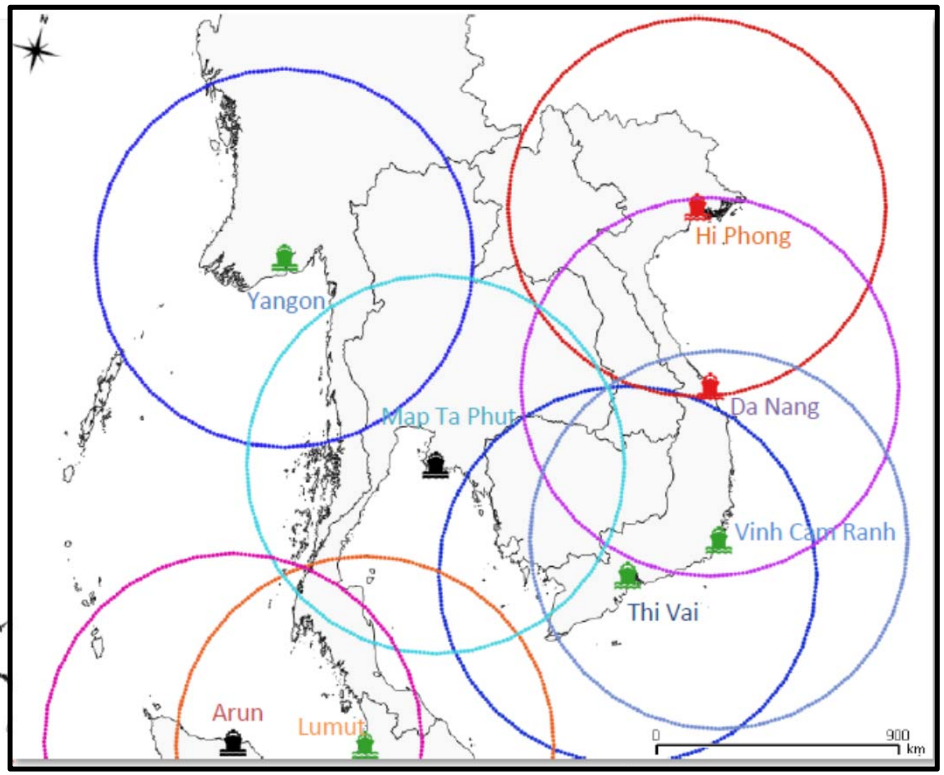
Fuel import cost			CO_2 emission	
LNG: USD 11.9/Mbtu (Billion USD)	LNG: USD 9/Mbtu (Billion USD)	LNG: USD 6/Mbtu (Billion USD)	(Million tons-CO2)	
-23.2	**-33.7**	**-44.6**	**-0.047**	**(-2%)**

Investment Need for LNG Supply Chain by 2030

- More primary LNG terminals necessary by 2030
- Estimated investment for additional LNG supply chain by 2030 is 81 billion USD altogether.
- Utilization of existing infrastructure like national railway system and ports.
- Primary LNG terminal in ASEAN could cover other countries' area.

LNG primary terminal location (existing, planned and added)



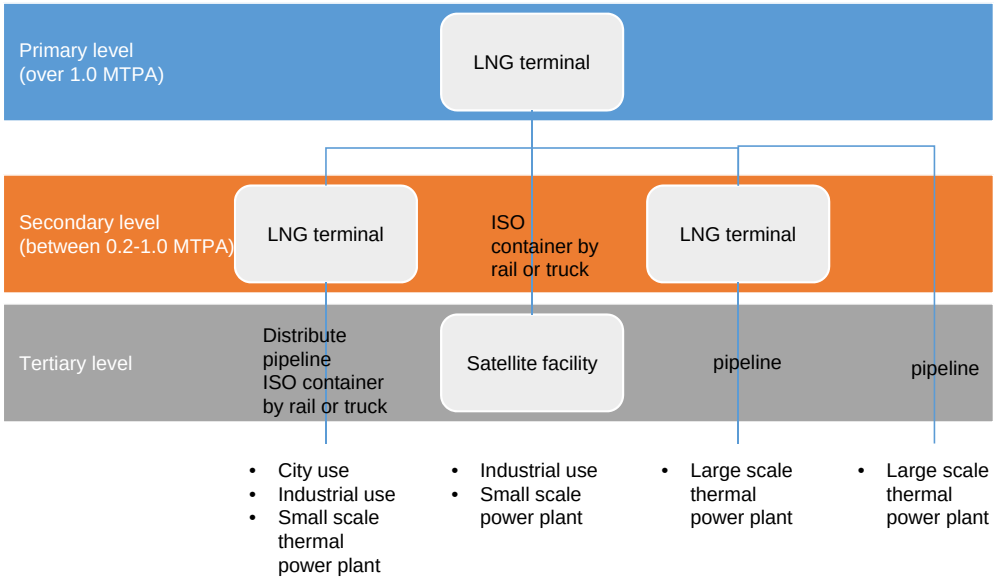


Investment in Supply Chain Options

Scope of LNG supply chain infrastructure and allocation methodology

☐ Scope of LNG supply chain infrastructure

- Three level hierarchy system is assumed
- Depending on the demand type, the transport methods are decided
- Pipeline, Land transport (Truck and Railway) and Sea transport are assumed.



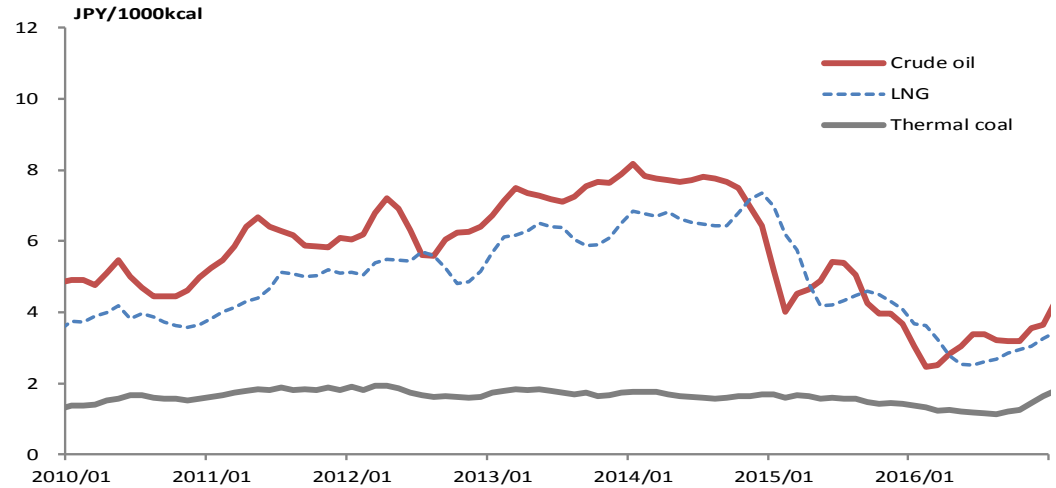
☐ Allocation methodology

- Compared to ISO containers, the pipeline transport is prioritized in case of the distance from port to thermal power plans are close as within 32.5 km because transshipment works need time and efforts.
- In case that both neighbor ports and thermal power plants have rail connectivity and distance between them is over 32.5 km, the railway transport is assumed to be applied.
- In case of impossibility to use pipeline and railway, the conditions to use truck transport can be satisfied, the truck will be used for the transport.
- Other cases but the above-mentioned case are discussed as case by case.

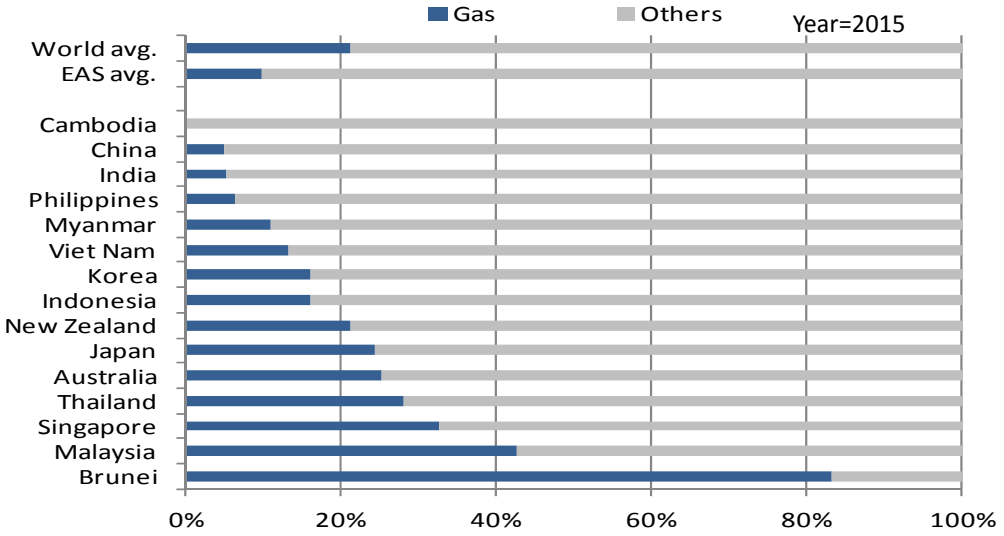
Transport mode from neighbor ports		Rules
Transmission pipeline		According to the case in Japan (Tokyo Elec. Corp.: distance from Futtsu LNG terminal to Chiba gas thermal power plant is 32.5 km), so that the transmission pipeline is assumed as transport mode with 32.5 km from port to thermal power plant.
Rail	At port	If the distance between railway and port is within 15km, it is judged as connectivity and railway transport can be used
	At demand points (e.g. thermal power plant)	If the distance between railway and thermal power plant is within 15km, it is judged as connectivity and railway transport can be used
trucks	Distance	Normally, port has road connectivity, so that if the demand points are within 700km from ports, it is judged as transportable.
	Frequency	Upper limit is set as 24 times/day of 40ft ISO container (13.5 ton eq.)

Sustainable Development of Natural Gas Market in East Asia

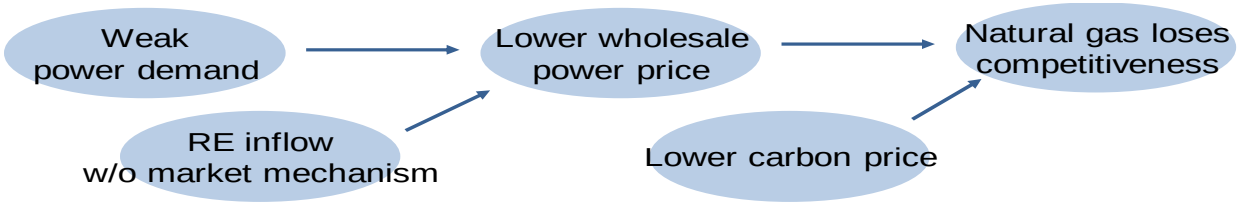
Japan's Fuel Import Prices per Unit of Heat Content



Share of Natural Gas in Total Primary Energy Supply



Mechanism to Squeeze out Natural Gas from the Power Generation Market



Policies and Actions to Strengthen the Competitiveness of Natural Gas in the Region

The expanded use of LNG in Asia will depend (i) LNG's competitiveness against other energy sources, & (ii) sufficient investment in every part of the value chain.

	Natural Gas Industry	Government
Producing country	• Adopting effective cost-reduction measures • Removing or relaxing destination clause • Creating a reliable natural gas price benchmark • Jointly developing well-functioning market • Optimizing upstream supply infrastructure	• Jointly developing well-functioning market • Improving investment environment • Optimizing upstream supply infrastructure • Supporting investment through public finance
Consuming country	• Adopting effective cost-reduction measures • Removing or relaxing destination clause and optimizing logistics • Creating a reliable natural gas price benchmark • Jointly developing well-functioning market • Optimizing downstream supply infrastructure • Investing upstream by downstream players	• Creating a reliable natural gas price benchmark • Liberalizing the domestic market • Providing a low-carbon policy • Jointly developing well-functioning market • Encouraging natural gas use through public policies • Optimizing downstream supply infrastructure • Supporting investment through public finance

Conclusions

Comprehensive and intensive policies as well as actions from both producer and consumer side of stakeholders in the following regards are recommended, in order to support the development of the regional natural gas market in the following four aspects.