

Gas Market Arrangement and Challenges in Korea

2017. 9. 11

Bongseok Choi, Ph. D.



에너지경제연구원

Contents

01

New Trends of Global Natural Gas Market

02

Domestic Gas Market

03

Deregulation

04

To-Do List



1



New Trends of Global Natural Gas Market



Production and Consumption

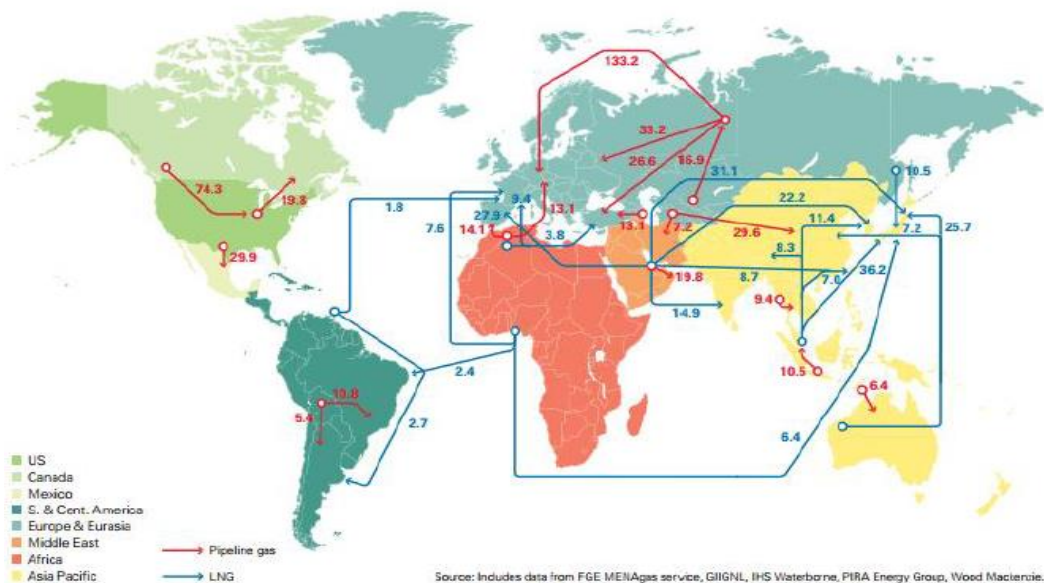
Produced by North America, Russia, Middle East

- United States (22%), Russia (16%), Qatar, Iran, Canada (each 5%)

Consumed by the above countries + European countries + East Asian countries

- Depends on GDP, weather, energy mix

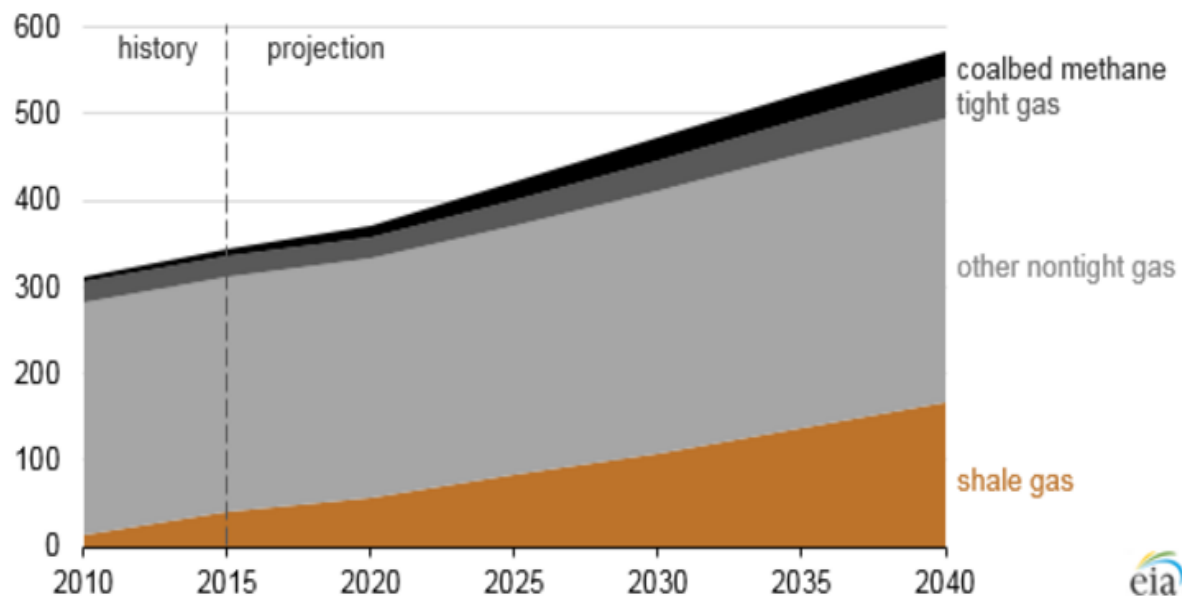
Major trade movements 2015
Trade flows worldwide (billion cubic metres)



Production	3,583.6bcm
Trade	1,042.4bcm
PNG (67.5%)	704.1bcm
LNG (32.5%)	338.3bcm

Explosive growth of gas production

- The so-called 'shale gas revolution' is expected to change the landscape of the world natural gas market



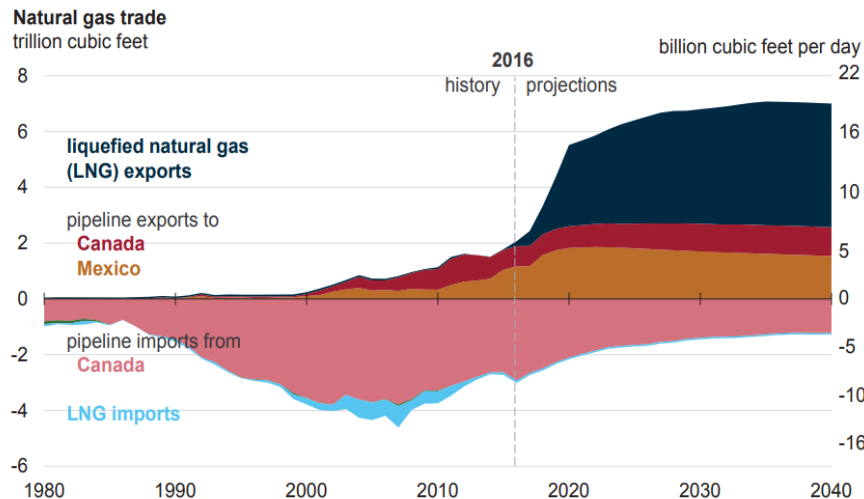
EIA; Unit: bcd/d(십억 입방피트/일), including "other non-tight gas"

By EIA(2016), Global gas production : 342bcd/d (2015) \uparrow 554bcd/d (2040)
 shale gas production : 42bcd/d (2015) \uparrow 168bcd/d (2040)

Explosive growth of gas production

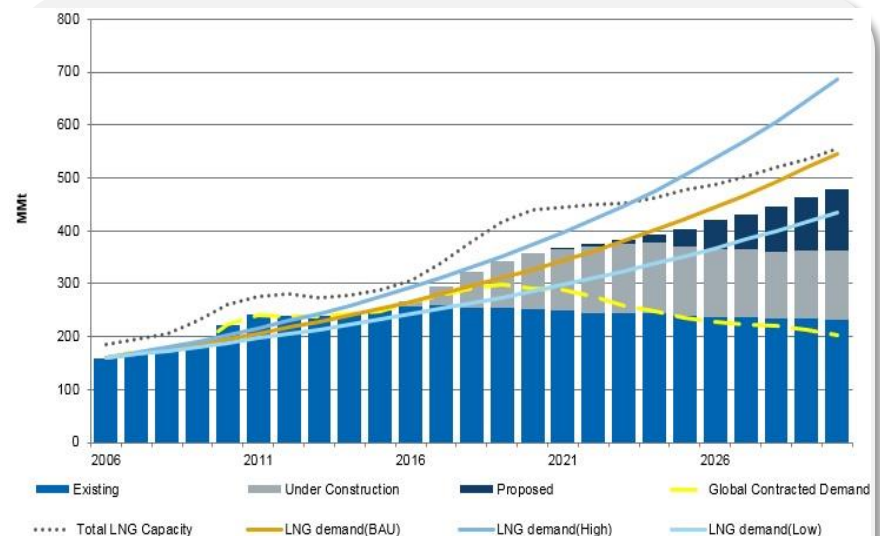
- U.S. shale gas revolution by technological innovation: increase in gas production per rig by shale play, decrease in unit production cost
 - The U.S. becomes a net energy exporter in 2018 in most AEO2017(EIA) cases as petroleum liquid imports fall and natural gas exports rise.
- LNG market is headed into oversupply. Australia plans more than 10 projects. New suppliers are emerging in the eastern Mediterranean and offshore east Africa

〈U.S export–import of natural gas〉



EIA DOE, AEO(2017)

〈Global LNG exports by status〉



IHS(2017)

○ Structural Change to Trade Patterns

○ Traditional “Integrated Model”

- The participants share a unity of interest in the LNG value chain from production of natural gas through the liquefaction of the LNG
- Few buyers and few sellers
- Fixed price, long-term based project

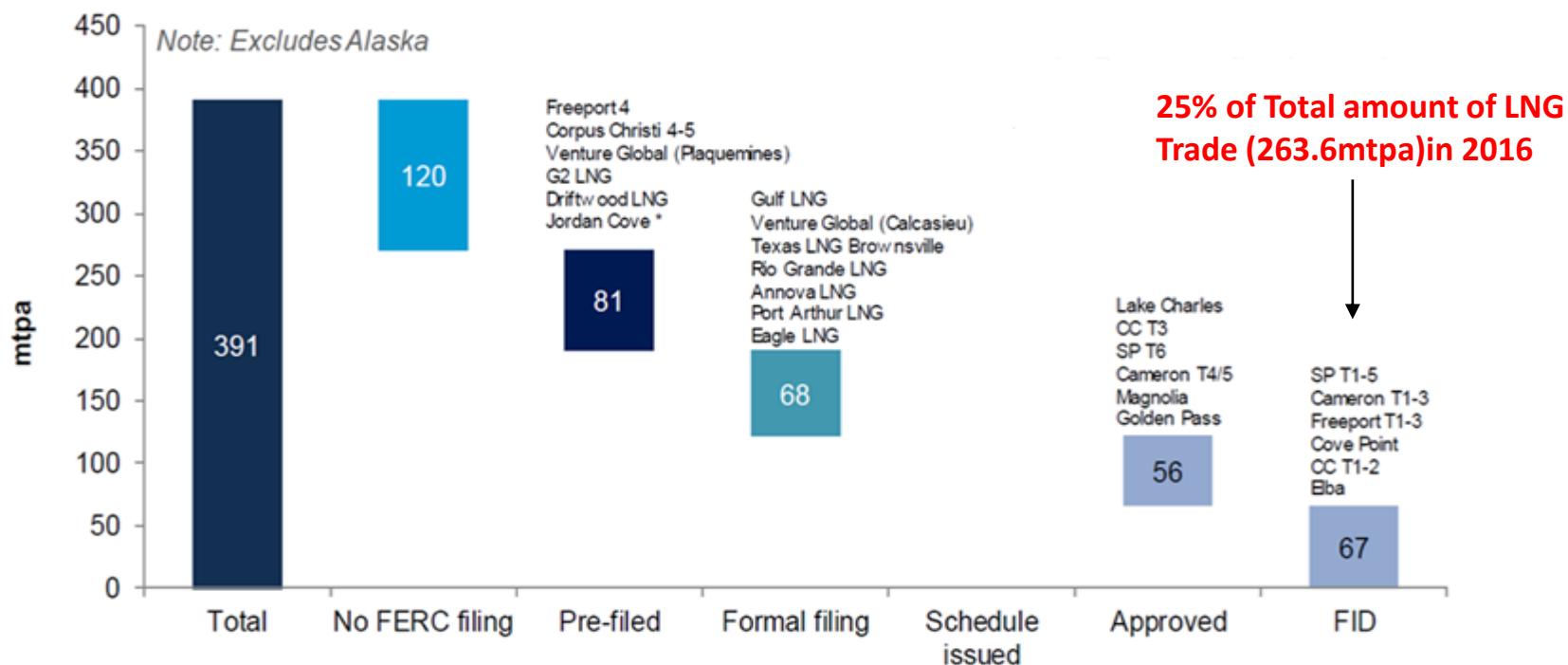
○ The US natural gas market exhibits different structure in terms of production, supply, price formulation

- In Tolling model, the LNG plant does not take title to natural gas feedstock or LNG produced at the plant, but provides liquefaction and processing for the owners of the feedstock natural gas.
- In Merchant model, the project company that owns the liquefaction facility purchases natural gas as feedstock from a seller (or sellers) and resells LNG to offtakers.
- Under both model, profits of the LNG project owners come mainly from the revenue from liquefaction capacity charges
- TOP penalties to LNG buyers are effectively lower to the level of liquefaction capacity charge

Structural Change to Trade Patterns

- Asian buyers have increasingly sought to diversify the pricing structures of their LNG portfolios; shift away from the traditional fixed-destination, long-term, oil-linked LNG contract.

FERC Status (as of 10 Feb 2017)



Source: US FERC, US DOE, and press reports



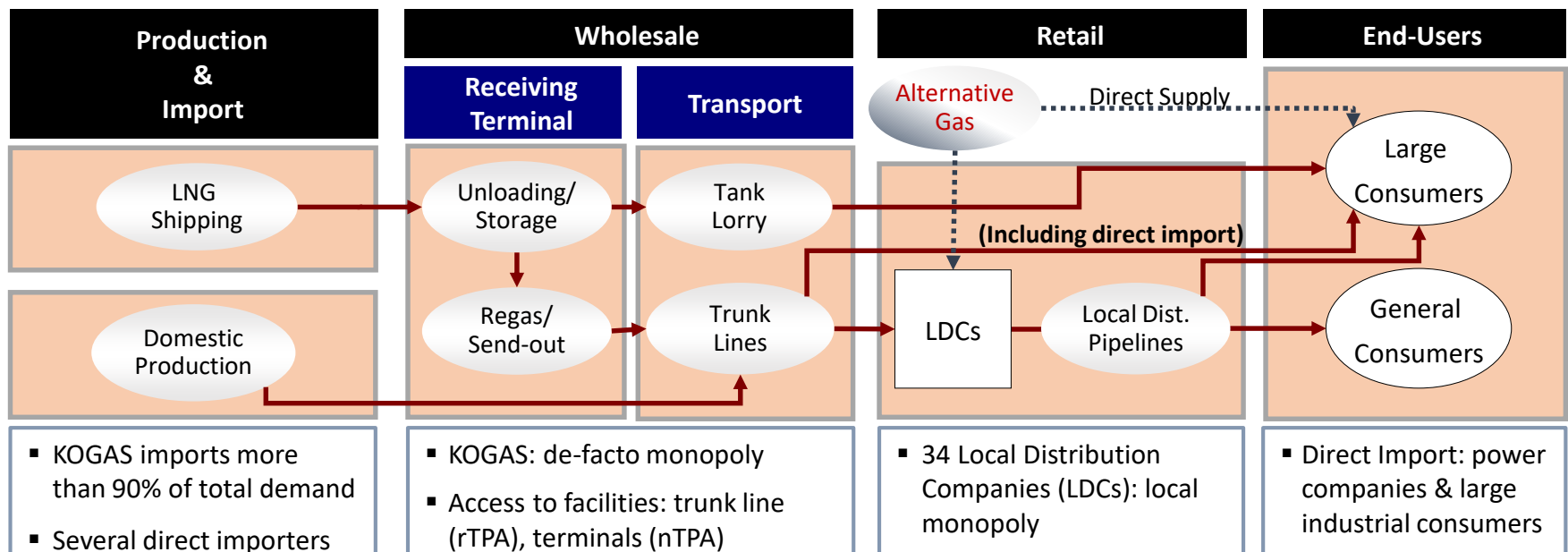
2 | Domestic Gas Market



Domestic Gas Market

Monopolized Import, Wholesale & Retail Markets

- LNG demand in Korea has increased since Korea started to import in 1987
- KOGAS: monopolistic in import & wholesale supply
- Supplies big power stations and city gas companies
- Direct importers: allowed only for their own use
- Local distributors (city gas companies): local monopoly

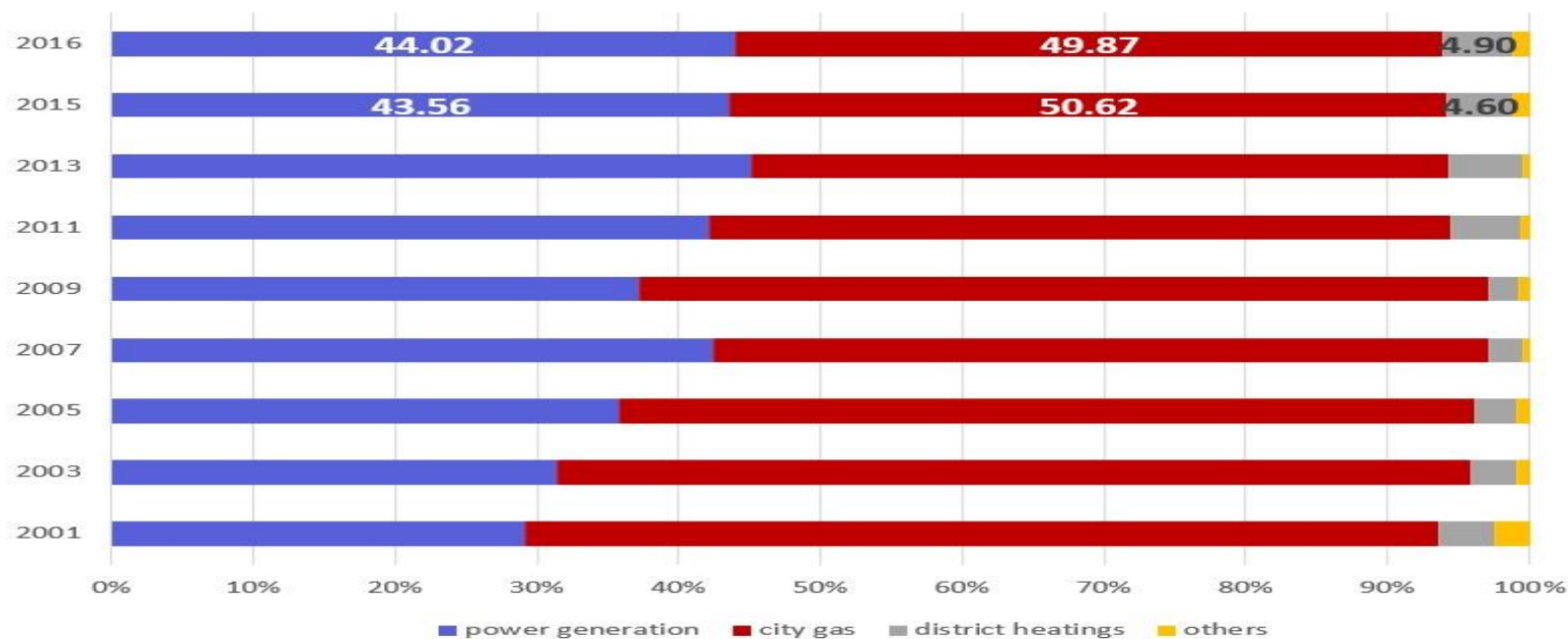


Source: KEEI

Demand Characteristics

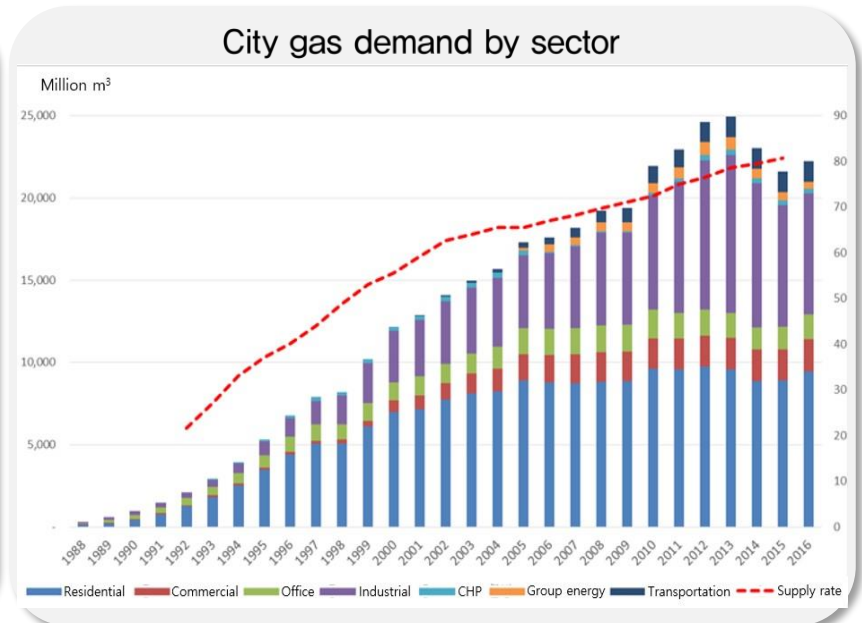
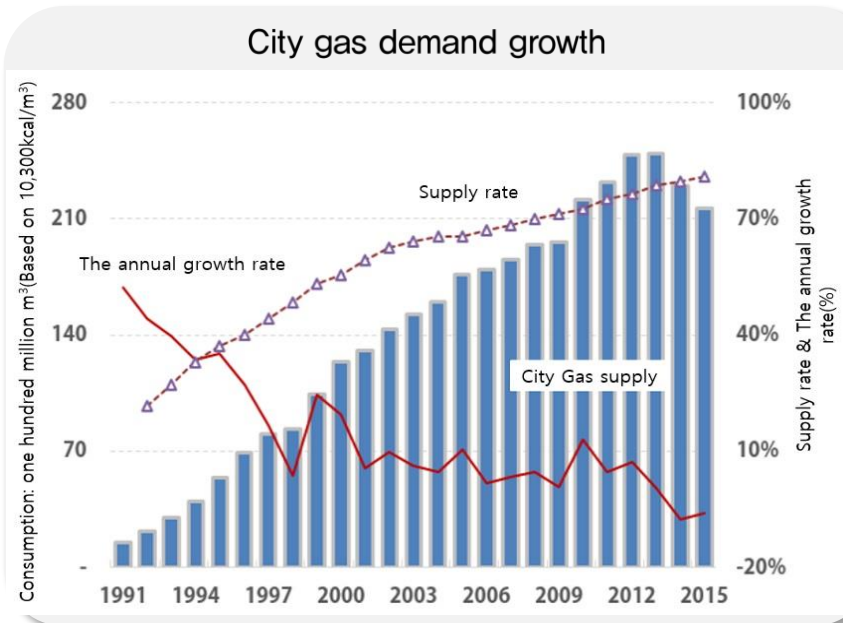
○ Demand Characteristics

- After the demand rose to 40MMt in 2013, it dropped by 13.4%(34.8MMT) in 2016.
- Demand spurred by power sector
- Low oil price induces shrinking demand : LPG (industrial)
- High-cost competitive nuclear, coal-fired power : Cheaper electricity



City gas demand growth : stagnant and falling

- The city gas demand turned to decrease since 2002

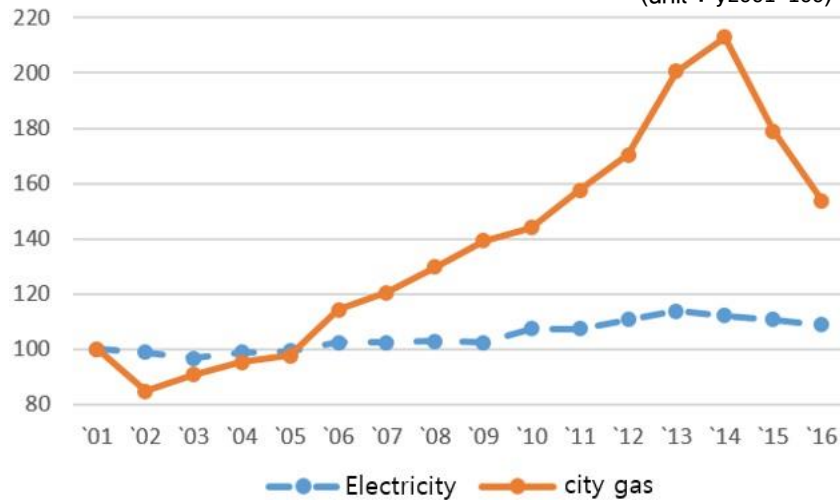


Korea City Gas Association

- The Residential, Commercial, and office customers is influenced by temperature and electricity price
- The Industrial demand is mainly influenced by economic activity and price of alternative fuels(LPG, B-C)
- Particularly, since the fuel costs linkage system maintained in 2013, lots of industrial customers with dual-fuel systems change fuels.

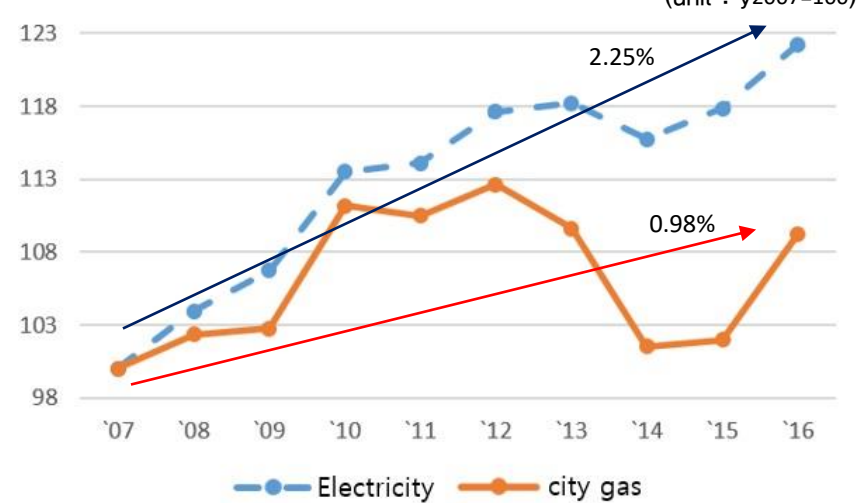
〈 Residential price: Electricity and City gas 〉

(unit : y2001=100)

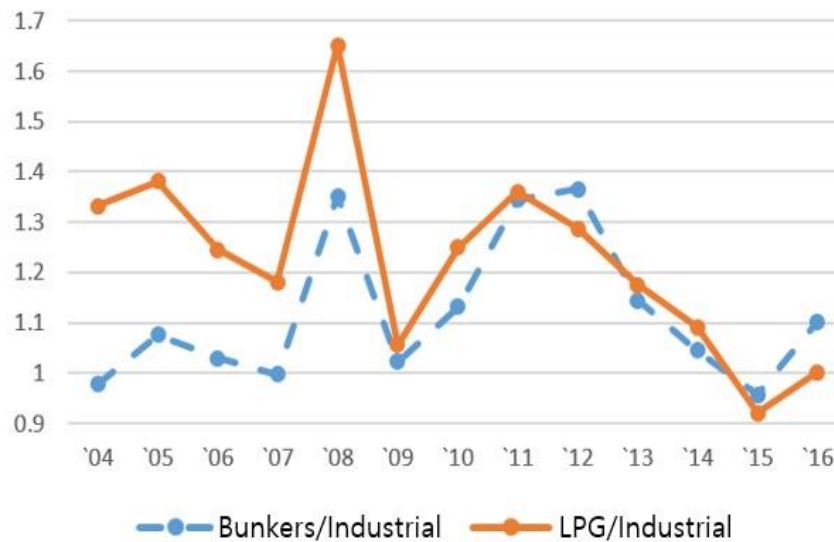


〈 Residential consumption: Electricity and City gas 〉

(unit : y2007=100)

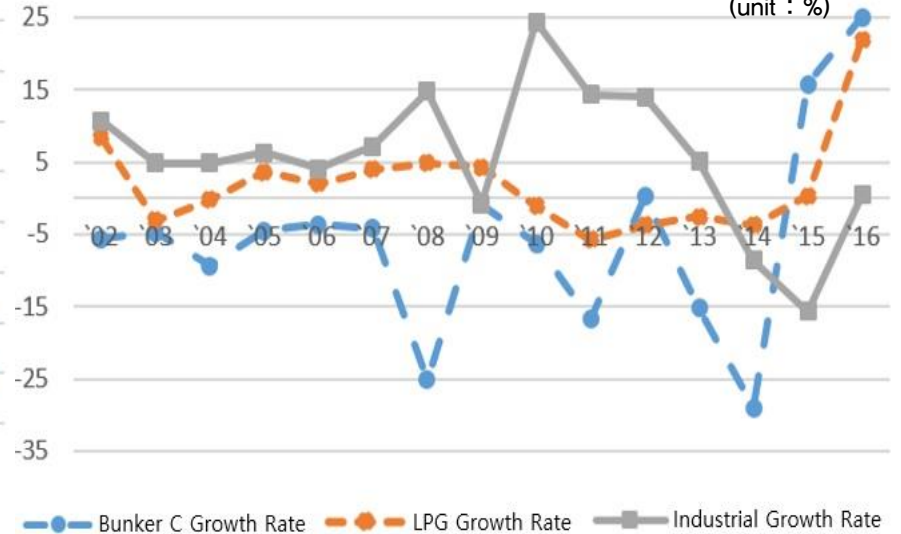


〈 Industrial price: B/C, LPG and City gas 〉



〈 Industrial consumption growth : B/C, LPG and City gas 〉

(unit : %)



Market price signaling failure : Case Study

- Fuel costs linkage system for city gas was introduced from August 1998
- assure the transparency and objectivity of rate adjustment, optimal allocation of resources and stable gas supply
- Deferred the fuel costs linkage system in order to stabilize prices due to the global financial crisis in March 2008.
- The rates were adjusted in September 2010 and October 2011 respectively, since then the material cost linkage system has been repeatedly implemented and deferred.

• The Industrial demand **increases** due to (relatively) cheap LNG

- The fuel costs linkage system has been maintained since February 2013
- Most industrial customers equip dual-fuel systems (e.g., LNG-LPG)

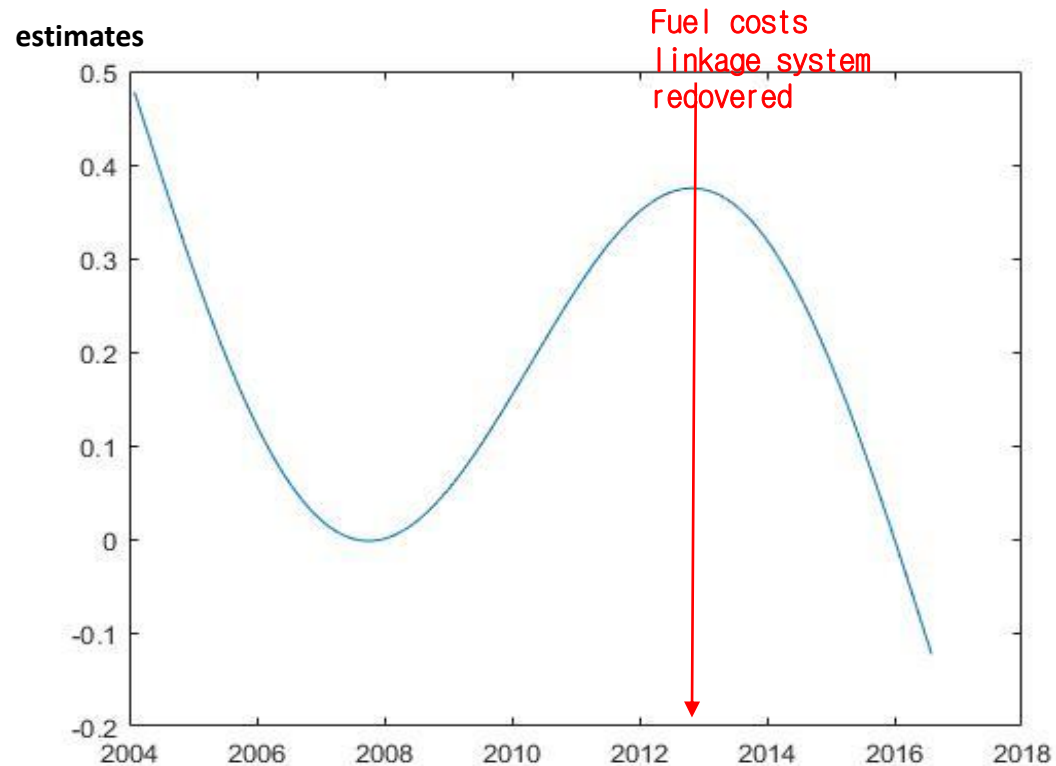
• The Industrial demand **falls** due to (relatively) expensive LNG

- Residential consumers bear recovery costs, reflecting losses resulting from uncollected material costs to price.

Market price signaling failure : Case Study

Estimation result of Time-varying price elasticity to Industrial LNG(city gas) demand

- Methodology: Chang et. al(2014) Energy Economics 46 (2014) 334-347
- Periods: 2004 to 2016
- Estimate the elasticity of change in (LPG price/LNG price) to change to Industrial LNG demand on Pusan, Ulsan, Kyung-nam areas
- Expected sign : (+)
- Controlling for economic activity, temperature effects ...



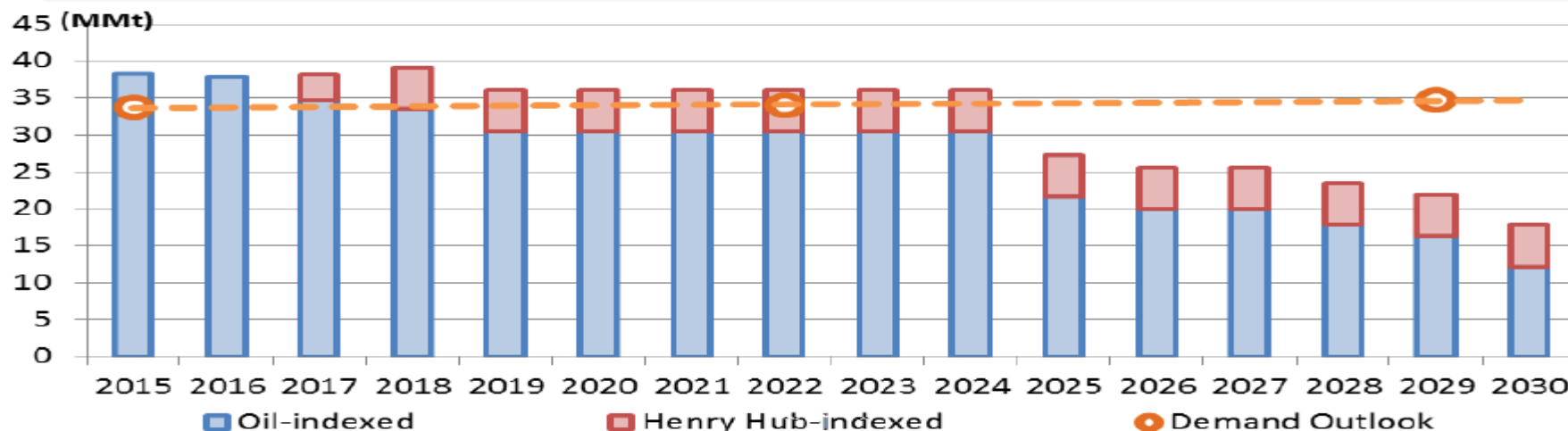


3 | Deregulation



Deregulation: Wholesale Market Competition

- There will be overcommitment of current contracts before 2025.



Source: KEEI

- It is necessary to come up with reasonable and rational policies regarding natural gas import by exploiting the global oversupply market situation.
- Encourage direct import for importers' own use to gradually rise from current 5% until 2025.
- Open wholesale market in phase to players other than KOGAS in 2025 (from power generation).
- Promote fair TPA for More Active Direct Import

Policy Change

◉ Promote fair TPA for More Active Direct Import

- To make the most of current LNG market situation
- Fairer TPA rules for better access to KOGAS facilities

◉ Open Up Wholesale Market from 2025

- 9 million tons of contracts to expire in 2024: unlikely to be renewed or replaced as before
- New entrants to compete against KOGAS on fair terms
- Stepwise approach: probably power generation and large consumers first, retail markets later
- Release the Roadmap

The creation of a fair competition (business) environments conducive to developing new technology and entrepreneurial activity to raise new demand



4



To-Do List



To-Do List for Liberalized Market

◉ Unbundling of KOGAS

- Prerequisite for equitable use of the infrastructure
- Ownership / Legal / Accounting with close monitoring

◉ Disposal of KOGAS' s Legacy Contracts

- Dissolving wholesale contracts may leave KOGAS with much of unwanted pricey LNG contracts
- How to share the burden of stranded contracts

◉ Ensuring Fair Distribution of Social Benefits

- Highly politicized issue: firms with high market power will get all the fruits
- Affordable price and stable supply to residential & commercial customers
- Open information on wholesale and retail price setting
- Fair Trade Commission keeps monitoring the gas market

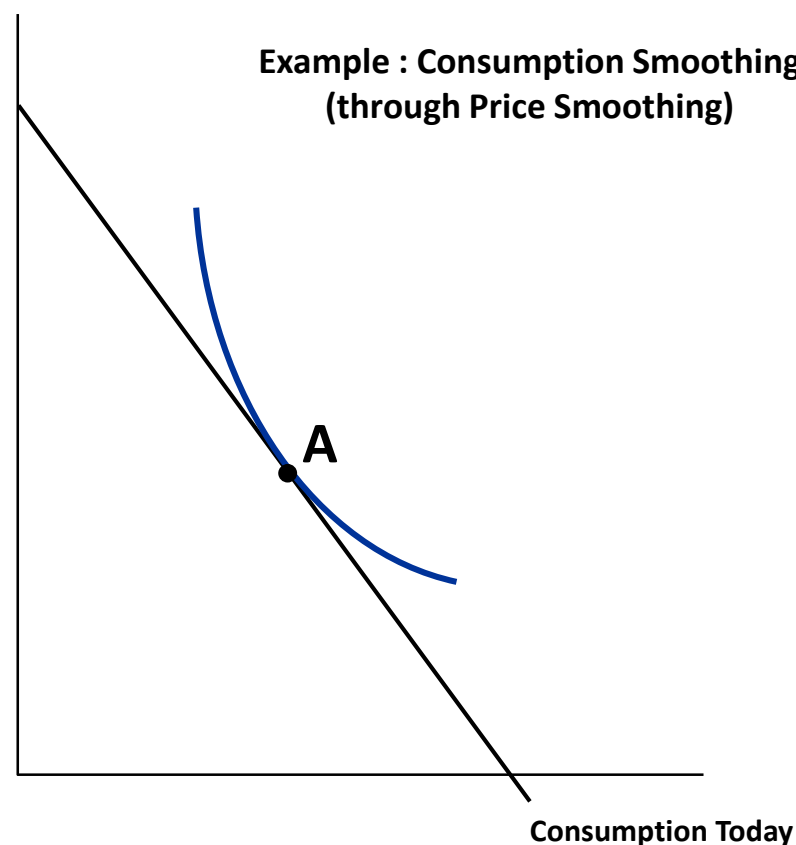
To-Do List for Liberalized Market

• Efficient market price signaling is prerequisites for market deregulation

- The adoption of an automatic fuel pricing mechanism
- The incorporation of a price smoothing mechanism can ensure pass-through over the medium term but also avoid sharp increases (and decreases) in domestic prices.
- Avoid reliance on an ad hoc approach to fuel pricing where governments change domestic prices at irregular intervals
- Price Volatility \leftrightarrow Fiscal Volatility

Consumption Tomorrow

Example : Consumption Smoothing
(through Price Smoothing)



〈 Ranking of Price Smoothing Mechanisms 〉

Price volatility	FPT	HIST	MA2	MA4	MA6	PB3	PB5	PB10
Std. deviation of monthly prices	8	2	6	5	3	1	4	7
Avg. monthly price change (sq)	8	1	5	4	2	3	6	7
Largest single monthly price increase	7	8	5	4	2	1	3	6
Avg. of 2 largest monthly price increases	8	6	5	4	2	1	3	7
Avg. of 3 largest monthly price increases	8	5	6	4	2	1	3	7
Sum of price volatility rankings	39	22	27	21	11	7	19	34
Rank order	8	5	6	4	2	1	3	7
Tax volatility	FPT	HIST	MA2	MA4	MA6	PB3	PB5	PB10
Std. deviation of taxes	1	8	3	5	7	6	4	2
Avg. monthly tax change (sq)	1	8	4	6	7	5	3	2
Largest single monthly tax decrease	1	6	3	8	7	4	5	2
Avg. of 2 largest monthly tax decreases	1	6	3	7	8	5	4	2
Avg. of 3 largest monthly tax decreases	1	6	3	7	8	5	4	2
Sum of tax volatility rankings	5	34	16	33	37	25	20	10
Rank order	1	7	3	6	8	5	4	2
Sum of all rankings	44	56	43	54	48	32	39	44
Overall ranking	4	8	3	7	6	1	2	4

Source: IMF staff estimates.

Note: Rank of (1) represents highest ranking in terms of minimizing the size of tax decreases and price increases, and minimizing the volatility of taxes and prices. The price series are: FPT—full pass-through; HIST—historical/actual retail price series; MA—moving average; PB—percentage price band.

Reference : Coady et. Al.(2012) “Automatic Fuel Pricing Mechanisms with Price Smoothing: Design, Implementation, and Fiscal Implication” IMF Technical Notes



| Thank You



에너지경제연구원
Korea Energy Economics Institute