Impact Analysis of Shale Gas on Shipbuilding & Offshore Industry

Sep. 2014

Global Economic Research Center

Korea Eximbank

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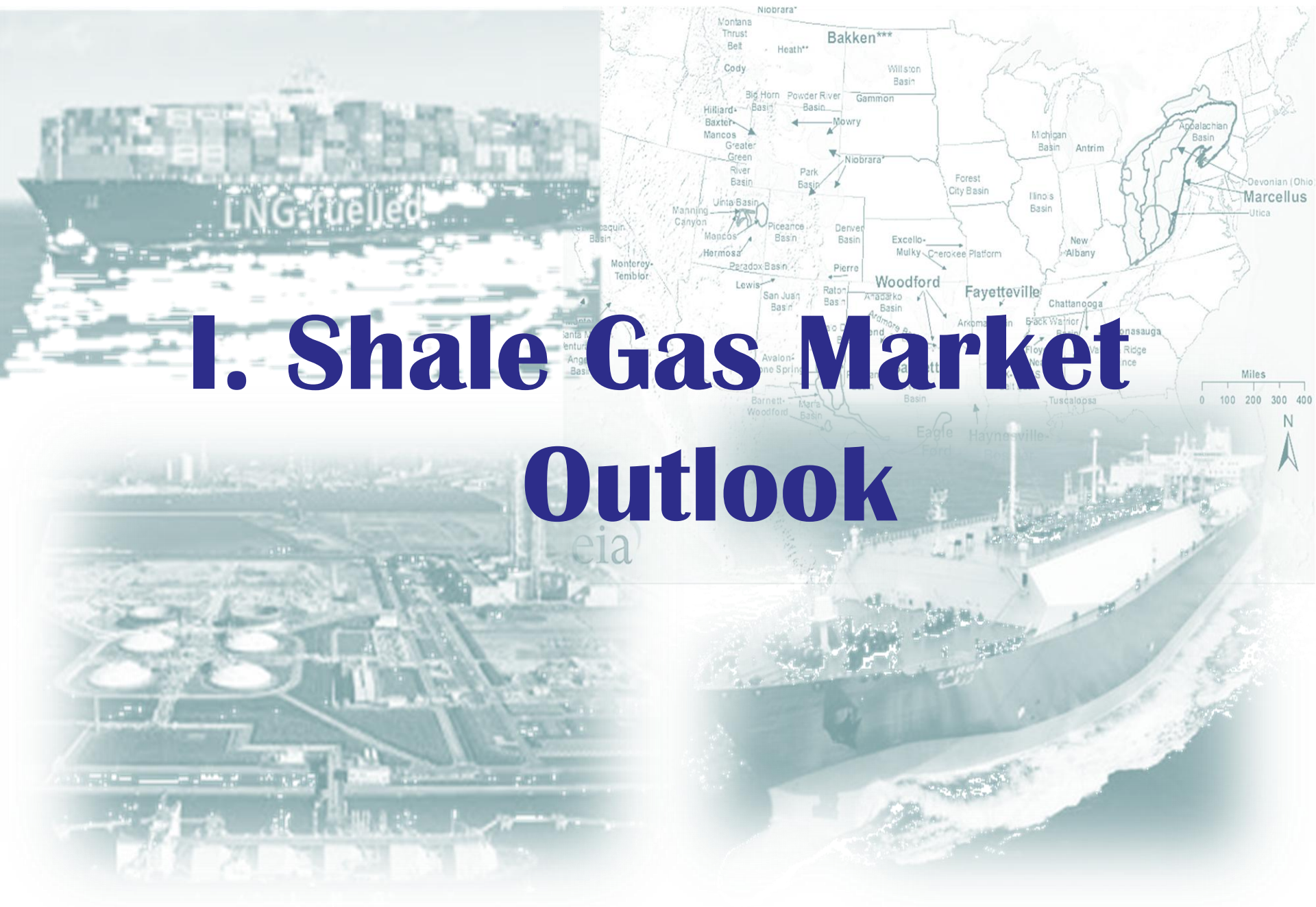
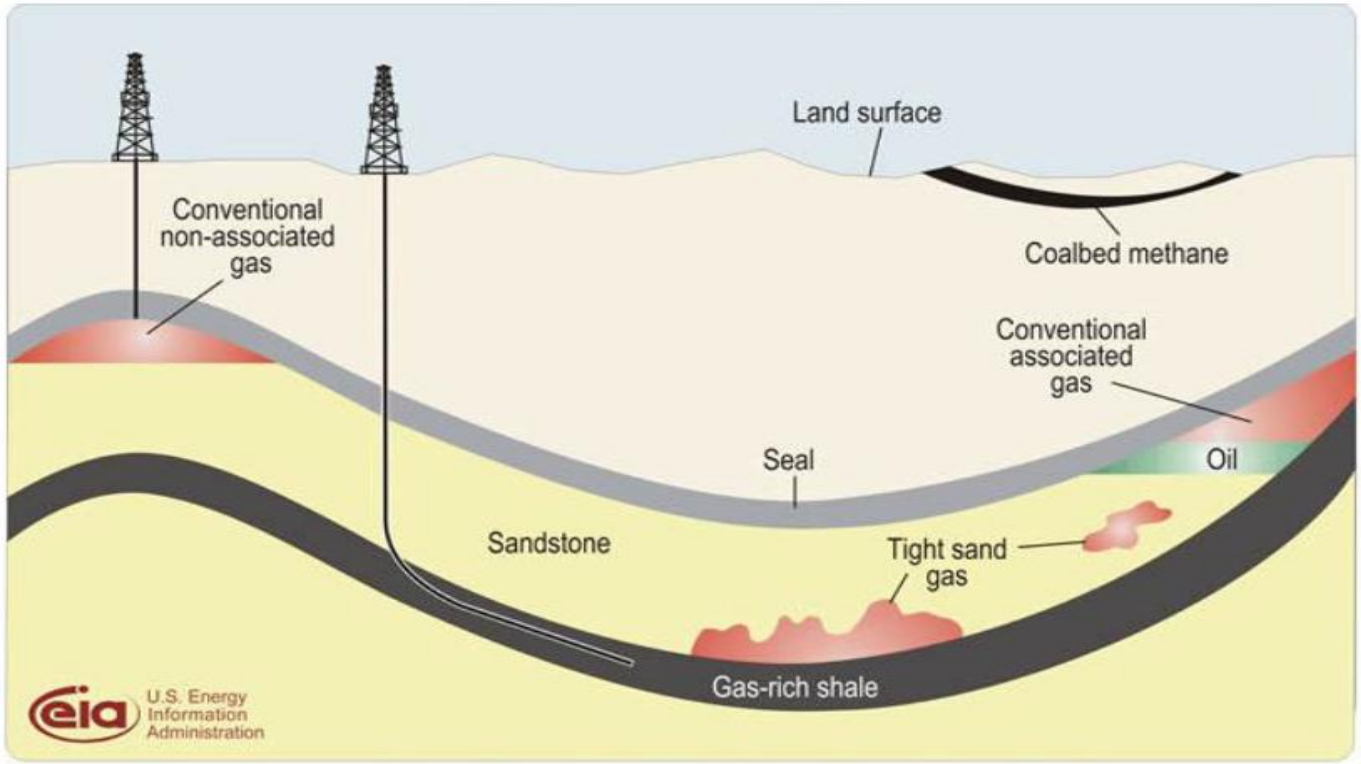


I. Shale Gas Market Outlook

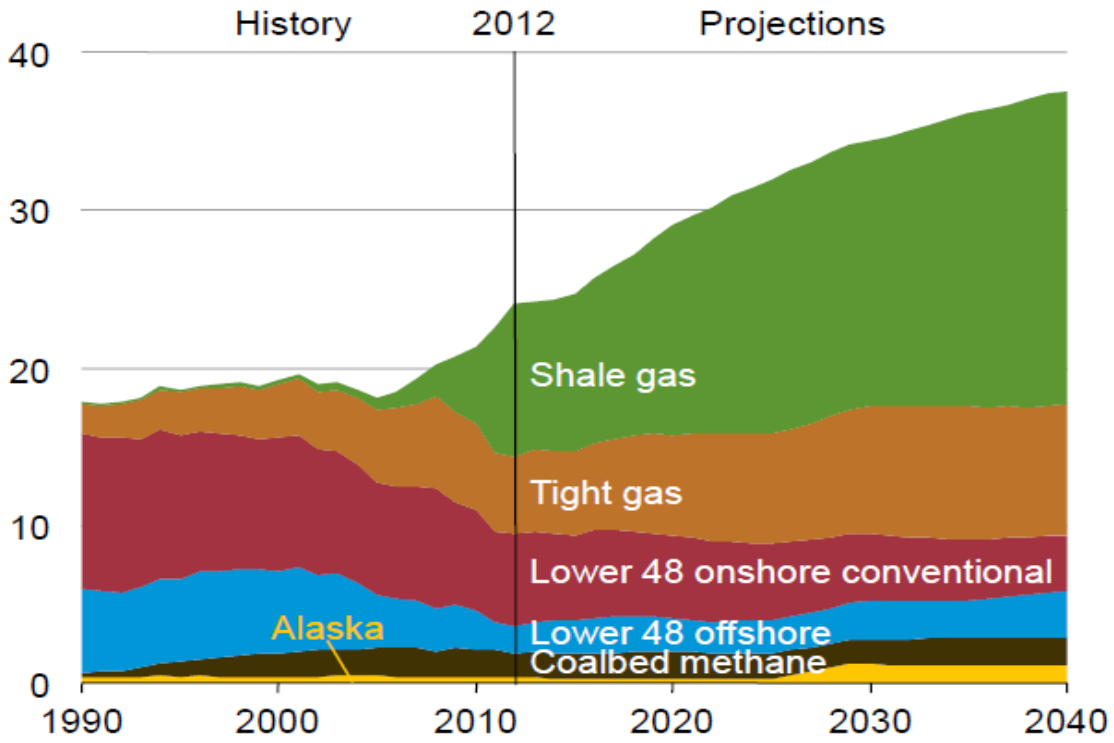
1. The Shale Gas

- Shale Gas : Gas trapped within shale formation
- Facilitated by development of methodology : Horizontal drilling, High pressure injection of water, chemical & sand



2. Shale Gas Production in USA

- US Shale gas production 2012 : 9.7 Tcf (equivalent to 83% of world LNG trade in 2013)
- EIA outlook : 19.7 Tcf in 2040



Source : EIA, Annual Energy Outlook 2014

3. Shale Gas Export from USA

- Uncertainty : US can secure enough economically feasible shale gas for domestic consumption ?
- The government approval process for export projects is too slowly going
- Only 2 projects have got FERC approval

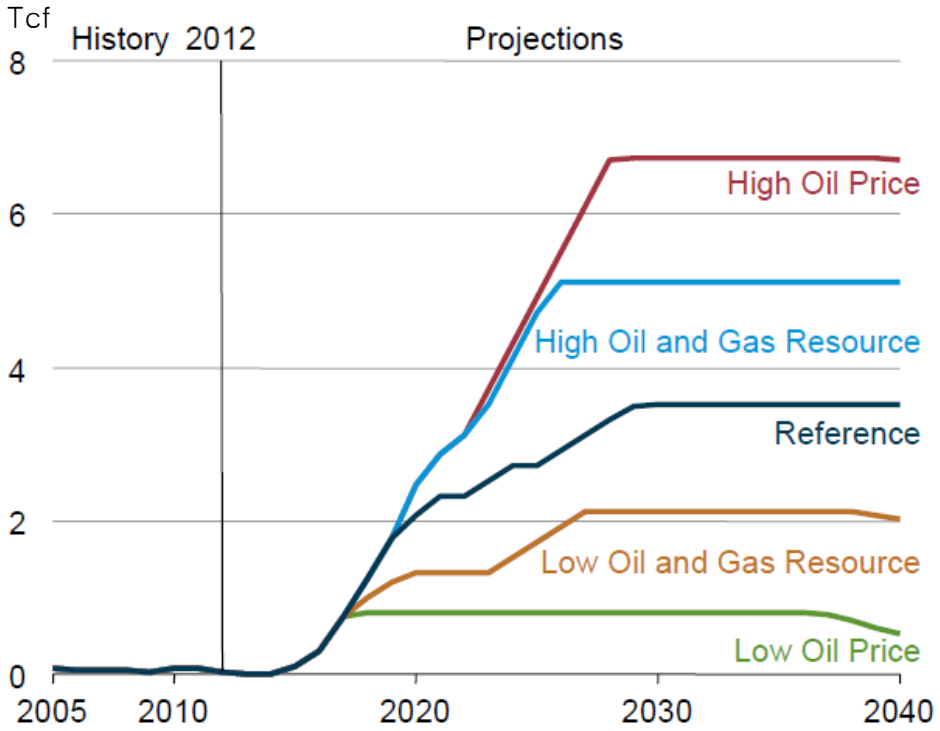
Project	Investors	Capacity	DOE Approval Date	FERC Approval Date
Sabine Pass LNG*	Cheniere Energy, BG, Gas Natural Fenosa, Kogas, Gail India, Total, Centrica	2.2Bcf/d	2011.5.20	2012.4.16
Freeport LNG	Freeport Energy, BP, Osaka Gas, Chubu Electric Power, SK E&S, Toshiba	1.4Bcf/d	2013.5.17	-
Lake Charles Exports	Energy Transfer Equity-Energy Transfer Partners, BG Group	2Bcf/d	2013.8.7	-
Cove Point LNG	Dominion Resources, Sumitomo社 및 Gail India	0.77Bcf/d	2013.9.11	-
Freeport LNG	Freeport Energy, BP, Osaka Gas, Chubu Electric Power, SK E&S, Toshiba	0.4Bcf/d	2013.11.15	-
Cameron LNG	Sempra Energy	1.7Bcf/d	2014.2.11	2014.6.19
Jordan Cove Energy	Veresen	1.2Bcf/d	2014.3.24	-

Source : KEEI

4. Shale Gas Export Outlook

- EIA's reference case
  - Export will be start in 2016
  - In 2030, 3.5Tcf and maintained
- 3.5 Tcf : about 30% of current world LNG trade
- In 2030, It is projected that US Shale gas export will be about 15% of world LNG trade

< US Exports of LNG >

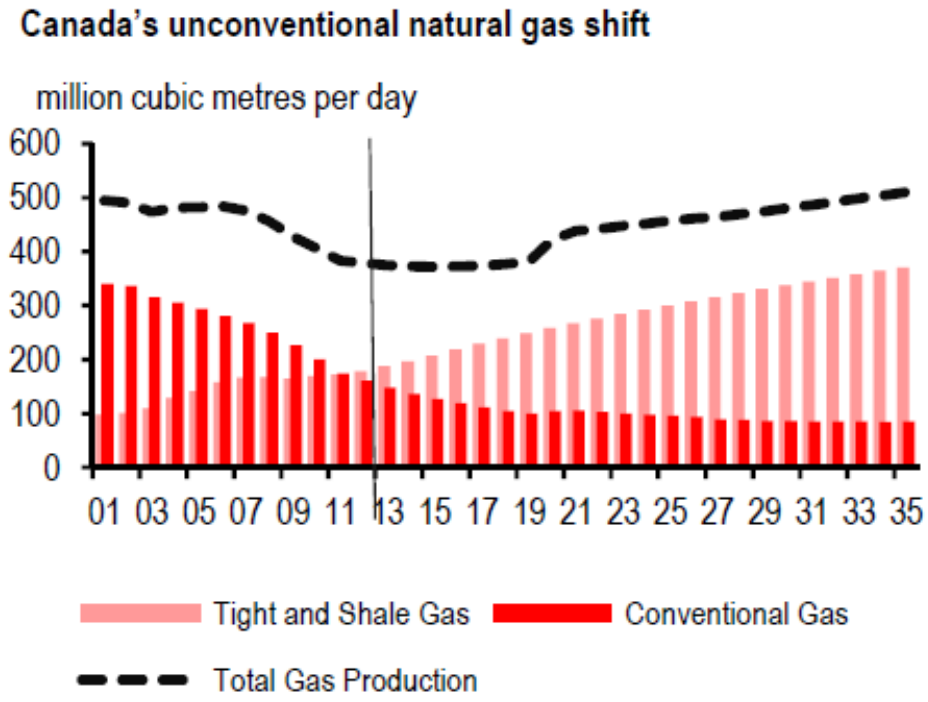


Source : EIA, Annual Energy Outlook 2014

5. Canadian Shale Gas Outlook

- Canada's Plan
  - Exports will be start in 2020
    → mainly to East Asia
- In 2020s, Canada's gas export will be about 10% of world LNG trade

< Canada Gas Production Outlook>

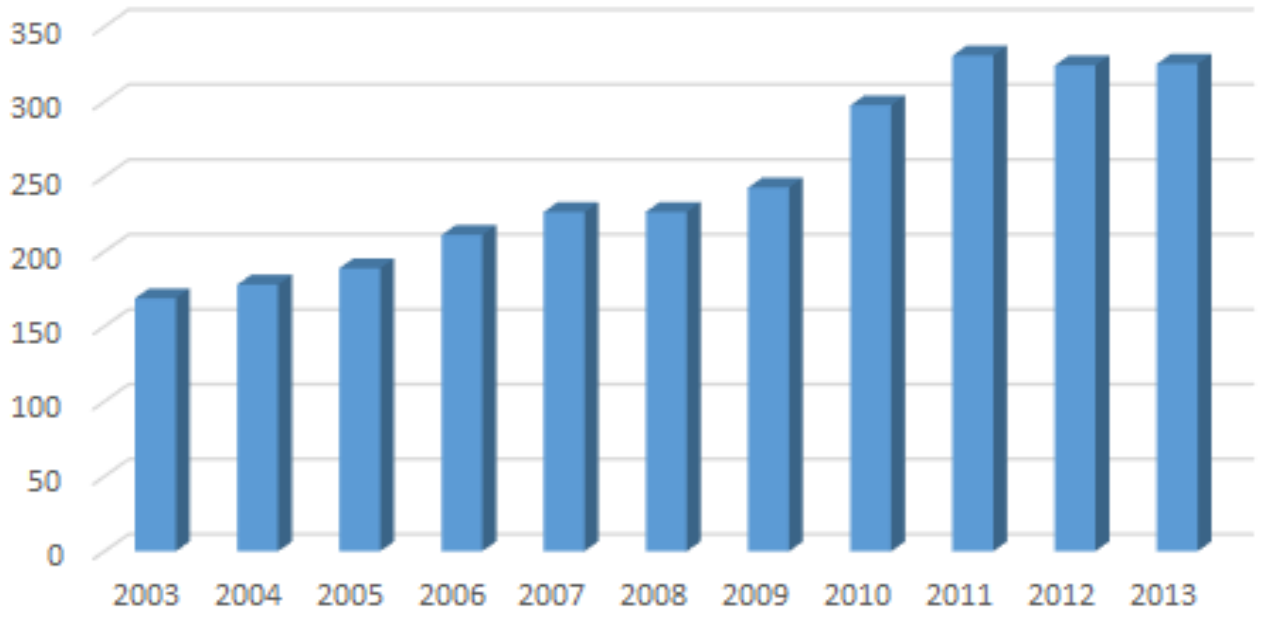


Source : HSBC, "Shale Oil and Gas : US Revolution, Global Evolution", (2013)

6. World LNG Trade

- Since 2012, volume of world LNG trade is stagnant
- Few of new projects.

< Total Amount of World LNG Trade (Bcm) >

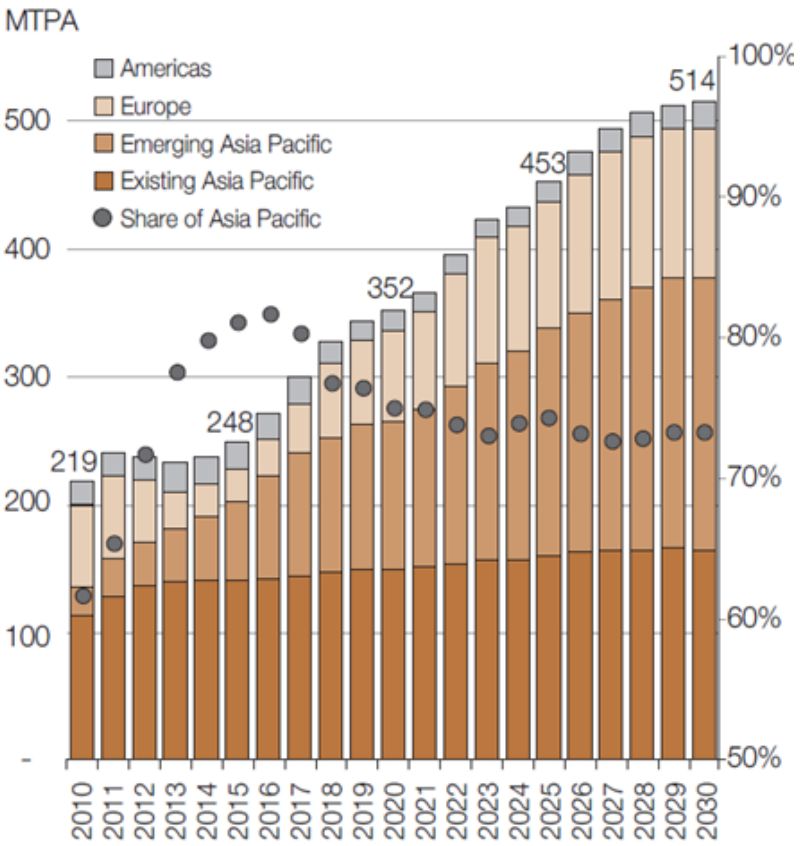


Source : BP

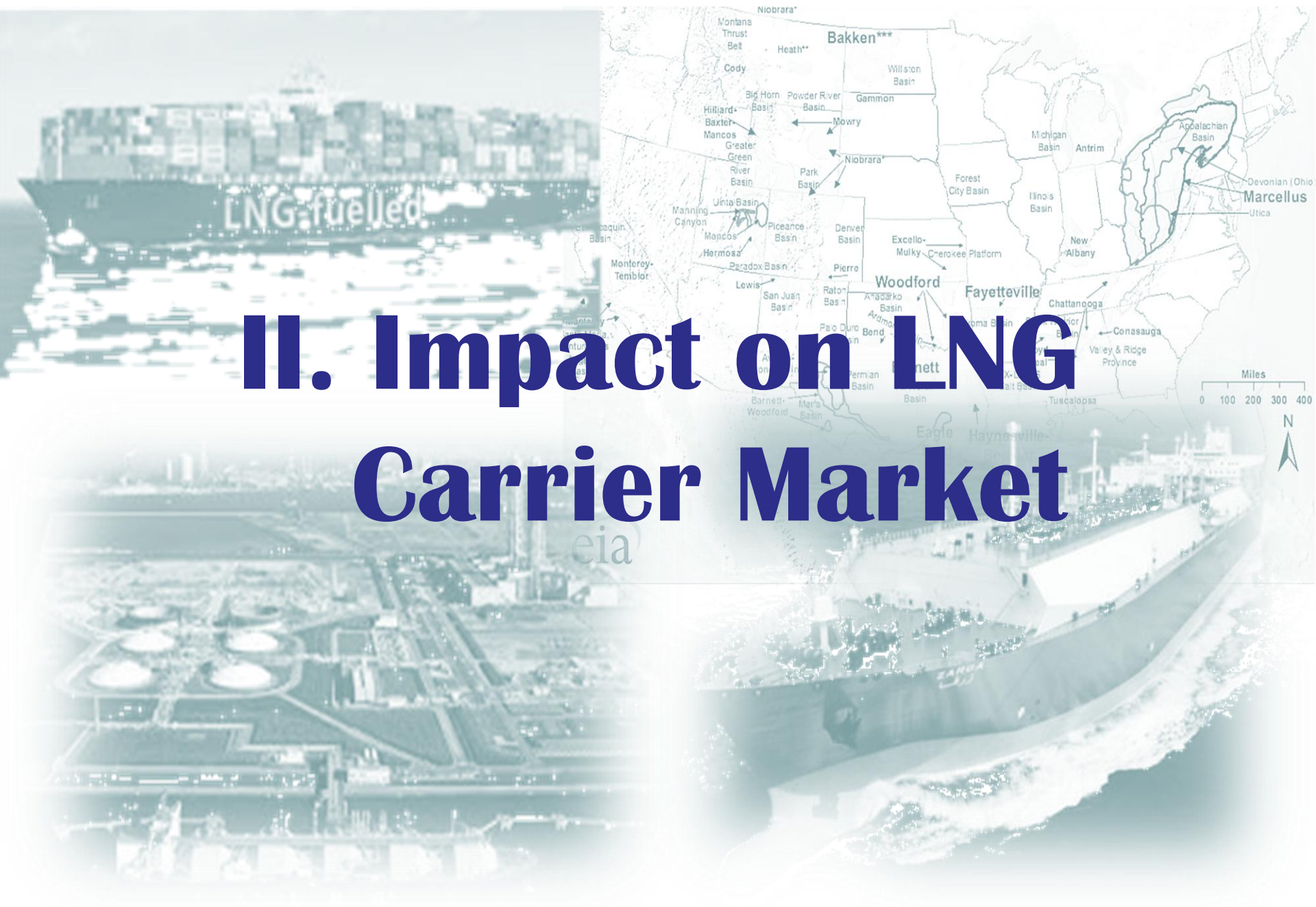
7. LNG Demand Outlook

- CAGR in Demand
  - 2015~2020 : 7.26%
  - 2021~2025 : 5.17%
  - 2025~2030 : 2.56%

< LNG Demand Outlook>



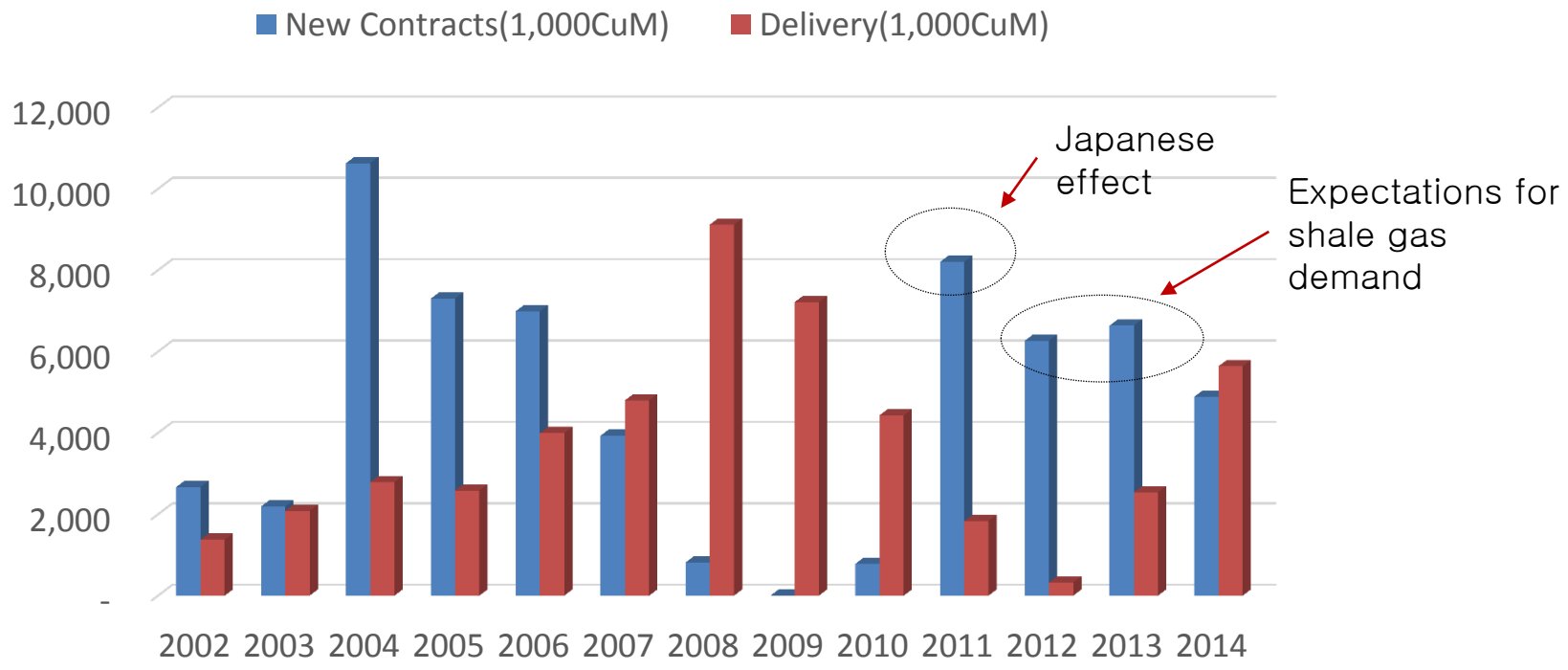
Source : Wood Mackenzie, KOGAS



II. Impact on LNG Carrier Market

1. Demand & Supply of LNGC

- Until 2010, there was oversupply of LNGC
- Since 2011, New orders were due to Japanese demand and expectations for shale gas

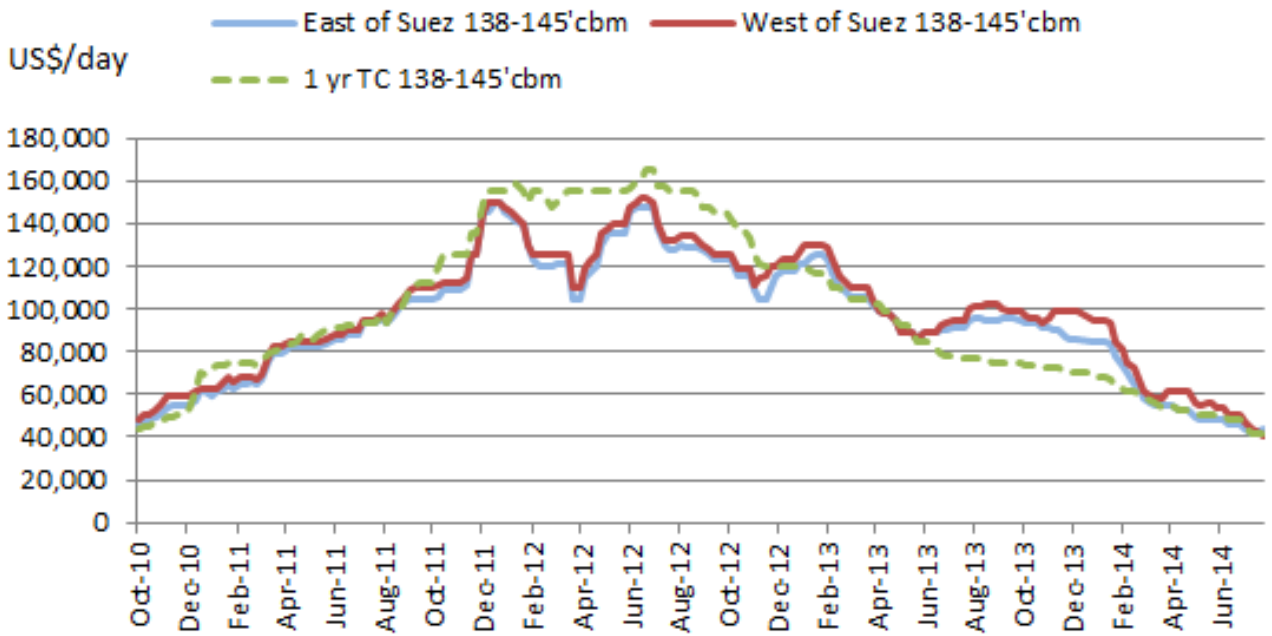


Source : Clarkson

2. Spot & Time Charter Rate of LNGC

- In 2014, spot & charter rates are rapidly falling down – oversupply
- Prediction : They will rebound in 2016 or 2017 by export of shale gas

< Spot Rate and Time Charter Rate of LNGC >



Source : Fearnresearch

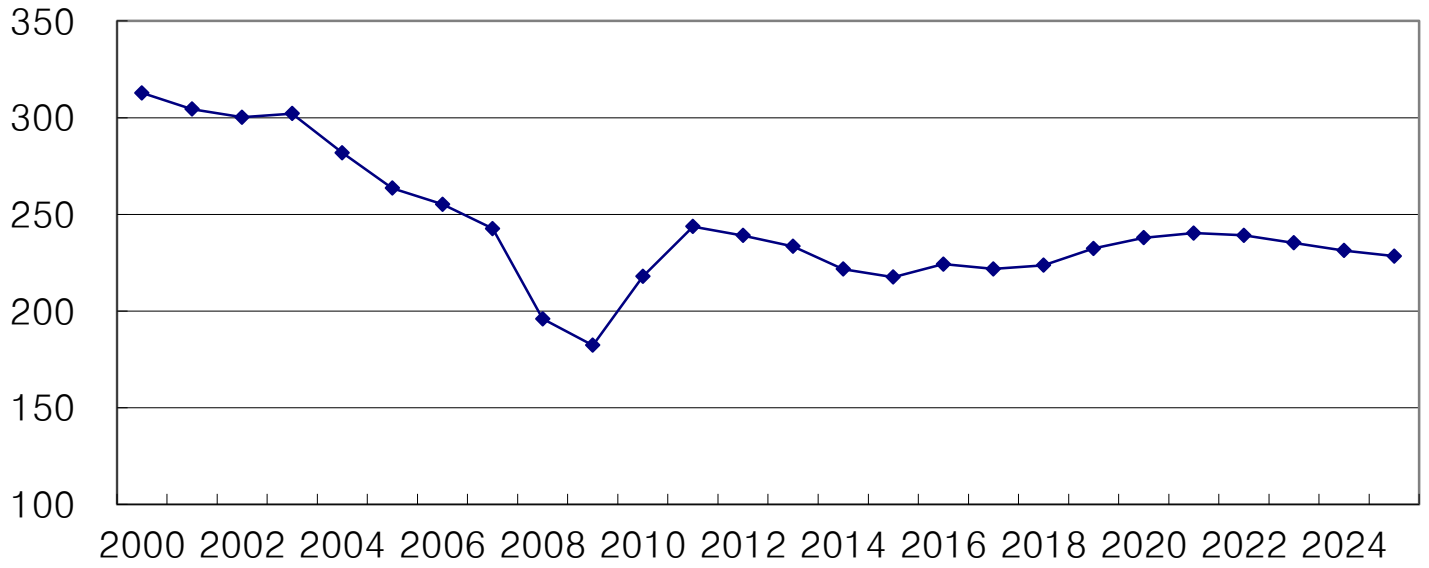
3. Effect of Shale Gas Trade

- Since 2016, the shale gas will lead increase of LNG trade volume
- US shale gas will need about 140~170 LNGC in 2030
- Canadian shale gas will need 50~60 LNGC in 2020s
- Spot rate can be stable in US$ 60,000 ~90,000/day

4. Outlook of Demand-Supply Balance

- Oversupply of LNGC can make problem until 2018
- In the long term, annual average working days of LNGC will be stabilized near 240 days

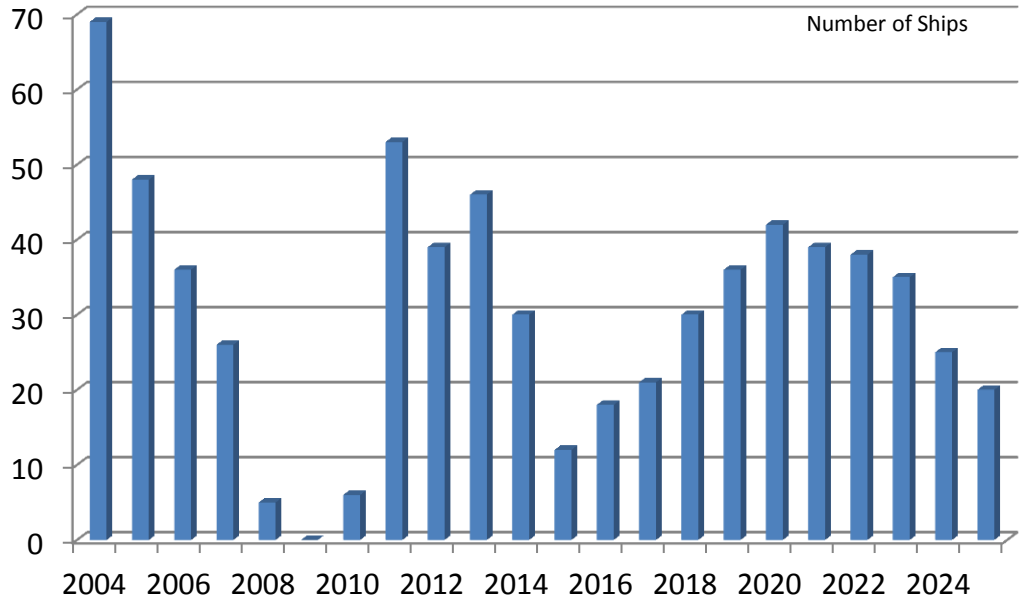
< Annual Average Number of Operation Days of LNGC >



5. Outlook of LNGC New Building Contracts

- It is predicted that new order will be 30~40 annually near 2020,
- Cyclic oversupply will appear

< Outlook of LNGC New Building Contracts >



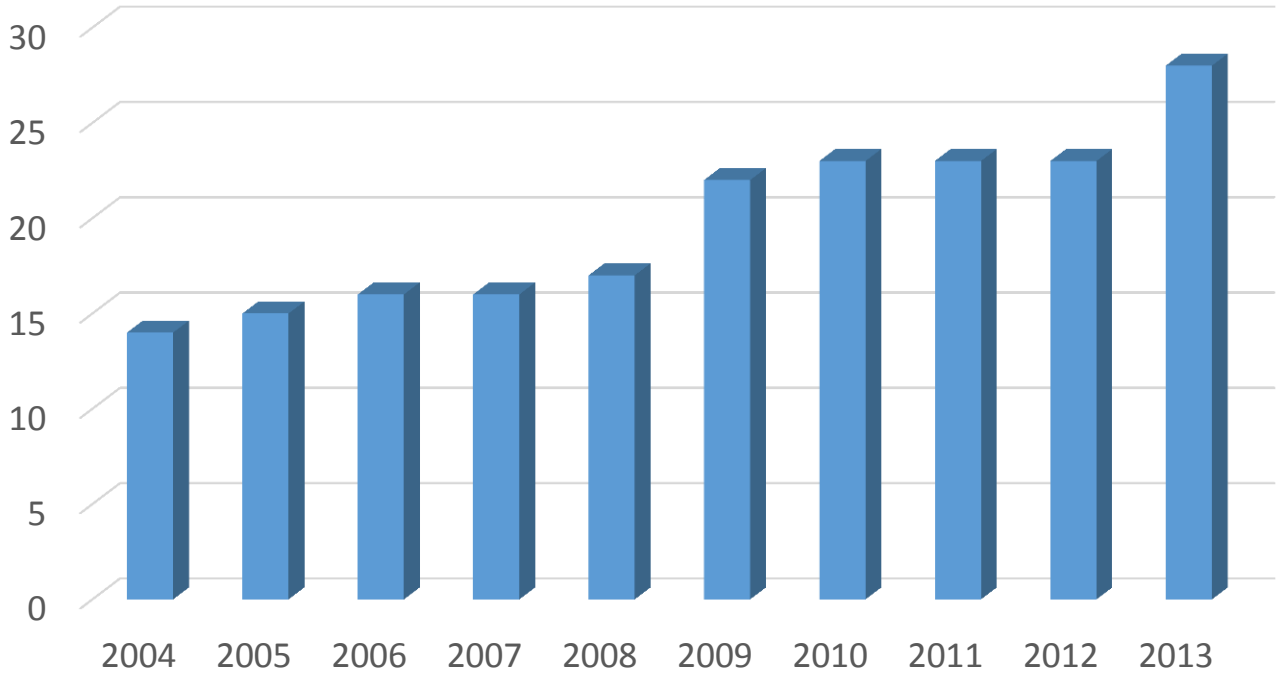
Source : Clarkson, Koreaeximbank

III. Impact on FSRU Market

1. Number of LNG Import Countries

- In 2004 : 14 countries → in 2014 : 28 countries
- Number of countries, who import just small quantity of LNG, is increasing

< Number of LNG Import Countries>



Source : BP

2. FSRU (Floating Storage & Regasification Unit)

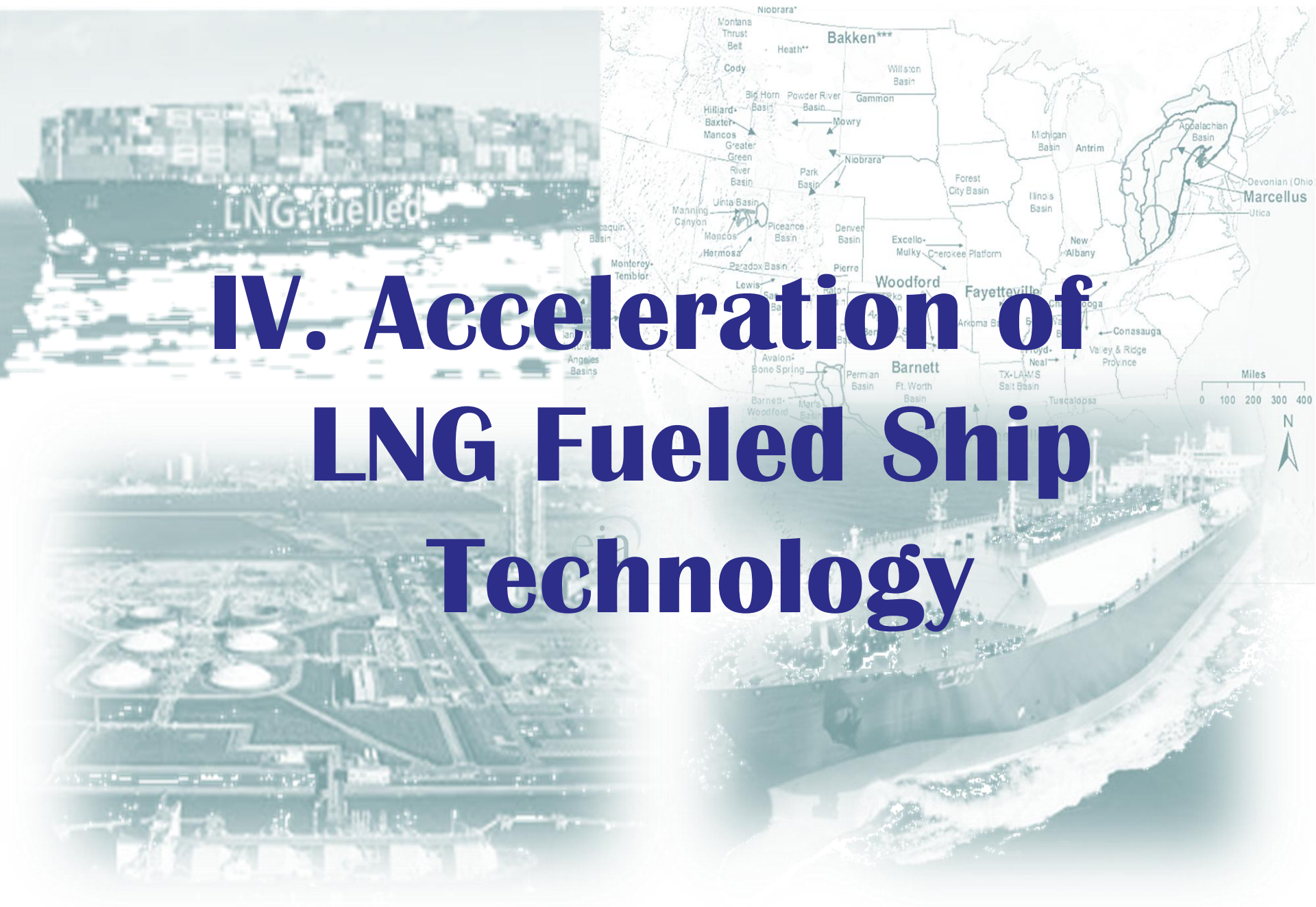
- Lots of import terminal facilities will be needed for storage & regasification
- FSRU can replace the terminal and do the role
- Half of construction period and cost
- No problem of NIMBY
- Temporal service available
- It can move to another place

< FSRU >

Source : Golar LNG

3. FSRU Market

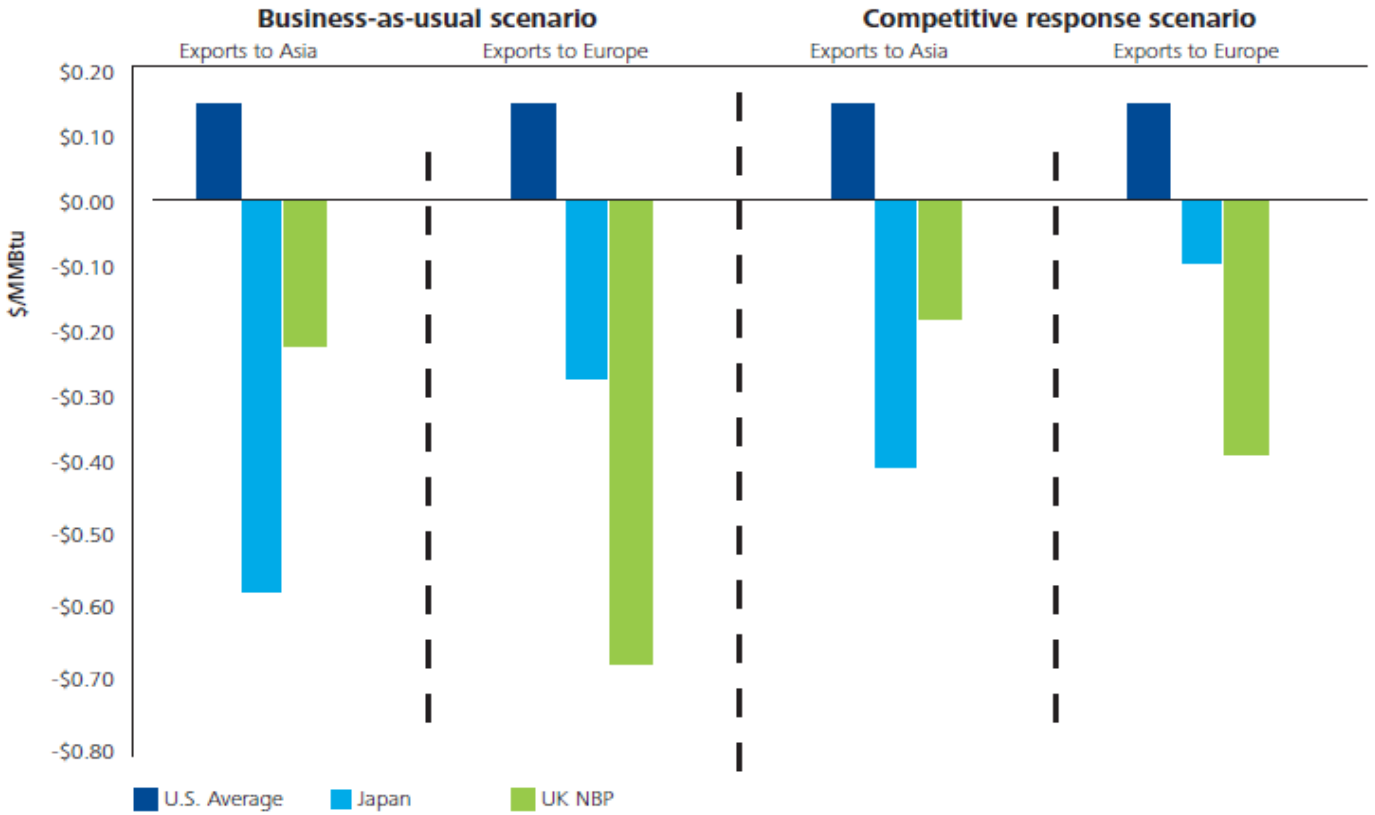
- In Service : Fredriksen group, Leif Hoegh, Exelerate Energy
- Preparing : BW group, VSG group, Mitsui OSK Line
- New Building Market is small yet
- New building order : 4 in 2011, 4 in 2012, 2 in2013, 2 in 2014
- Expectation : The new building market will be expanded near 2020
- Korean & Chinese big yards will get benefits



IV. Acceleration of LNG Fueled Ship Technology

1. Shale Impacts on Gas Price

- Shale gas will make gas price down



Source: DMP World Gas Model projection (October 2012).

Source : Deloitte(2013), "Exporting the American Renaissance : Global Impacts of LNG Exports from the United States"

2. Drivers of LNG Fueled Ship Technology

1. Regulation of CO_2 and SOx

2. Fuel Cost Down

3. Current Situation of LNG Fueled Shipping

- Engines are already developed
- Fuel Gas Supply Systems are almost developed
  - It is expected, they will be commercialized soon
- Ship Builders have enough technology of fuel tank
- LNG Bunkering Vessel was ordered

< The first full LNG fueled ship in Asia – Econuri >

3. Current Situation of LNG Fueled Shipping

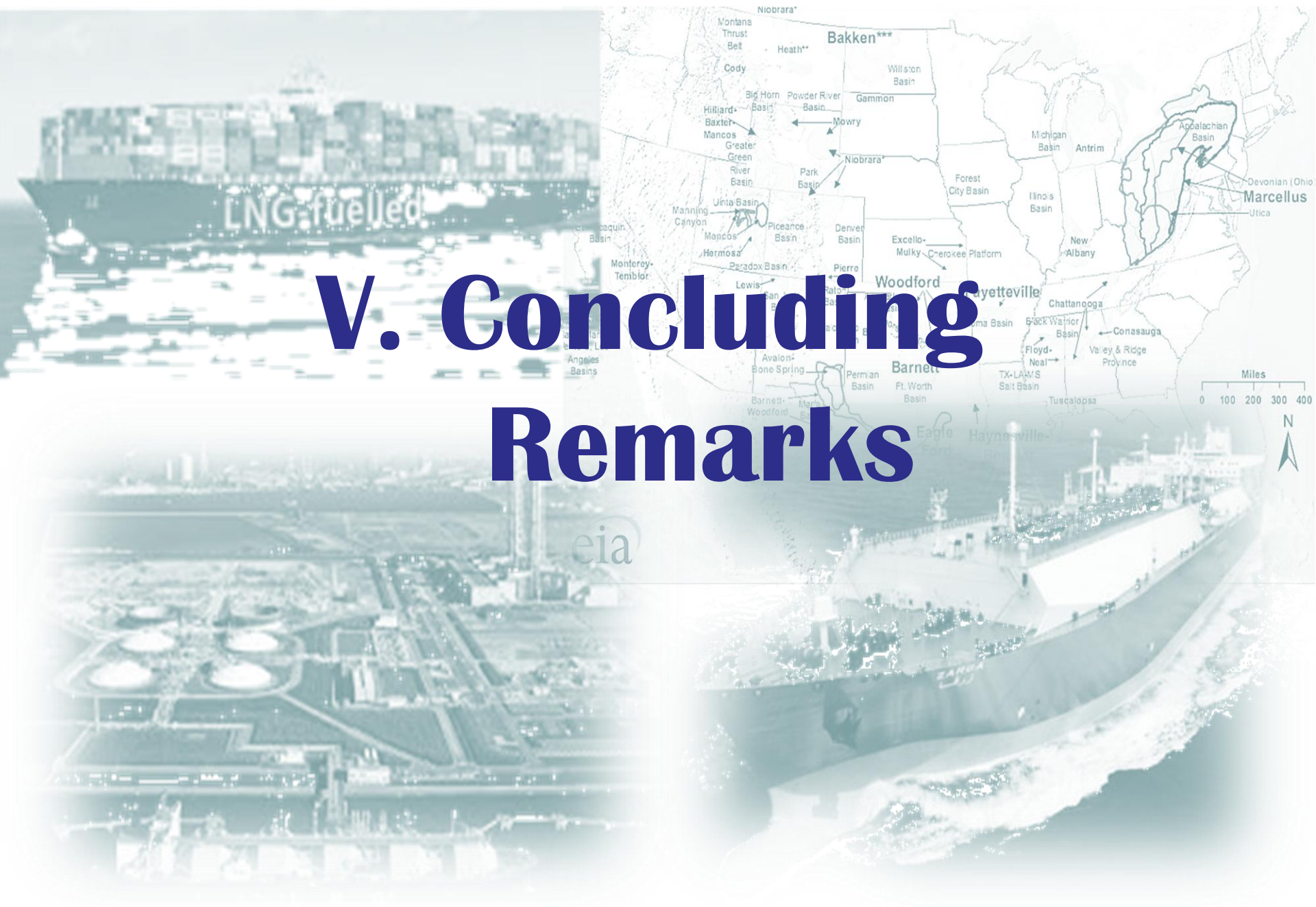
- Problems
  - Bunkering System at Ports
  - Safety
  - and others……

4. Shale Gas Effect on LNG Fueled Shipping

- The expectations will prompt business and technology development
  - Facilitating bunkering business on ports
  - Accelerating technology development

- LNG fueled shipping businesses are accelerated in 2020s in earnest
  - Volume of North American shale gas will be meaningful quantity in 2020s

- Shipping might have effect of gas price up ↑
  - A little fluctuation expected



V. Concluding Remarks

Outlook & Concluding Remarks

It is Expected that North America Shale Gas will have effect on

- Shipping market : Stable benefits for ship owners
- Shipbuilders :
  - New building contracts of 20~25 LNGC annually
  - New building contracts of several FSRU annually
- LNG Fueled Shipping :
  - Facilitating businesses such as bunkering, changing old ships as new one, ……
  - Accelerating technology development
- But negative effect on offshore market

Thank You !!

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