Maritime Bureau
Ministry of Land, Infrastructure, Transport and Tourism (MLIT)

Japanese Policies in Maritime Industry

Hirotaka Mori
Maritime Bureau, MLIT
mori-h2pv@mlit.go.jp

12th February, 2016
- Future technology and Finance on maritime sector in Japan and Norway -

Contents

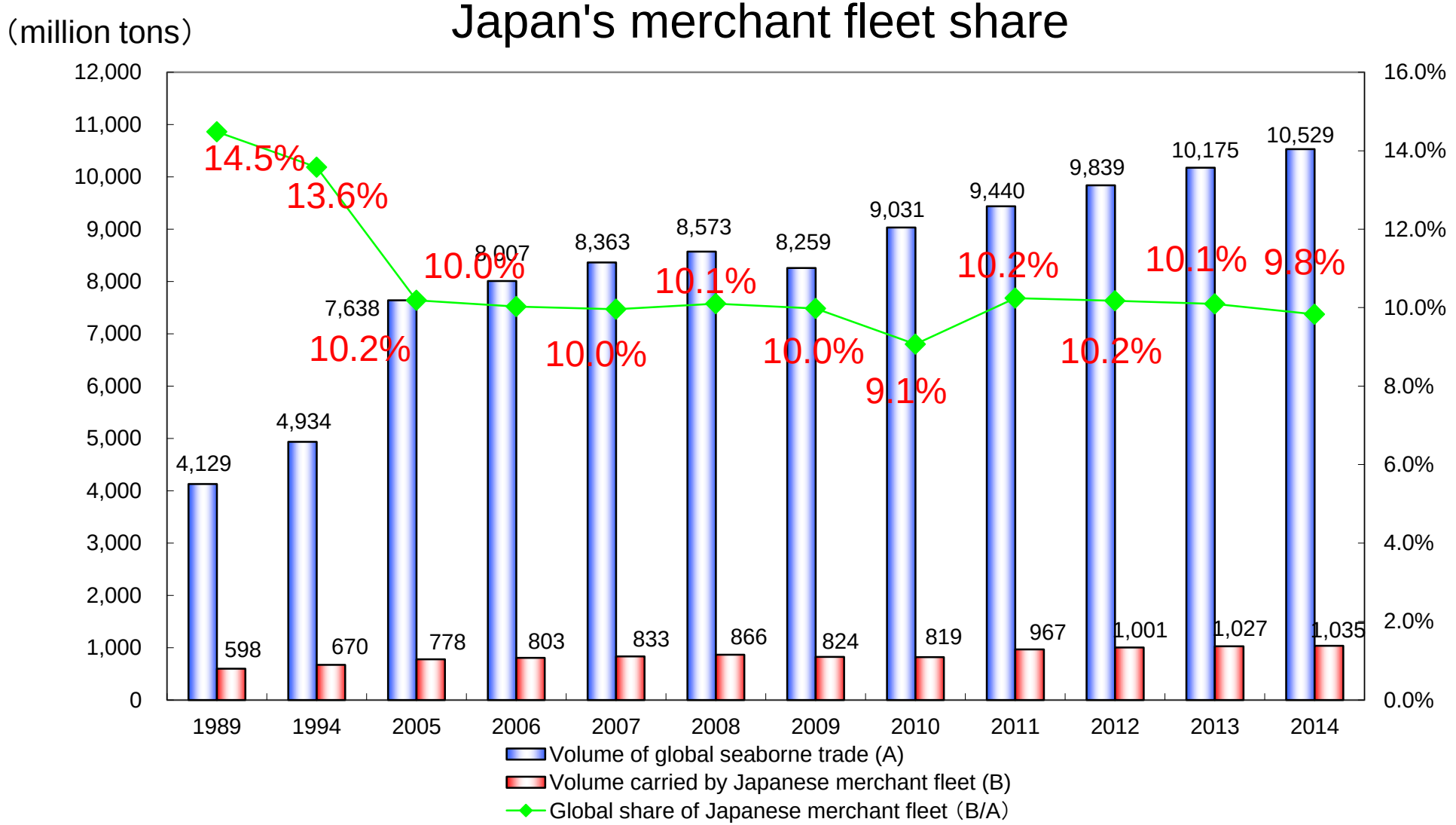
1. Overview of Shipping & Shipbuilding Industry in Japan

Overview of Shipping Industry in Japan

国土交通省

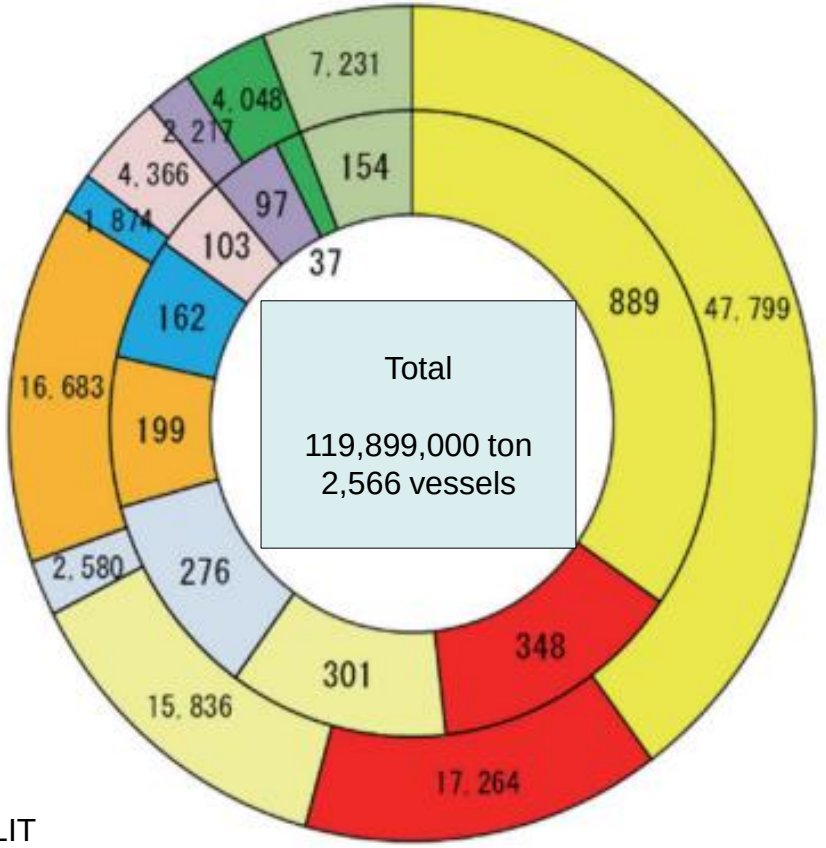
【機密性2】

Global seaborne trade volume and Japan's merchant fleet share



(Source) 1.Global marine cargo volume according to Clarkusons"SHIPPING REVIEW DATEBASE".
2.Japan's merchant fleet share of transport compiled by the Maritime Bureau of the MLIT.

Vessel type of Japan's merchant fleets



Bulk carrier
PCC
Container
General cargo ship
Tanker
Chemical
Wood chip
LPG
LNG
Others

Outside: Gross Tonnage (1,000)
Inside: number of vessels

(source) Maritime Bureau of MLIT

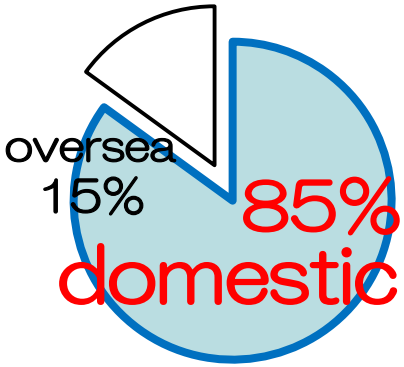
Overview of Shipbuilding Industry in Japan

- Japan's shipbuilding industry keeps domestic production, sustaining local economy and employment.**(about 125,000 employees, US$ 27 billion of sales, 90% of domestic production, including ship machinery industry)**

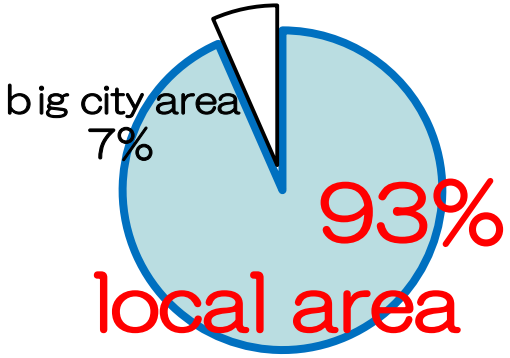
(US$1 = 120 yen)

Mainly domestic production, in local areas

Ratio of domestic production

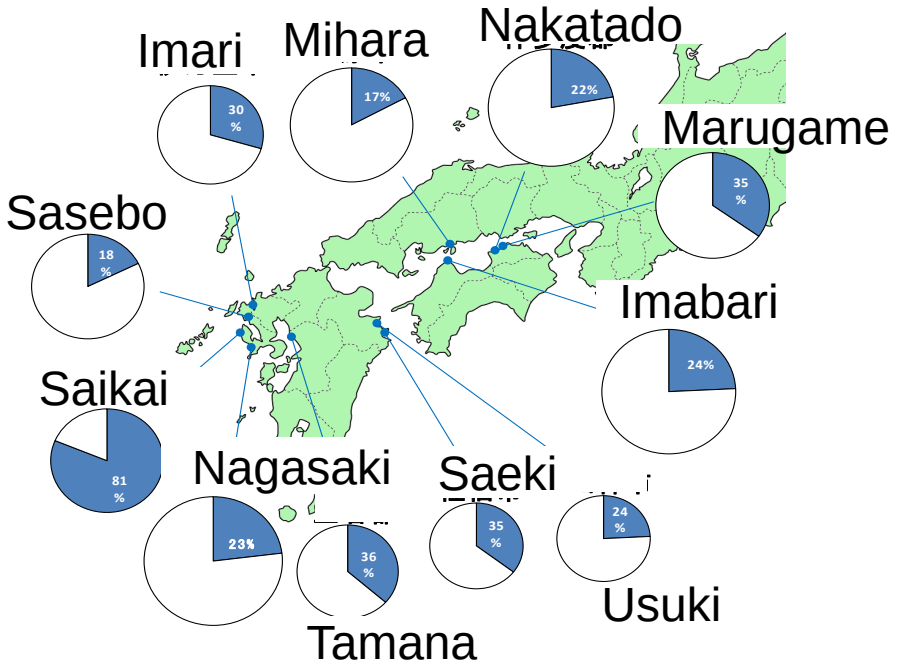


Ratio of local production



Sustaining local economy and employment

The ratio of output share of shipbuilding industry in each region in eastern Japan

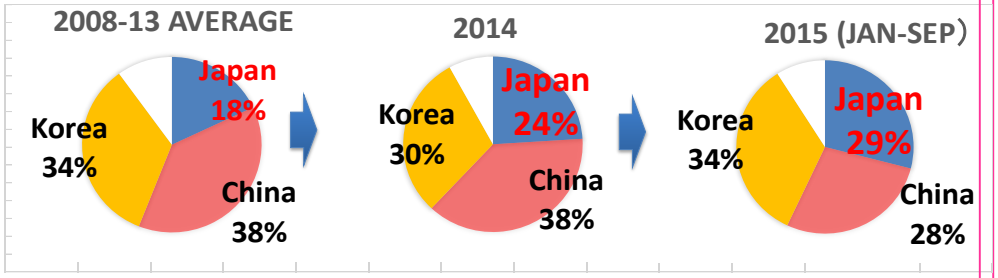


Overview of Shipbuilding Industry in Japan

- Competing with China and Korea in the world market.(2014 share was about 20%, 3rd share in the world)
- Due to yen appreciation by *Abenomics* and the development of energy-saving technologies in parallel with its global standardization, the number of shipbuilding orders to Japanese companies has been growing increasing after 2013. (The share of Jan-Sep 2015 became 29%, 2nd place in the world, overtaking China.)

Back to high performance & high quality vessels built by Japanese shipbuilding companies

Japan's share of new order increased, and China lost the share.

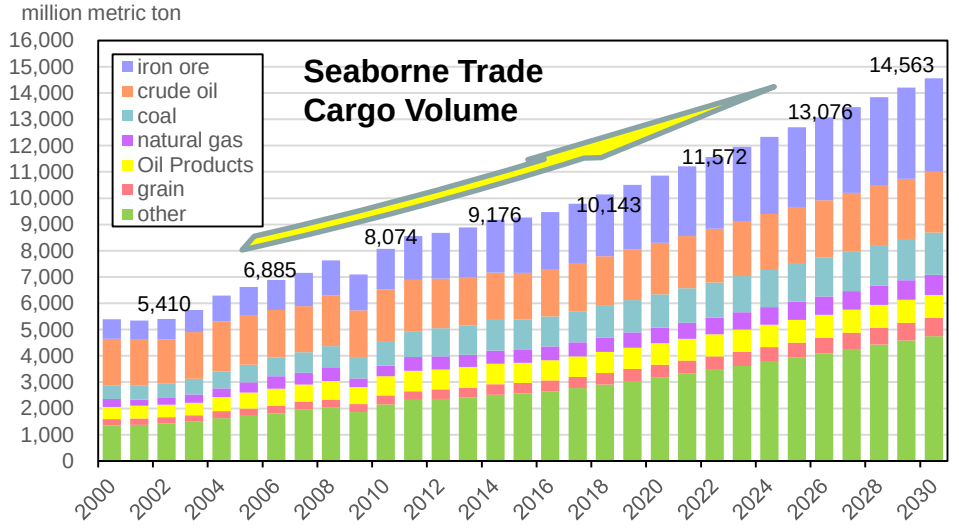


Japanese shipbuilding companies now in position to increase the production.

Ex. Imabari･･･Obtained the orders of Ultra Large Container Carriers, and their new dock is under construction.

Shipping & shipbuilding market will expand with the world economy's growth in the long term.

In spite of recent sluggish market..



Structure of Maritime Cluster in Japan

国土交通省

【機密性2】

Cargo owners

Transportation service

Shipping industry (Carriers) (overseas / coastal)
Number of companies: abt 200 / abt 2,450
Employees: abt 7,000 / abt 66,000
Business revenue: abt US$ 39 billion / abt US$11 billion

Charter contract

Ship owners (overseas / coastal)
Number of owners: abt 700 / abt 1,600
Employees: abt 1,400 / abt 21,000

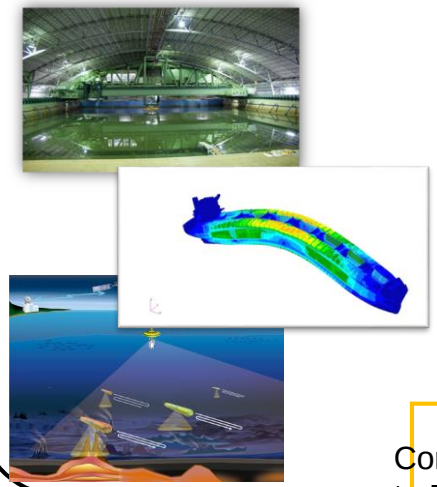
71% are for Japanese fleet
(in value terms)

Shipbuilding industry
Number of Companies：abt 1,000
Employees: abt 83,000
Business revenue: abt US$ 20 billion (major 13 companies)

58% are for shipbuilding companies in Japan
(in value terms)

Ship machinery industry
Number of companies: abt 1,100
Employees: abt 47,000
Production output: abt US$8 billion

National Maritime Research Institute (NMRI)



Contribute to R&D

Academic Institutes

- **Universities**
- **Technical school (e.g. High school)**

Supply of Engineers

Stable Supply

Seafarers

Coastal Seafarer
abt 27,000

Overseas seafarers
Japanese abt 2,000
Foreigner abt 56,000

Organization for Training

Marine Technical Education Agency
8 schools,
450 students/year

National Institute for Sea Training Independent Administrative Institution
5 school ships

Nautical colleges and National Institute of Technology
7 schools,
370 students/year

(US$1 = 120 yen)

2. Policies of MLIT in Maritime Sector

Basic Act on Ocean Policy (April, 2007)

CHAPTER III Basic Measures

- The State, in order to promote the ocean industries and to strengthen the international competitiveness, shall take necessary measures with regard to the Ocean Industries to nurture and secure the human resources (abr.). (Article 24)

CHAPTER IV Headquarters for Ocean Policy

- The Headquarters shall be headed by the Director-General of the Headquarters for Ocean Policy, the post which shall be served as Prime Minister. (Article 32(1))

Prime Minister Shinzo Abe, in the meeting of the Headquarters for Ocean Policy (December, 2014)

Basic Plan on Ocean Policy (April, 2013)

In 2013, *"Basic Plan on Ocean Policy"* was adopted for further development of Japan's Maritime Industry, in the form of reinforcement of Basic Act on Ocean Policy.

(extract)

Chapter VIII. Promotion of Marine Industries and Increase in International Competitiveness

(1) Solidifying management base

a. Maritime transport industry, shipbuilding industry and infrastructure system

(i) Increasing competitiveness to obtain orders

- In efforts to make the Japanese shipbuilding and ship machinery industries more competitive to receive new contracts, make efforts toward reducing carbon dioxide, exhaust (NOx and SOx) emissions and other environmental pollutants from ships in compliance with regulations related to the issues and ensuing ship safety.
- Under coordination between the industrial, academic and governmental sectors, **implement technological development for high-value-added vessels** to help boost international competitiveness of the Japanese shipbuilding, ship machinery and marine resources-related industries.

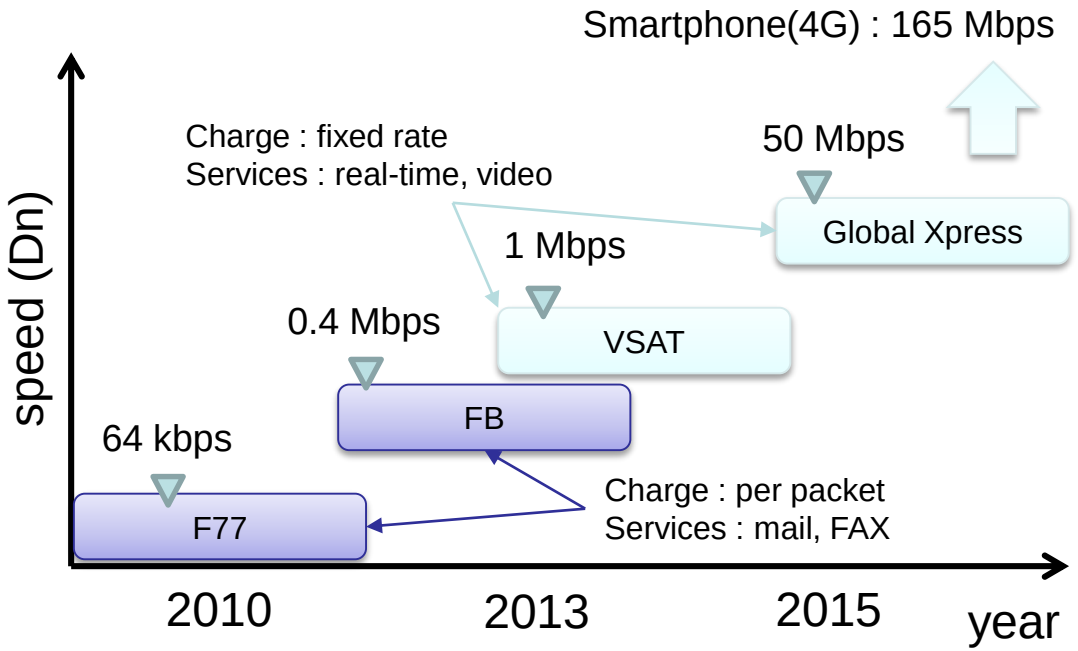
2.(1) Big Data Application and IoT for Maritime Industry

Background

Dawn of Maritime Broadband Era.

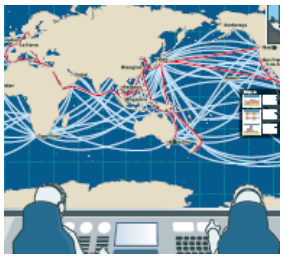
- Development of satellite system and communication technology
- After VSAT, it becomes common to have real time and fixed-rate charged services

There are great potential in maritime sector for new services, innovation using IoT and big data



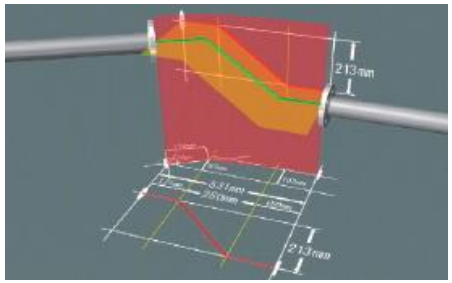
Example

Smart operations using real time support from land



- Weather, sea condition, voyage planning
- Ship condition (load, oscillation)
- Monitoring cargo

Effective maintenance



- Trouble alert, preventive system
- On ship repairing support

Japan's Policy

Japan Revitalization Strategy (Growth Strategy) 2015

The development of IoT, big data, and artificial intelligence having brought about unprecedented change in the industry / employment structures,
therefore, the government will consider,
how the government and private companies should be prepared to seize such chances.

In maritime fields, it is a key to,

- Promote developing technology which enable us to make use of big data in ship operation.
- Be speedy, involving other sectors.

Therefore, Maritime Bureau,

- Supports for technology development （budget for FY2016, US$ 0.6 million).
- Considers the scheme to promote its advanced use.

US$1 = 120 yen

and leads innovation in whole maritime sector *!!*

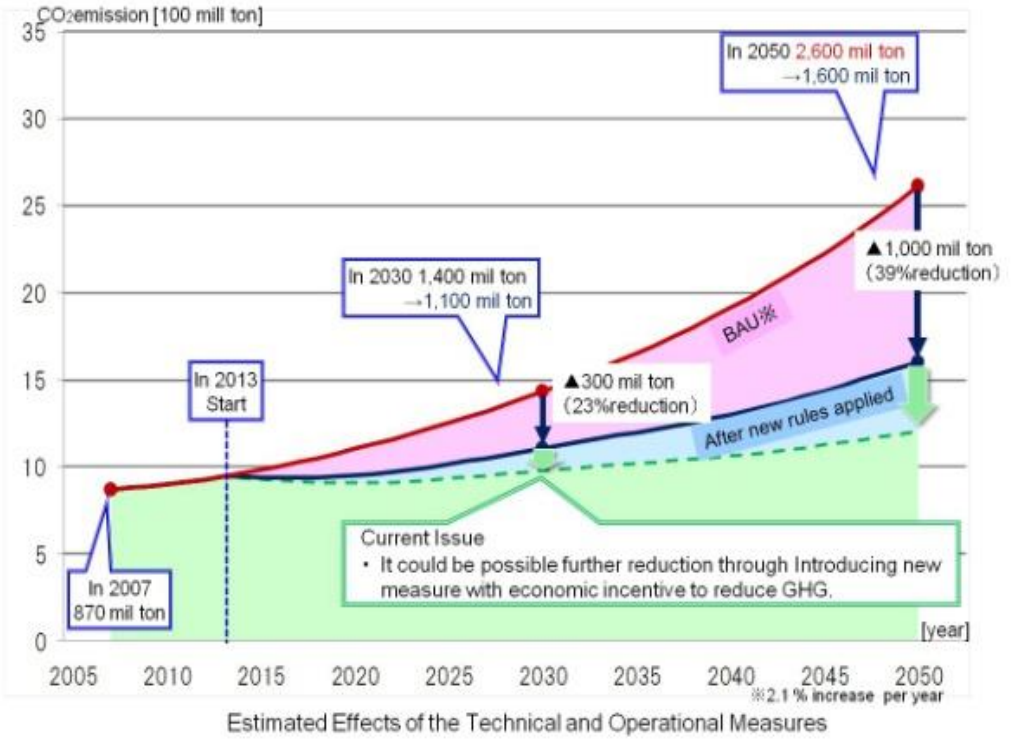
2.(2) Reduction of CO2 / SOx / NOx

Development of CO_2 Emission Reduction Technology

国土交通省
【機密性2】

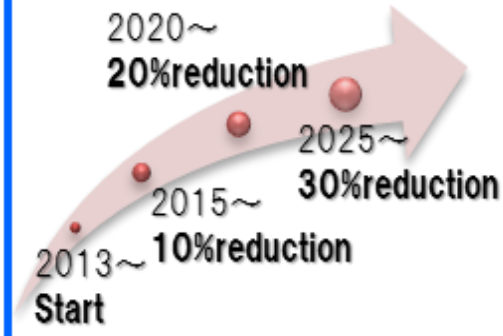
CO2 emissions reduction requirement in IMO

- Improving energy efficiency of international shipping is an important issue because of a constant increase of international shipping transport demands.
- In July 2011, IMO accomplished a introduction of global regulation on energy efficiency of international shipping. The regulation came into effect in January 2013.
- IMO has been developing a data collection system of fuel consumption of ships as a further measure for enhancing the energy efficiency of international shipping.



Estimated Effects of the Technical and Operational Measures

Energy efficiency requirements for new ships — Technical measure



From 2013, new ships have to meet the energy efficiency, which gradually become strict.

It is not allowed to build ships, which do not satisfy criteria

Development of CO_2 Emission Reduction Technology

Development of CO_2 emissions reduction technology

- Technology development project (2009-2012) succeeded in 30% reduction of CO2 emissions from ships, and achieved IMO requirement by 2025.

- Japan has promoted further developments of maritime environment technology which aim to further reduce CO2 emissions.

Examples

Engine system

Heat recovery system with which low-temperature waste heat is used

Fuel shift

Dual fuel gas engine

Propulsion system

Controllable pitch propeller

Hull

Low-frictional coating

Further Utilization and Promotion of Ships Fueled by Natural Gas

国土交通省

【機密性2】

【Strengthening environmental regulation of international shipping】

- Environmental regulation for shipping is getting more strict and SOx regulation will be strengthened in the all sea areas in the world from 2020 at the earliest.

⇒ **Natural gas fuel can reduce CO2 and NOx as well as SOx at the same time.**

【Expansion of natural gas use】

- Production and the use of natural gas are expanding
- Japan implemented the diversification of energy supply by the import of less expensive natural gas including shale gas and by the support for natural gas development by Japanese companies.
- Natural gas will be used as fuel for ships also in North America and Asia also as it is used more in Europe.

Environmental development toward further utilization and promotion of ships fueled by natural gas (FY 2012 budget)

- ✓ Smooth implementation of LNG fuel servicing
- ✓ Design efficiency improvement by ship yards
- ✓ Leading formulation of international standards.

Current Status and Future Trends of Ships Fueled by Natural Gas

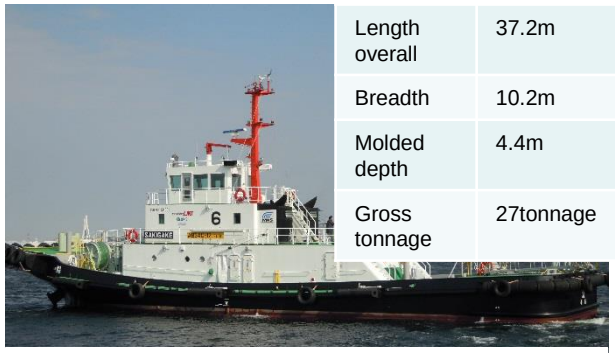
国土交通省

【機密性2】

Overview of ships fueled by natural gas

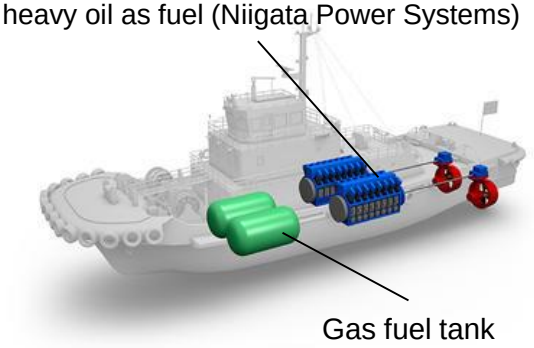
- In September 2015, Japan's first natural gas-fueled vessel “Sakigake” was delivered.
- Japan’s Ministry of Economy, Trade and Industry and the Ministry of Land, Infrastructure, Transport and Tourism supported this building.
- LNG is supplied to the ship from a tank truck.

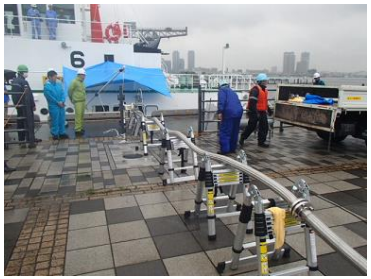
Owner	NYK Line
Flight's	Wing Maritime Service
Shipyard	Keihin Dock
Operating location	Yokohama harbor



Length overall	37.2m
Breadth	10.2m
Molded depth	4.4m
Gross tonnage	27tonnage

Principal of natural gas fuel ship



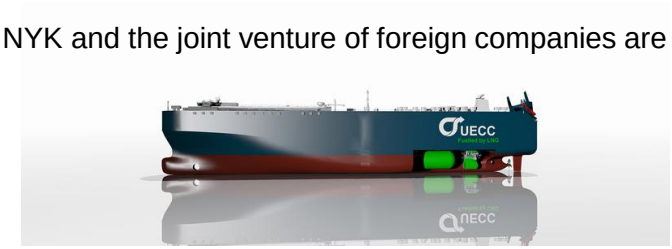


Fuel supply landscape

Future Trends

○Natural gas-fueled vessels are mostly used in emission control area, and expected to become popular in the future.
○NYK Line is constructing the world’s first natural gas-fueled car carrier ※ and natural gas bunkering vessel. (scheduled to be completed this year).

※ NYK and the joint venture of foreign companies are building



Natural gas fuel car carriers

Natural gas fuel supply ship (Image)

Fuel supply landscape (image)

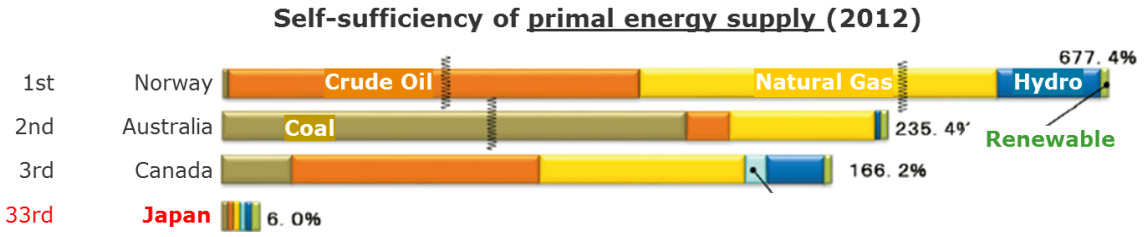
2.(3) Hydrogen Energy

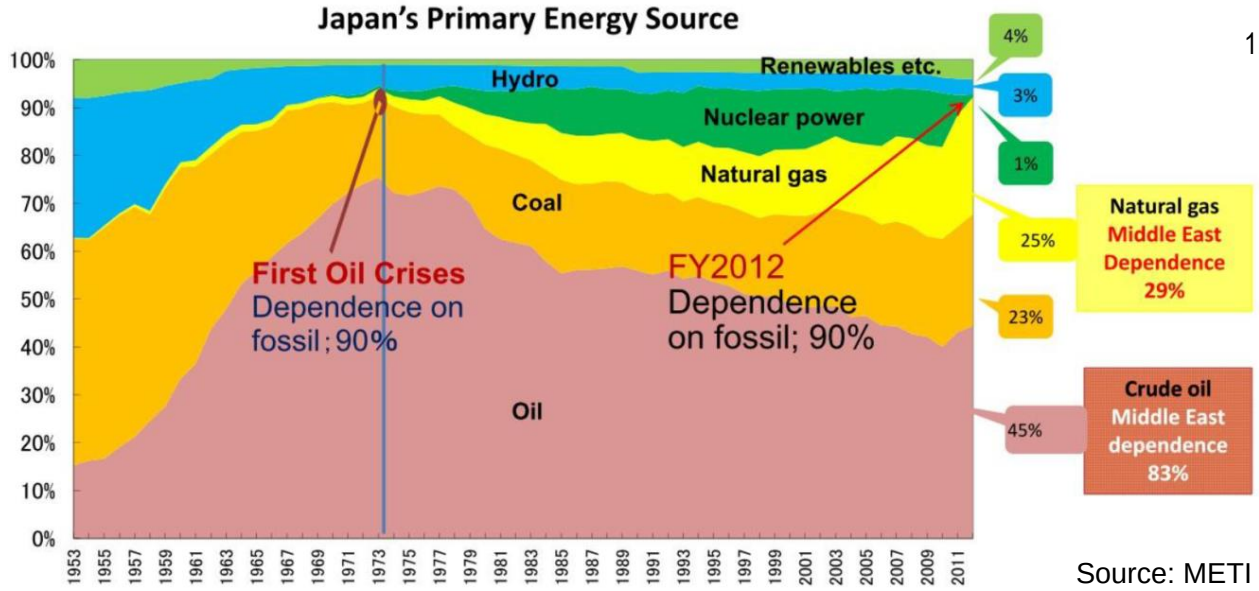
Main Challenges

3E + S（Energy Security, Economic Efficiency, Environment + Safety)

-Strategic Energy Plan of Japan, April 2014

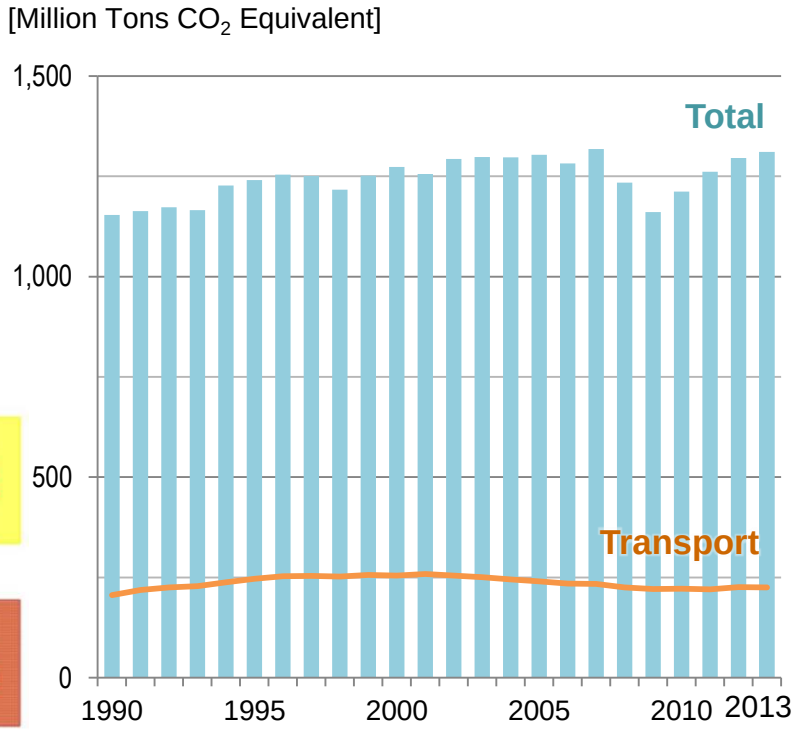
■ Energy supply





Source: METI

■ Greenhouse gas emissions



Source: Greenhouse Gas Inventory Office of Japan

Roles of Hydrogen

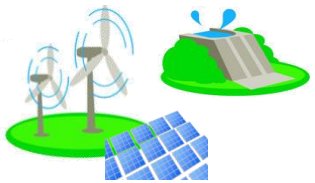
As for future secondary energy, **hydrogen is expected to play a central role**, as well as electricity and heat

-Strategic Energy Plan of Japan, April 2014

Primary Energy | **Secondary Energy** | **Utilization**

Natural gas, petroleum, coal, etc.

Renewables.



Fossil Fuel (Natural Gas, Oil etc.)

Reforming, gasification

CCS

Electrolysis etc.

Hydrogen

- ✓ **Energy security**
- ✓ **Reducing environmental burdens**
- ✓ **Energy conservation**
- ✓ **Promoting industries and revitalizing regional economies**

Transport (LH2, MCH etc.)

Electricity

FCV（2014～）

© TOYOTA

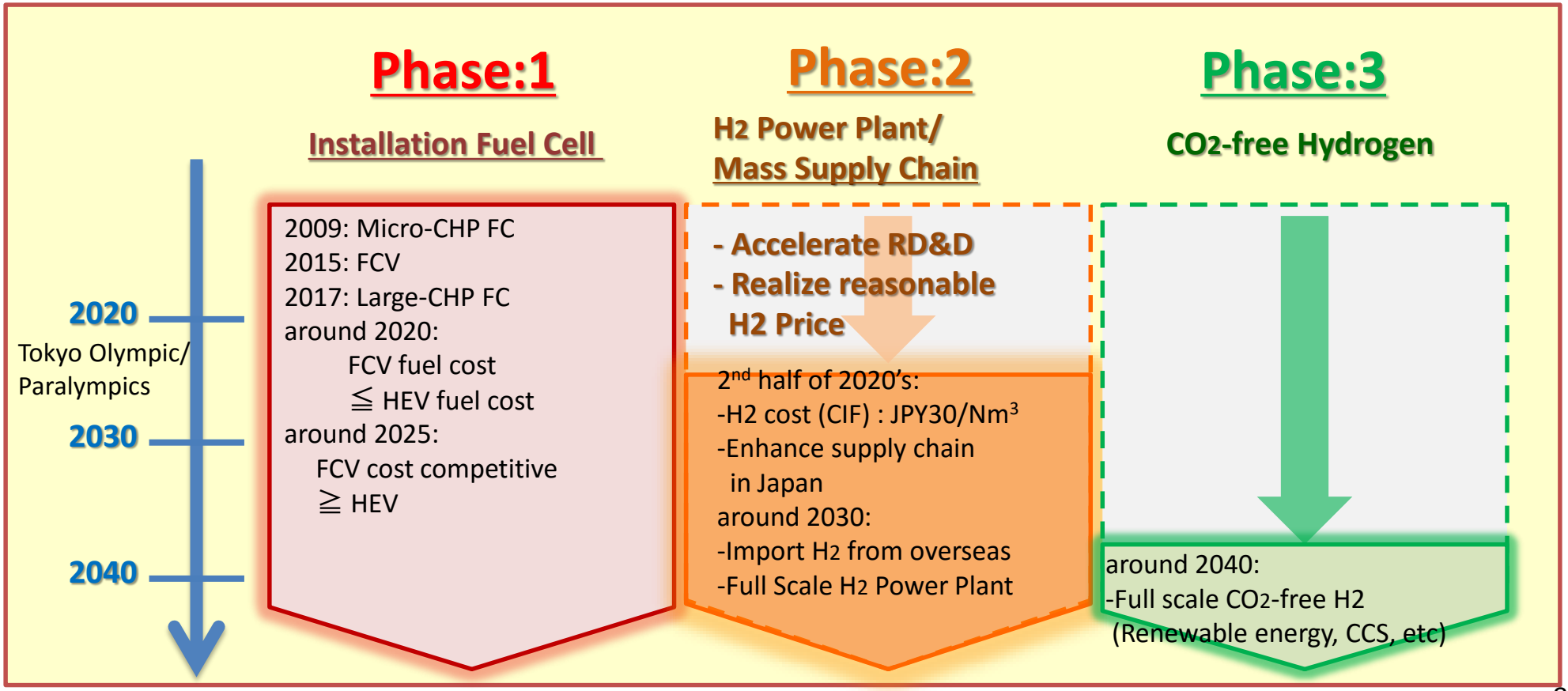
Residential fuel cell（2009 ～）

© FCA

© MHPS

Hydrogen / FC Strategic Roadmap

- **Step by step approach** to realize hydrogen society
- **Expansion usage** ← → Establishment of **mass hydrogen supply**



Projects for Establishment of Mass Hydrogen Supply

国土交通省

【機密性2】

15 JPY = 1 NOK

Building hydrogen supply chain

FY2015 – 2021
（NOK 137 million in FY2015）

Demonstrate the whole supply chain of hydrogen produced from untapped overseas energy resources

Demonstrations on:

- Method(s) of **hydrogen production** from e.g. by-product hydrogen, brown coal (untapped overseas resources)
- **Transportation and storage** in the form of cryogenic liquid hydrogen or organic hydride
- **Power generation** using (imported) hydrogen

Production

Transportation and storage

Power generation

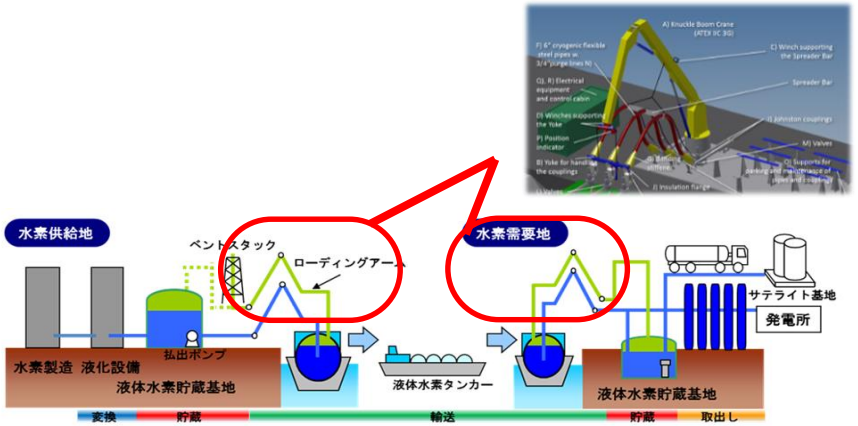
Development of loading system for LH2

FY2014 – 2018
（NOK 9 million + overhead cost in FY2014）

Develop ship-shore loading system(s) for cryogenic liquid hydrogen

Key Issues:

- **R&D** (Emergency Release System, swivel joints etc.)
- **Procedures** for loading/offloading operations
- Safety **regulations and standards**



Project for Expansion of Usage of Hydrogen

Fuel cell boat as a future ship

Advantage of fuel cell boats

- Environmental performance
  - No emission of CO_2, NO_X neither SO_X when use
- Comfortableness
  - Less vibration and noise

Set target on water taxies and small restaurant ships for the Tokyo 2020 Olympic games

Small restaurant ship

Water taxi

Planned Activities for Fuel Cell Boat

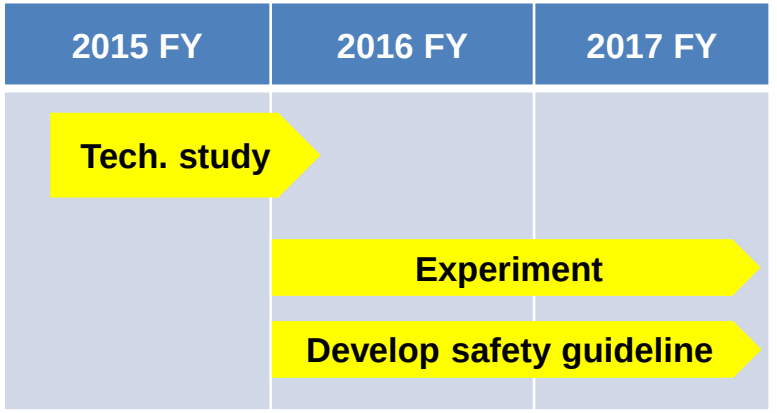
15 JPY = 1 NOK

Verification of the technology & development of safety guidelines

FY2015 – 2017 （NOK 1.3 million in FY2015）

Technical challenges to be addressed

- FC degradation by salty air
- Continued high load operation
- FC operation in ship motions/ load fluctuation
- Leak prevention/ detection
- Prevention of ignition
- Emergency preparedness



■ Remaining challenges:

- Cost (boat itself, fuel)
- Fuel supply (availability, infrastructures etc.)

→ Demonstration

Future Cooperation between Norway and Japan

Extensive experiences of Norway & ambitious visions and projects of Japan

→ Cooperative initiatives in the future

2) Production of H_2 from intermittent wind energy, liquefaction and export in spherical tankers to the market

2.(5) Other Technological Development

New Generation LNG Carriers with High Transport Efficiency

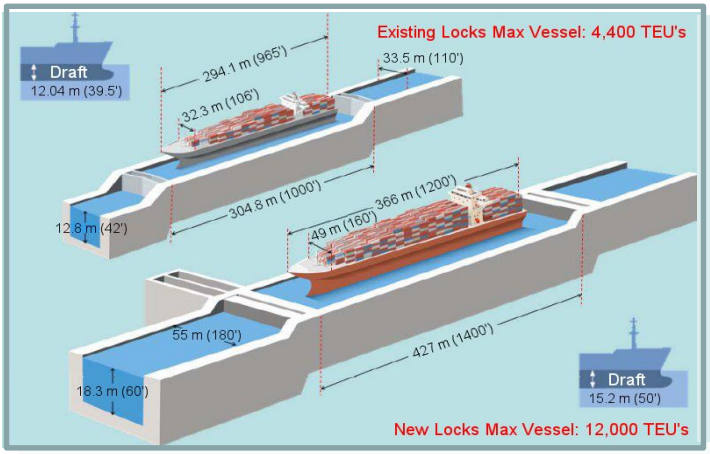
国土交通省

【機密性2】

- Japan imports Shale gas in North America via Panama Canal.
- Targeting the completion of Panama Canal expansion program in 2016, Japanese shipbuilding companies have developed a new generation LNG carrier with larger tank which improves transport efficiency.

Shale gas via Panama Canal to Japan

Panama Canal expansion project



Acceptable size

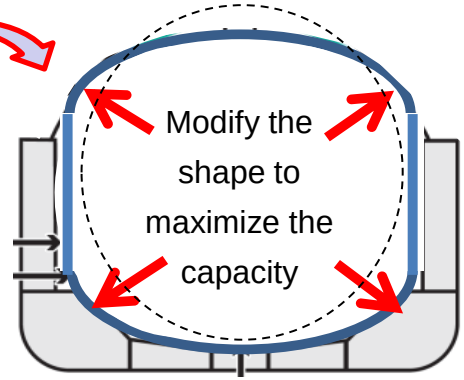
	now	after expansion
Length	294m	→ 366m
Width	**32.3m**	**→ 49m**
Draft	12m	→ 15.2m

Image of new type vessel which can maximize the transport efficiency

- Conventionally, it was a mainstream to use the spherical tank detached from the hull.
- Liquefied Shale Gas is to be transported by larger vessels which can pass through “New” Panama Canal (49m width).
- Due to the modification of the tank’s shape, loading efficiency has improved by 16% compared with the conventional carriers.
- The reduction of Japan’s energy procurement cost of is expected through transportation cost savings.

LNG carriers transport natural gas liquefied under -160℃

Cross-section shape



Support Program for for the Developments of Offshore Technologies

国土交通省

【機密性2】

- Support the development of offshore technologies which contribute to ensure high durability, reliability and safety for the offshore utilities (FLNG, Ultra-deepwater drilling platform)
- Program Period: 2013～2017

Floating Liquefied Natural Gas Facility (FLNG)

Power system

Technologies for LNG storage

Control system

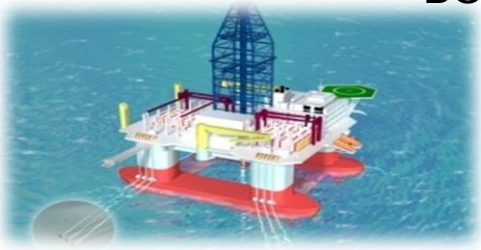
図1　DPS システム全体概念図

Ultra-Deepwater Drilling Platform

Environmental measures

<BOP system>

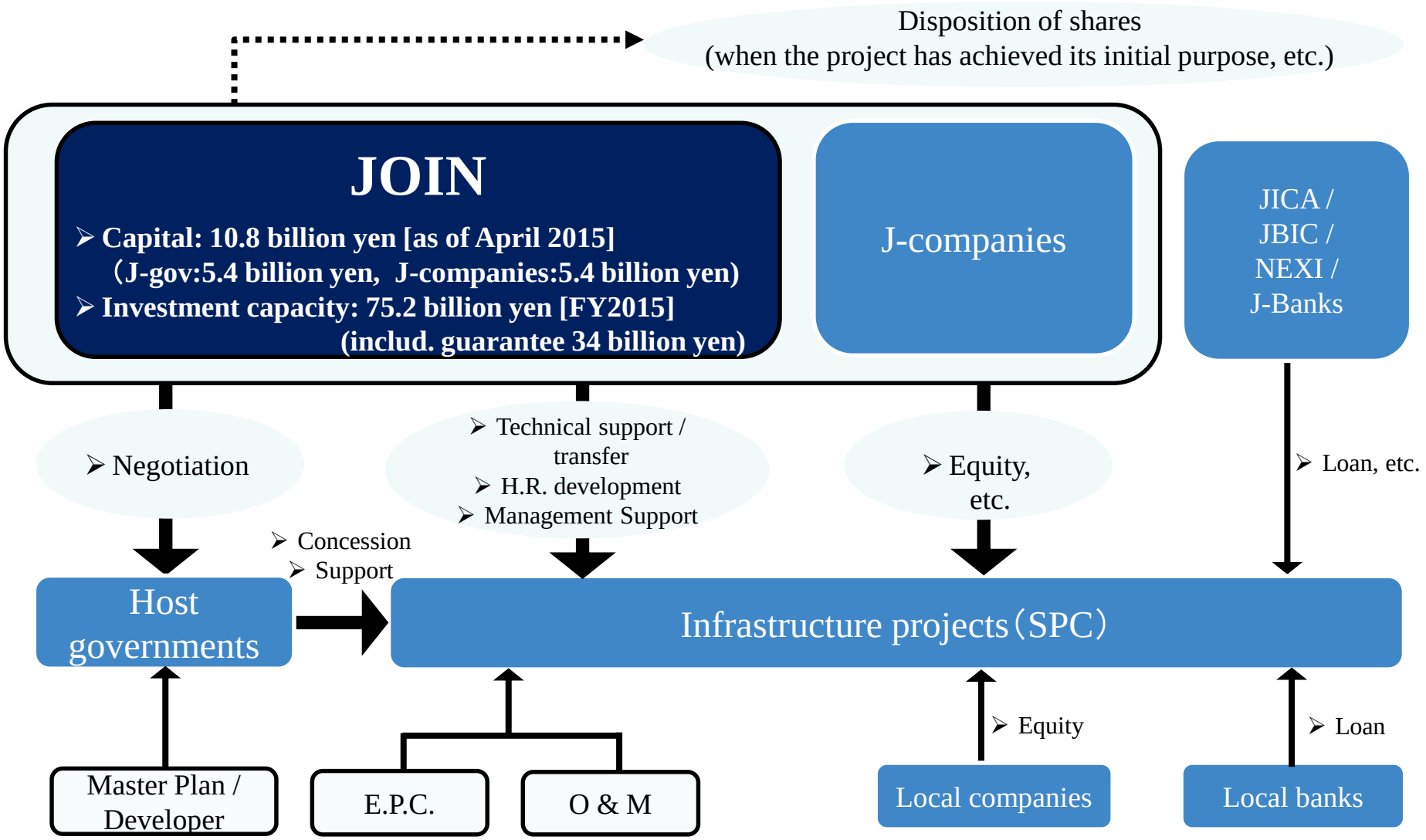
Stability technology



Technology for total safety

3. Financial Support

JOIN will back up the financing of projects by holding a considerable portion of the equity of SPC. This equity finance scheme can improve bankability of the project.



JOIN's Focus to Invest

High-speed railways

Urban railways / transport system

Toll roads

Ships / offshore units

Port terminals

Airport terminals

Urban development

Logistics

JOIN for Maritime Sector

Scope of funding

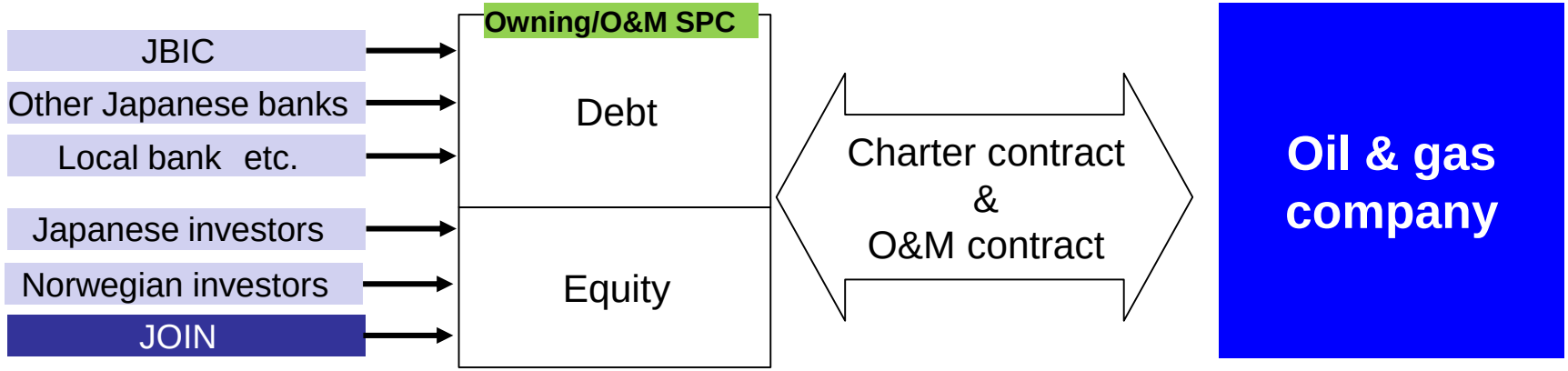
Projects, to be supported by JOIN, need to be relevant to overseas transport* or urban/regional development.

* ”Transport” includes not only “traditional” sea transport such as the operation of LNG vessels and container vessels, but also offshore projects such as the operation of FPSO, FLNG, PSV, AHTS, shuttle tankers and Logistics Hub.

Where the funding can go

- Owning/O&M SPC of the LNG Vessel
- Owning/O&M SPC of the FPSO
- Owning/O&M SPC of the PSV/AHTS

Example of lease financing structure



4. Cooperation between Norway and Japan

Cooperation between Norway and Japan

【Norway】

- In 2011, Norway and Japan signed “Memorandum on Cooperation in the Field of Maritime Technology and Industry”.
- Norway and Japan are in good cooperation for the preparation for two big international maritime exhibitions; Norshipping (in Norway) & SEA JAPAN (in Japan).
- During these exhibitions, international maritime seminars and round tables are held by the mutual cooperation between Norway and Japan.
- Norway and Japan have had high level bilateral meetings (Vice Ministers and Directors for Maritime Bureau) and exchange their policies to foster the mutual relationship during these events.

Bilateral Meeting during Norshipping 2015

- **Exhibition in the Maritime Cluster Zone**

  Japanese and overseas shipping / shipbuilding / ship machinery companies, research institutes, maritime organizations and other parties participated to appeal their leading technologies like maritime environmental-friendly technologies and offshore resource development technologies.
  （Participants: 18,672 persons in total)

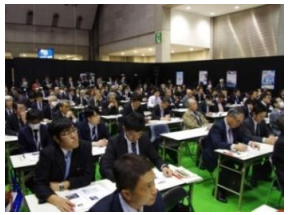
Japan Pavilion Theme Zone

- **Seminars organized by MLIT**

  “International Maritime Seminar”
  - Theme: Green growth in the maritime industry and offshore resource development.

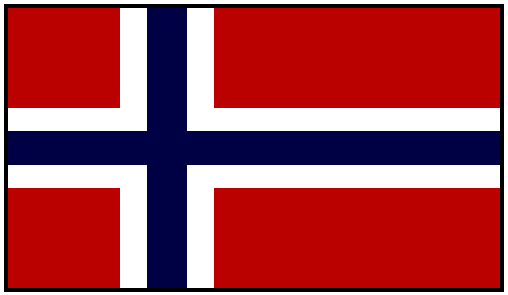
Ms.Dilek Ayhan
at International Maritime Seminar

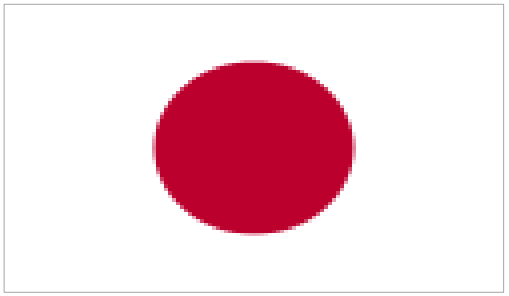
  “Maritime Environmental Technology Seminar”
  - Theme: world-leading environmental-friendly technologies



Maritime Environmental
Technology Seminar

We are looking forward to seeing you in SEA JAPAN 2016 !
(13th～15th April, 2016 in TOKYO)





Tusen Takk !