International Working Style

from the view point of

the Japanese Shipowner' Association Europe District Branch

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J S A

1. Why R&D ?

- Why R&D, if we are satisfied with today's technical level for the international shipping ?

  - ✓ Because The Maritime Energy Test Bed (METB) is there.

  - ✓ Because the earth and the world are moving and changing, we need technologies more.
    - GHG
    - SOx, NOx
    - Ballast Water
    - Others

- What is the most important one for the earth and the world ?
    - All of above

- If a purpose of R&D is **to minimize the economic impact with new technologies**, what is the biggest economic impact on the international shipping ?

2. What R&D ?

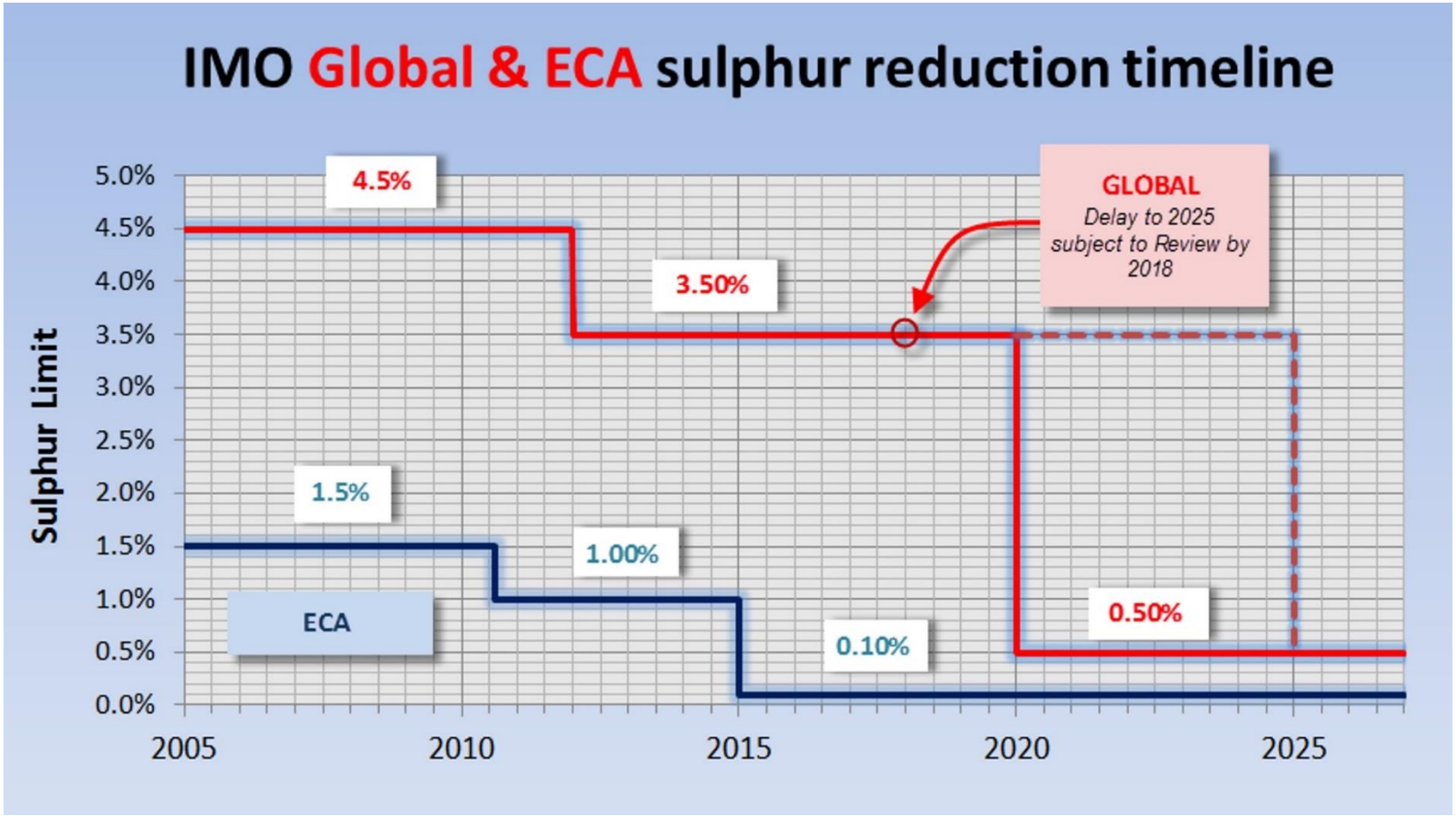
- My logic of calculation
  - ✓ Assumptions of initial cost and running cost
    - Running cost of 0.1% SOx ECA; 100$ (0.1%MGO-1.0%LSO/MDO) x 50 ton/day x 200 day/year x 5 year x 20%
    - Running cost of NOx Tier Ⅲ; +2%FOC = 600$ (3.5%HFO) x 50 ton/day x 2% x 200 day/year x 5 year
    - Running cost of CO2; 30 $/CO2–ton x 3.1 x 50 ton/day x 200 day/year x 5 year
    - Running cost of 0.5% SOx Global Cap; 300$ (3.5%HFO-0.5%LSO)) x 50 ton/day x 200 day/year x 5 year
  - ✓ Target vessels (including or excluding existing vessels)
    - New vessels during 5 years = 2,000 ships/year x 5 years = 10,000 ships, Existing vessels = 30,000 ships

[Unit: M$]	Cost per vessel			Target Vessels		Cost of our industry		
	Initial	Running (5 years)	Total	New	Existing	New (5years)	Existing	Total
BWMS	2.0	0.0	2.0	○	○	20,000	60,000	80,000
0.1% SOx ECA	0.0	1.0	1.0	○	○	10,000	30,000	40,000
NOx Tier Ⅲ	2.0	0.6	2.6	○	–	26,000	0	26,000
CO_2	0.0	4.7	4.7	○	○	46,500	139,500	186,000
0.5% SOx Global Cap	0.0	15.0	15.0	○	○	150,000	450,000	600,000

- You may make your own table in accordance with your logic.
- Impact on existing vessels is bigger than impact on new vessels.
- **0.5% SOx Global Cap is the biggest economic impact on the international shipping.**
- One of the most important issues is **how to minimize the economic impact**.

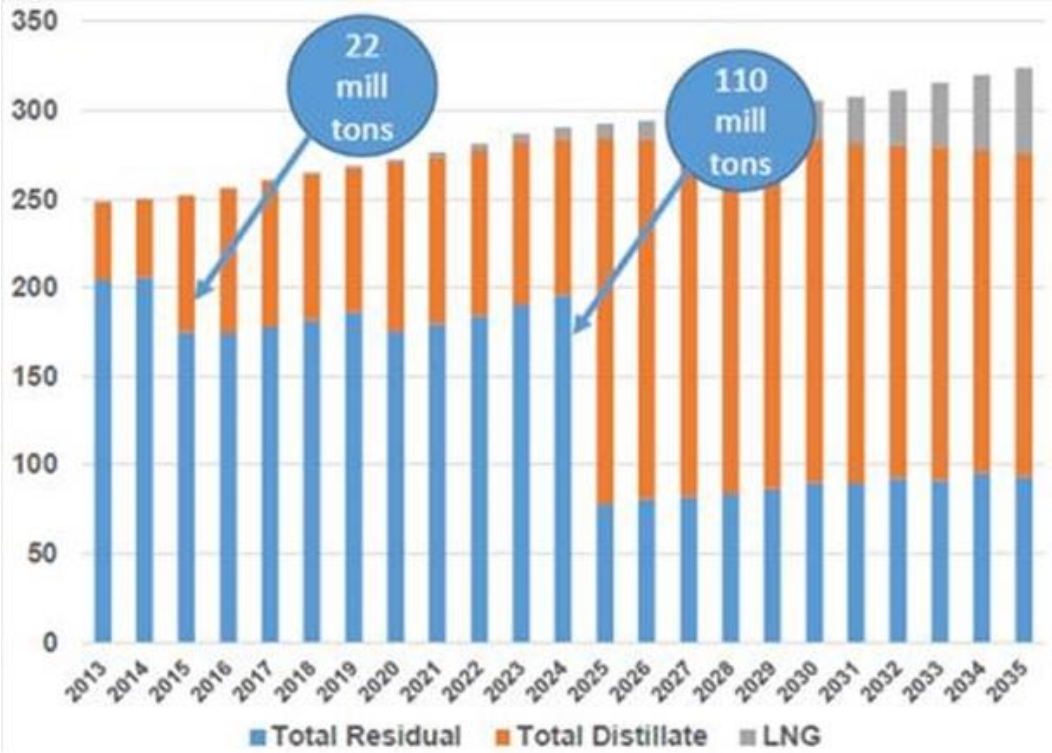
3. SOx Global Cap (1) Regulation

- IMO MARPOL Annex VI



3. SOx Global Cap (2) A prospect

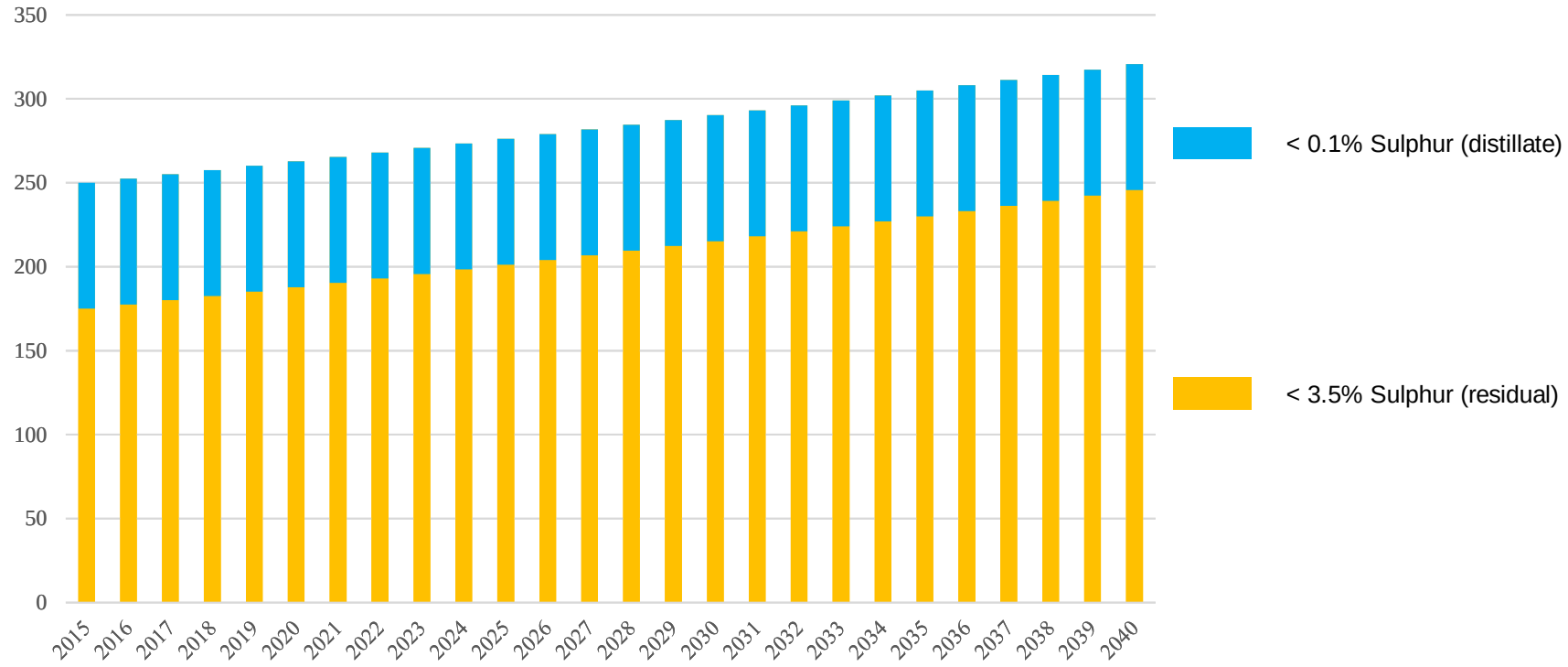
- One prospect shows a changing composition of marine fuels.
  - ✓ Residual oil : HFO (Heavy Fuel Oil), MDO (Marine Diesel Oil) over 1.0% Sulphur
  - ✓ Distillate oil : MGO (marine Gas Oil), MDO Max 1.0% Sulphur
  - ✓ LNG : LNG (Liquefied Natural gas)



- Total quantity in 2015 : 250 million ton
- Sulphur in ECA from 1.0% to 0.1% since 2015 : 22 million ton from Residual to Distillate, and new low Sulphur products' debut (Low Sulphur Heavy Fuel Oil, DMB to RMD80, Gas to Liquid, etc.)
- 0.5% Global Cap : 110 million ton from Residual to Distillate, and Distillate increase to 70%

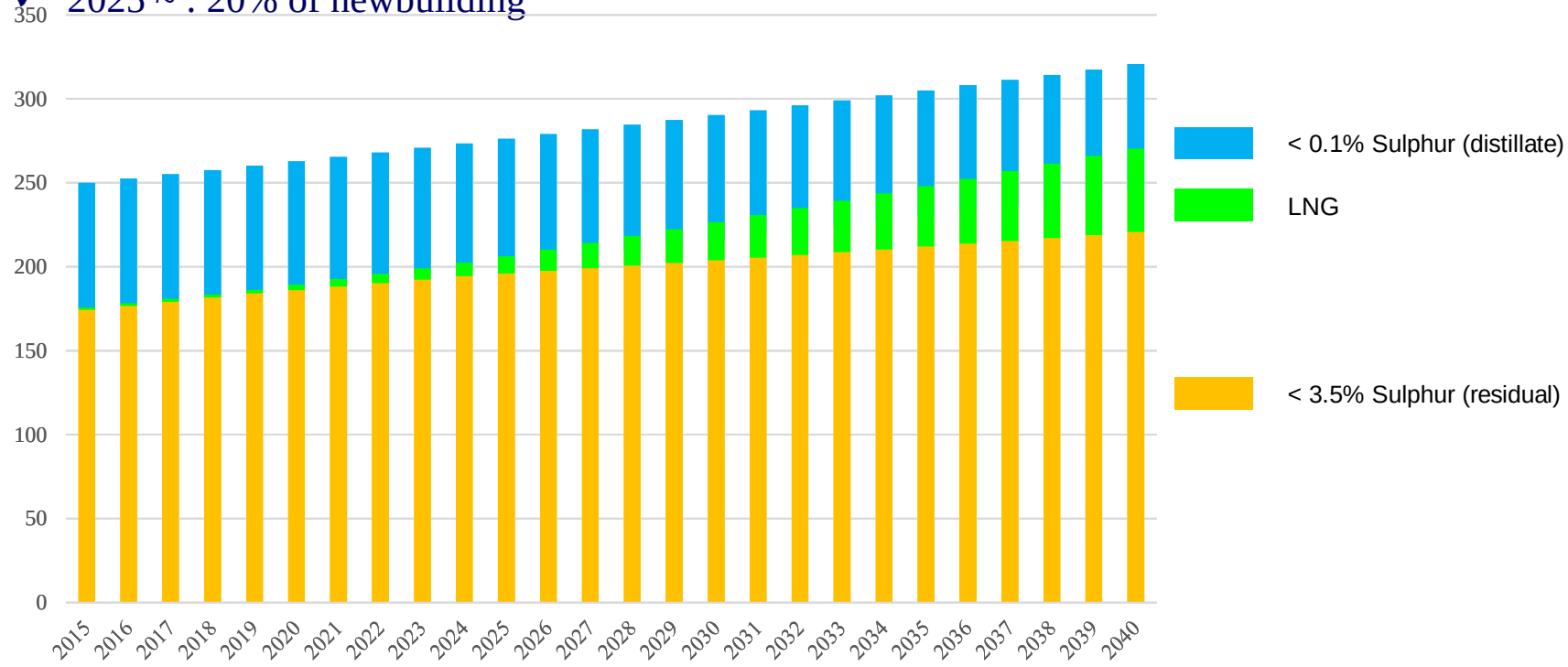
3. SOx Global Cap (3) Simulation

- Total quantity in 2015 : 250 million ton
  Total quantity in future : Sea bone trade +2.5%/y, Efficiency improvement ▲1.5%/y, ∴ +1.0%/y
- MGO/MDO Max 0.10% for ECA in 2015 : 75 million ton



3. SOx Global Cap (3) Simulation

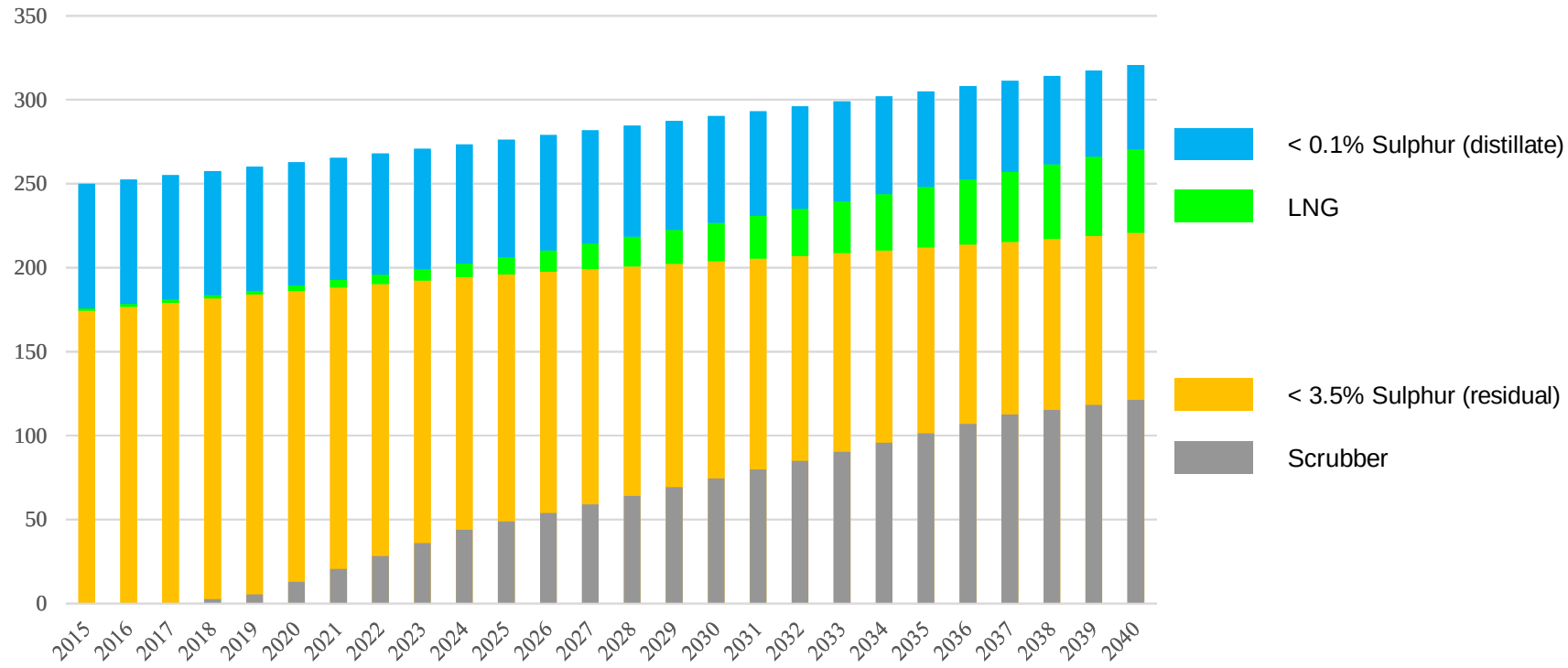
- LNG as fuel
  - ✓ in 2015 : 0.5%
  - ✓ 2016 ~ 2019 : 2% of newbuilding
  - ✓ 2020 ~ 2024 : 10% of newbuilding
  - ✓ 2025 ~ : 20% of newbuilding



- Effect of LNG fuel : 50% for ECA, 50% for Global Cap

3. SOx Global Cap (3) Simulation

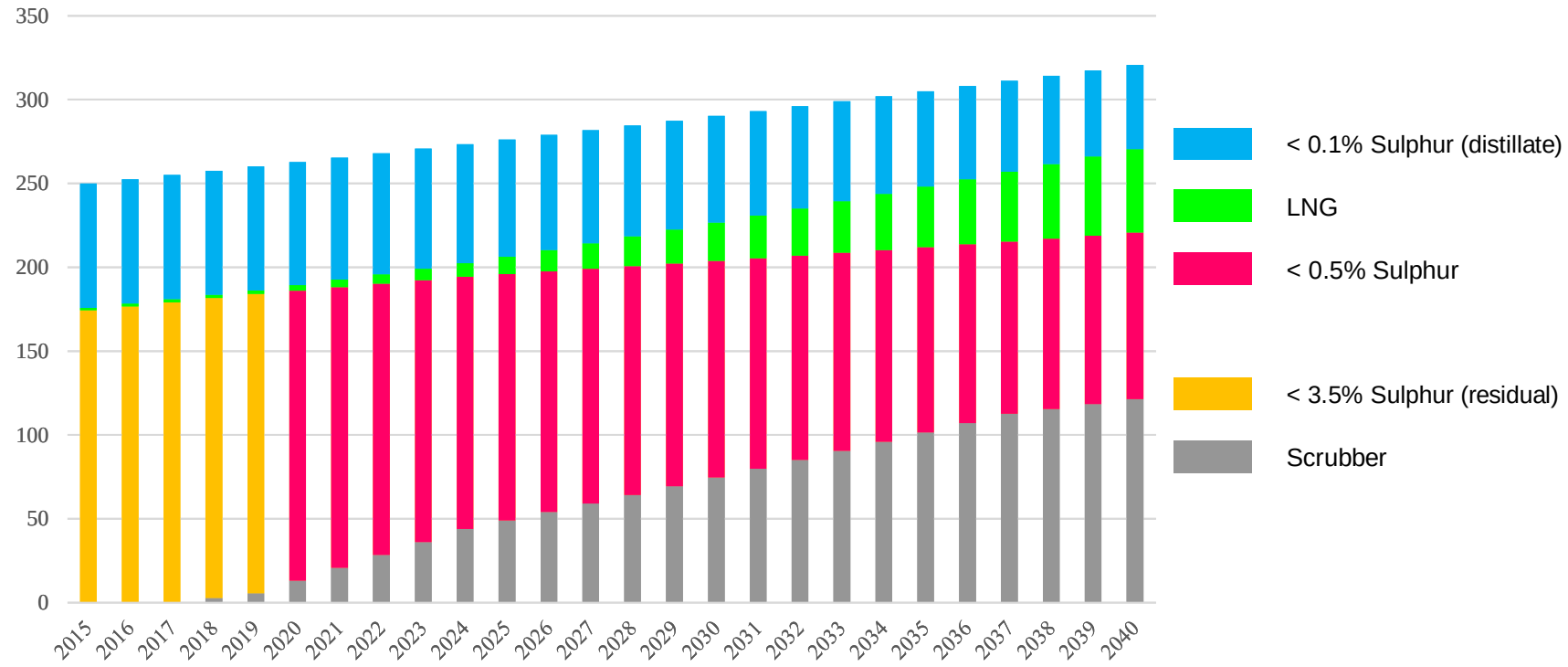
- Scrubber
  - ✓ 2018 ~ 2024 : 25% of first special survey
  - ✓ 2020 ~ : 40% of newbuilding



- Effect of Scrubber : 100% for Global Cap

3. SOx Global Cap (3) Simulation

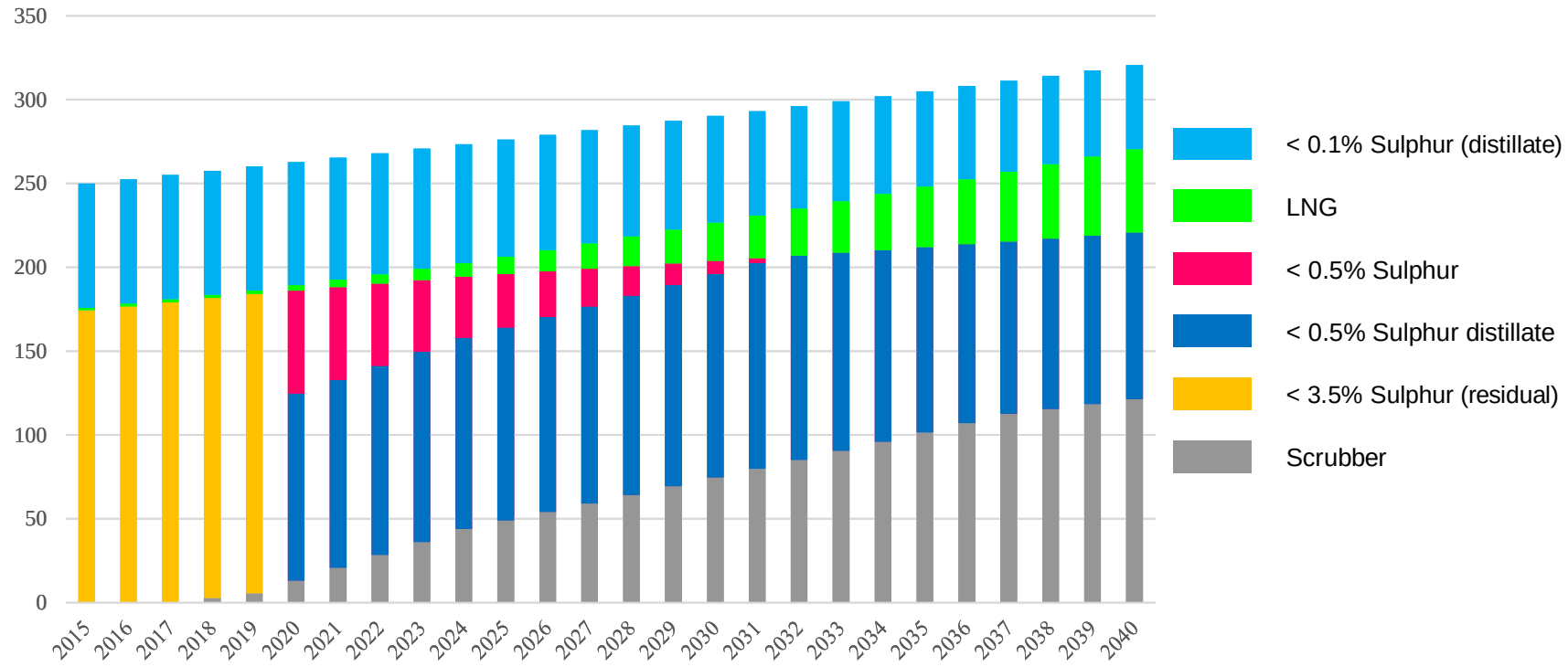
- Global Cap
  - ✓ In effect : since 2020



- Demand : 173 million ton from Residual to Distillate, and Distillate increase to 94%
- Supply : ?

3. SOx Global Cap (3) Simulation

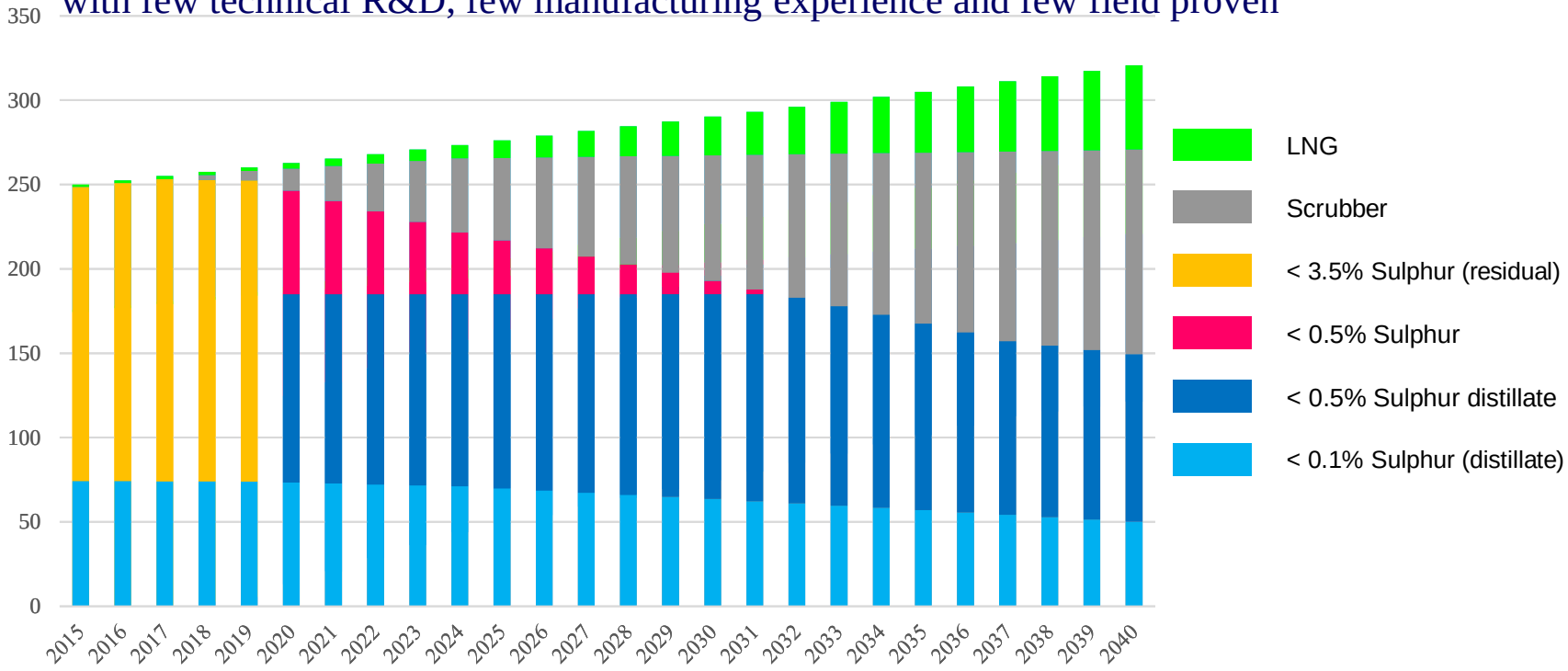
- Supply capacity of 0.5% distillate oil
  - ✓ Estimation : there are many explanations including IEA 2015 MTOMR, max 110 million ton (?)
  - ✓ Gap between demand and supply : 61 million ton in 2020



- Prospect of price : Deference between 0.5% oil and HSO increased, with high volatility
- High volatility of price : On all oil consuming industries beyond international shipping
- Who will take care of this gap ? Oil industry ??

3. SOx Global Cap (3) Simulation

- From the view point of oil industry, sort the data for easier understanding
- Gap between demand and supply : Max in 2020, smaller in future, disappeared in 2031
  - ✓ Weak incentive to make big investments on refinery facilities
  - ✓ New kinds of Low Sulphur Fuel : LSHFO, LS half residual oil (mixed with distillate oil), so on with few technical R&D, few manufacturing experience and few field proven



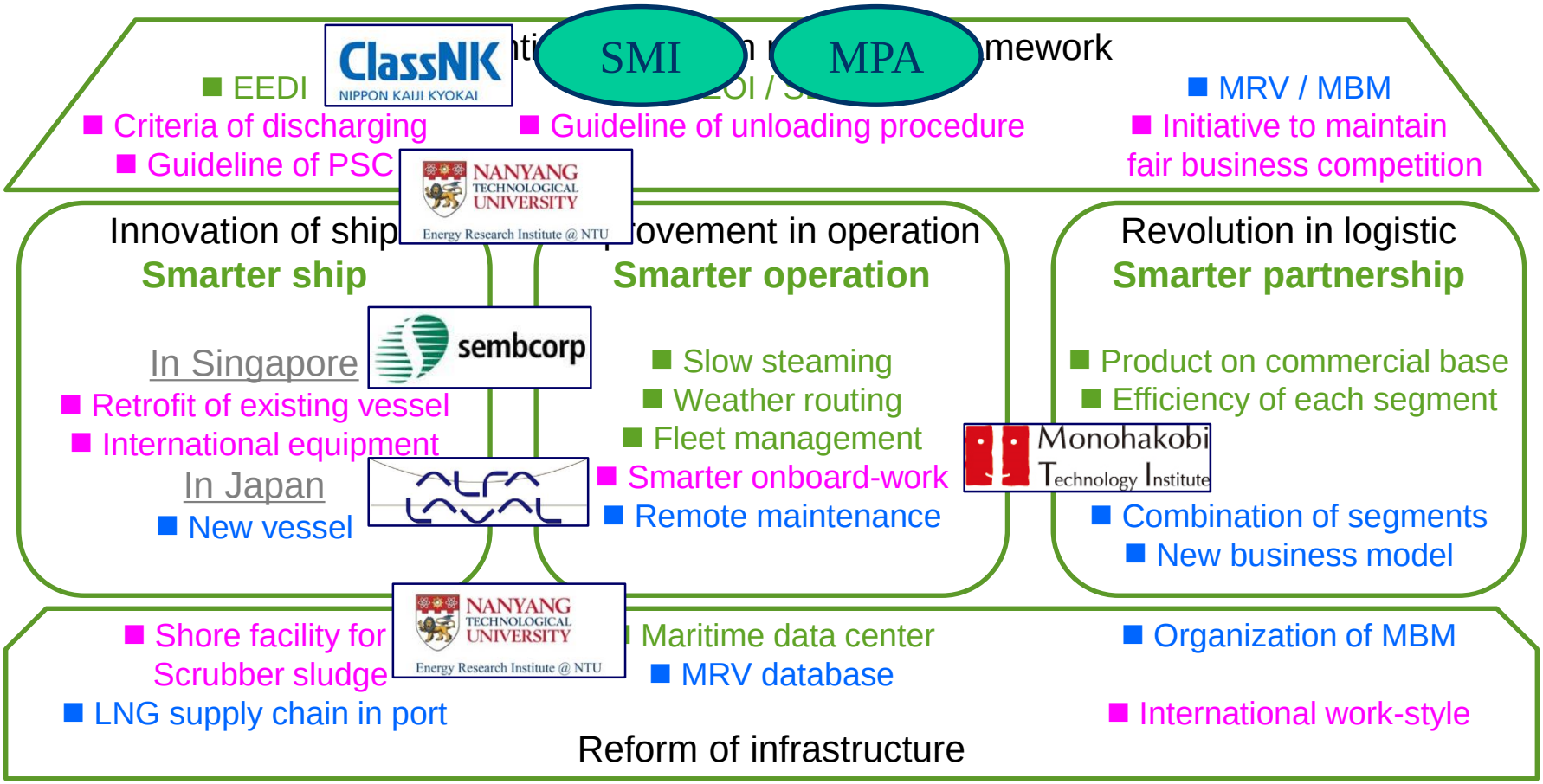
- Maritime industries, by themselves, may take care of
  - ✓ R&D for combustion technologies against new kinds of Low Sulphur Fuel
  - ✓ Earlier, wider and more powerful R&D of LNG fueled Engine and Scrubber
- **Therefore, the role of The Maritime Energy Test Bed (METB) is very important.**

3. SOx Global Cap (4) How to apply R&D results

- How to make the best use of R&D results
  - ✓ R&D center
    - Next R&D project
  - ✓ Manufacture of ship equipment
    - Next product
  - ✓ Shipyard for newbuilding
    - Next design
  - ✓ Ship-owner and Ship-operator
    - Strategy/tactics/plan/schedule for newbuilding/retrofit
      - BWMS : Postponement of retrofit, front-loading/advancement of special survey
      - **Scrubber : Front-loading/advancement of retrofit**
    - Request to regulation and guideline
  - ✓ Shipyard for retrofit
    - Strategy/plan/schedule of retrofit business
    - Information center of world business
  - ✓ Oil industry
  - ✓ State/Government
    - Strategy for maritime industries
    - Proposal for regulation and guideline to IMO

4. Singapore (1) R&D

- R&D of SOx Global Cap Scrubber
  - ✓ Project is not only to develop an equipment but also retrofit of existing vessel, smarter onboard-work, shore facility for Scrubber sludge, criteria of discharging water, guideline of PSC and guideline of unloading procedure.
  - ✓ **Worldwide partnership and international work-style.**



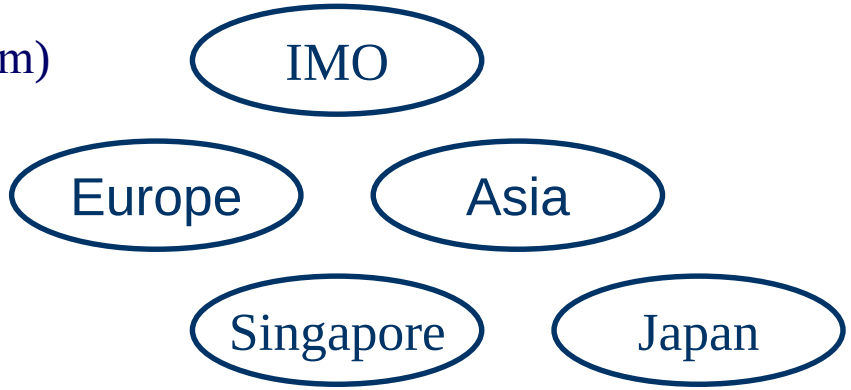
4. Singapore (2) Retrofit/Conversion

- How to make the best use of R&D results
  - ✓ Ship-owner and Ship-operator
    - Strategy/tactics/plan/schedule for newbuilding/retrofit
      - BWMS : Postponement of retrofit, front-loading/advancement of special survey
      - **Scrubber : Front-loading/advancement of retrofit**
    - Request to regulation and guideline
  - ✓ Shipyard for retrofit
    - Strategy/plan/schedule of retrofit business
    - Information center of world business

      Worldwide partnership and international work-style

4. Singapore (3) Cluster of Maritime industries

- The role of cluster of maritime industries
  - ✓ State/Government
    - Strategy for maritime industries
    - Proposal for regulation and guideline to IMO
  - ✓ **Each of maritime industries**
    - How to approach to IMO
- Partnership with IMO
  - ✓ beyond "No.1 of the world"
  - ✓ For the world
  - ✓ **Worldwide partnership and international work-style**
- Partnership with Asian countries
  - ✓ ASF (Asian Shipowners' Forum)
    ASEF (Asian Shipbuilding Experts' Forum)

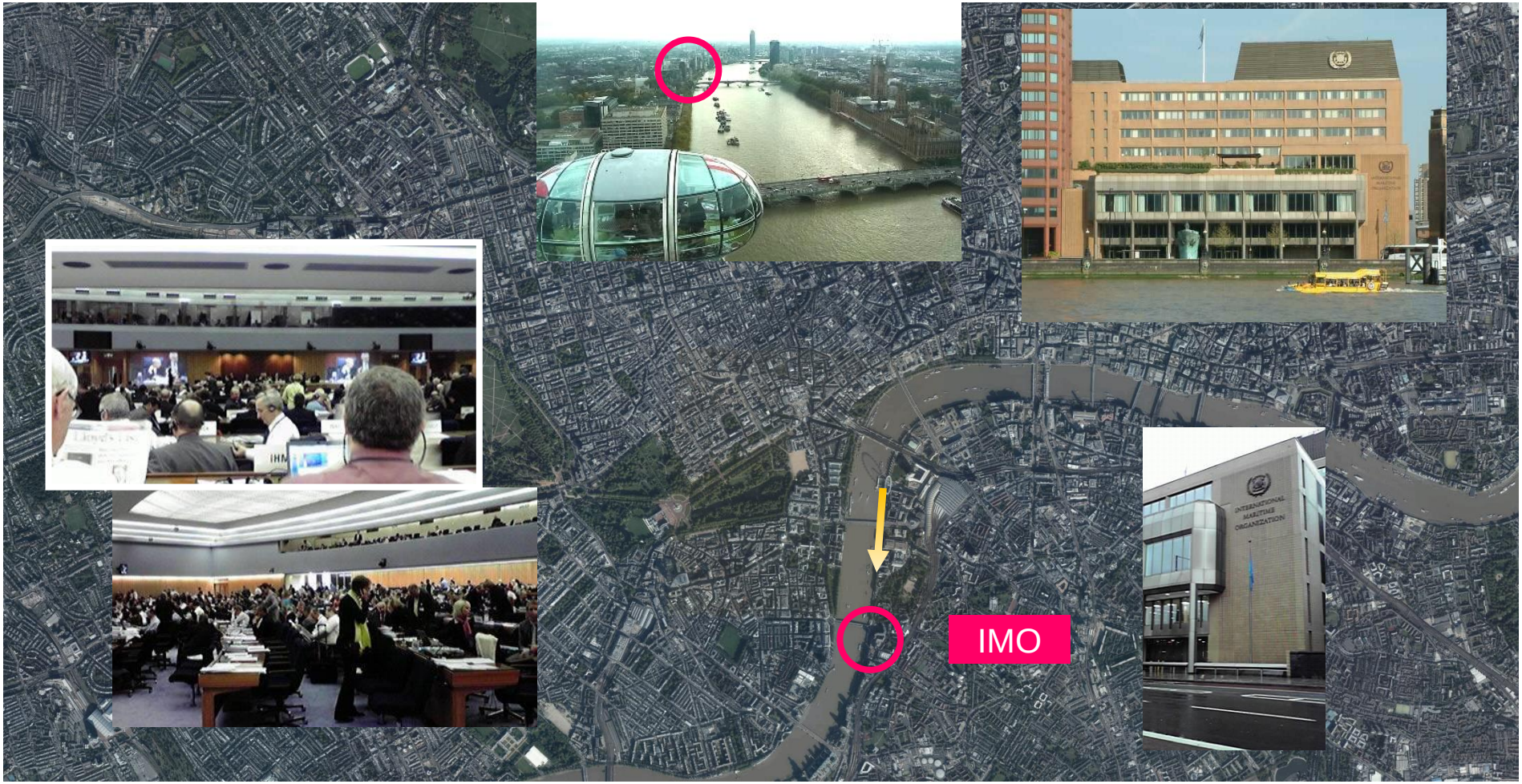


5. IMO

- International Maritime Organization

  Address : 4, Albert Embankment, London

  Website : http://www.imo.org



5. IMO

- Member States
  - ✓ 171 Member States and three Associate Members
- Intergovernmental organizations
  - ✓ 64 intergovernmental organization which have signed agreements of co-operation with IMO : European Commission (EC),
- Non-governmental international organizations
  - ✓ International Association of Classification Societies (IACS)
  - ✓ Community of European Shipyards' Associations (CESA), The European Association of Internal Combustion Engine Manufacturers (EUROMOT), The Institute of Marine Engineering, Science and Technology (IMarEST), The Royal Institution of Naval Architects (RINA)
  - ✓ International Chamber of Shipping (ICS), BIMCO, International Association of Independent Tanker Owners (INTERTANKO), Society of International Gas Tanker and Terminal Operators Limited (SIGTTO), Cruise Lines International Association (CLIA), International Association of Dry Cargo Shipowners (INTERCARGO), INTERFERRY, World Shipping Council (WSC),
  - ✓ International Organization for Standardization (ISO), Oil Companies International Marine Forum (OCIMF)
  - ✓ Friends of the Earth International (FOEI), World Wide Fund for Nature (WWF)
- IMO Secretariat

- **How to approach to IMO ?**

6. JSA

- The Japanese Shipowners' Association

  Website : http://www.jsanet.or.jp/e/

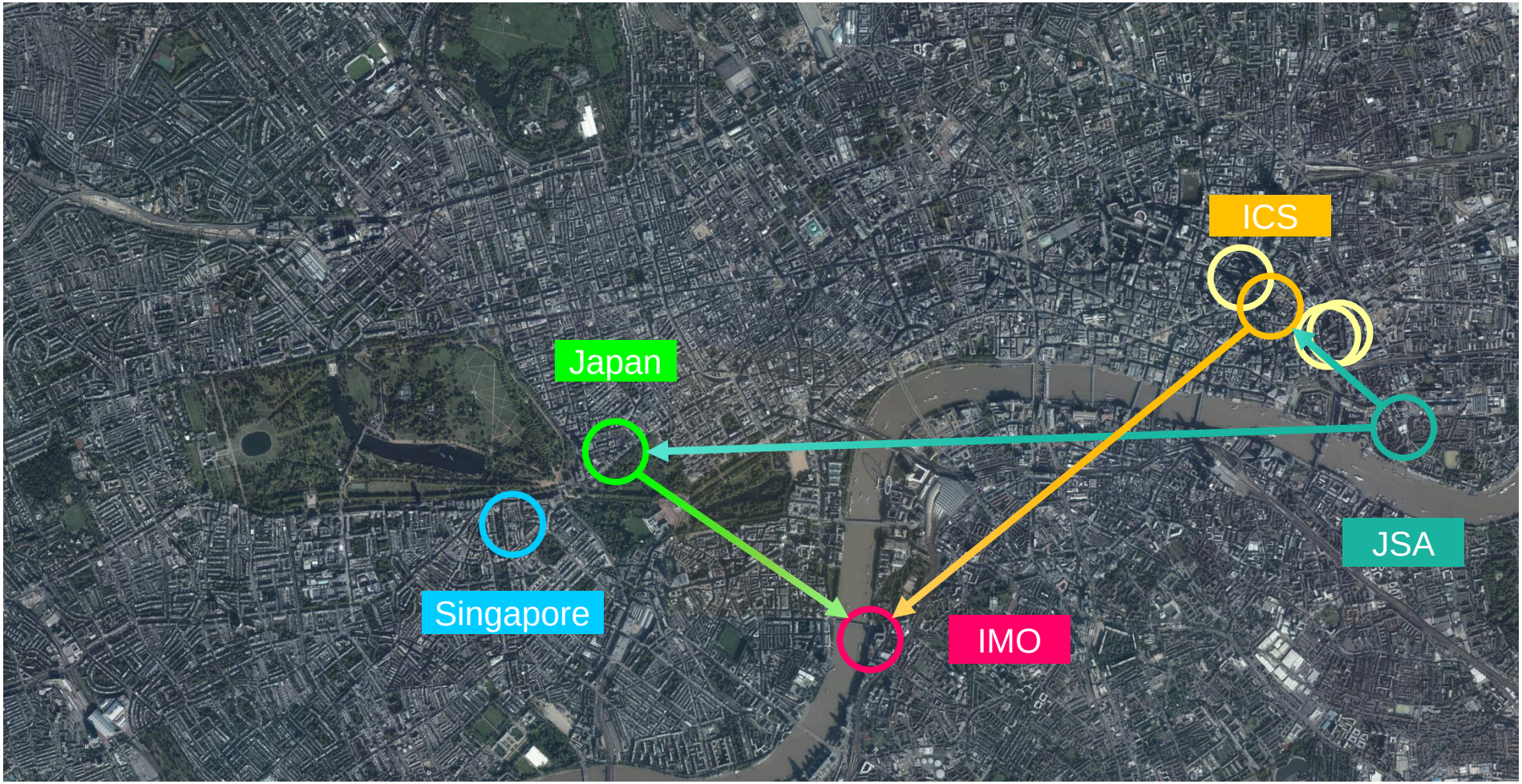
- Partnership with
  - ✓ **Japanese government (MLIT / Ministry of Land, Infrastructure and Transport)**
  - ✓ **ClassNK**
  - ✓ The Shipbuiders' Association of Japan
  - ✓ The cooperative Association of Japan Shipbuilders
  - ✓ JASMEA (Japan Ship Machinery & Equipment Association)
  - ✓ JSTRA (Japan Ship Technology Research Association)
  - ✓ NMRI (National Maritime Research Institute)
  - ✓ JASNAOE (The Japan Society of Naval Architects and Ocean Engineeering)
  - ✓ JIME (The Japan Institute of Marine Engineering)
  - ✓ **ICS (International Chamber of Shipping)**
  - ✓ BIMCO, INTERTANKO, SIGTTO, INTERCARGO, WSC…
- Partnership with Asian countries
  - ✓ **Singapore**
  - ✓ ASF (Asian Shipowners' Forum)
    ASEF (Asian Shipbuilding Experts' Forum)

6. JSA

- Europe District Branch

  Address : 3, Thomas More Square, London

  Website : http://www.jsanet.or.jp/e/



For the Future

Thank you