On December 20, 2016 Japan’s Ministry of Land, Infrastructure, Transport and Tourism informed a feasibility study report on the development of LNG bunkering hub at the port of Yokohama.

National Government, City of Yokohama, Yokohama-Kawasaki International Port CO., Ltd., and private enterprises promote together to establish the LNG bunkering hub.

We will hold an international symposium on LNG Bunkering in Yokohama on April 3 to accelerate the efforts of stakeholders, toward the formation of a LNG bunkering hub and building of an international network.

We try to increase the number of the global liner routes connecting Japan and North America by establishing LNG bunkering hub in Yokohama Port, and we try to enhance the function as the Hub Port in the East Asia.

1. Date & Time : April 3, 2017(Monday) 14:00〜17:00
2. Venue : Yokohama Royal Park Hotel(2-2-1-3 Minatomirai, Nishi-ku, Yokohama)
3. Subject : “Toward the formation of LNG Bunkering Ports Network”
4. Program
   ○Keynote Speech   Dr.Fereidun Fesharaki (Chairman, FACTS Global Energy Group)
   ○Panel Discussion  “Toward the formation of LNG bunkering hub”
     •Moderator  Mr.Masamichi Morooka
      (President, Yokohama-Kawasaki international Port Corporation)
5. Entry
   Regarding related details and entry, please refer to the attached file and the following site. Further, this event is free to attend.  URL  http://eventregist.com/e/LNG2017

*LNG Bunkering : Supplying LNG as a marine fuel at ports and harbors

CONTACT
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Director of Policy Coordination Division Port & Harbor Bureau
International Symposium on LNG Bunkering in Yokohama

Time and Date:
14:00 – 17:00, Monday, April 3, 2017 (Registration starts at 13:15)

Venue: “Hoh-sho” Banquet Hall (3rd floor of Banquet Wing)
Yokohama Royal Park Hotel
2-2-1-3 Minatomirai, Nishi-ku, Yokohama  Telephone: 045-221-1111 (main line)

Subject: 「Toward the formation of LNG Bunkering Ports Network」

PROGRAM (tentative)  ※Simultaneous interpretation available

Keynote Speech
Title:  「IMO Challenges: The Emerging Role of LNG Bunkering」
Speaker: Dr. Fereidun Fesharaki (Chairman, FACTS Global Energy (FGE) Group)

Panel Discussion
Subject: 「Toward the formation of LNG Bunkering ports network」
Moderator: Mr. Masamichi Morooka (President, Yokohama-Kawasaki International Port Corporation)
Panelists: Mr. Michael Chia (Managing Director(Marine), Keppel Offshore & Marine Ltd)
Mr. Michiaki Hirose (President, Tokyo Gas Co. Ltd.)
Mr. Peter Keller (Executive Vice President, TOTE)
Mr. Tadaaki Naito (President, NYK Line)
Mr. Andrew Tan (Chief Executive, Maritime and Port Authority of Singapore)
Representative from cruise shipping company (pending)

Following the symposium, a networking reception in standing style will be held to offer participants an opportunity to exchange business cards.

Organizers: Ministry of Land, Infrastructure, Transport and Tourism / Ministry of Economy, Trade and Industry
Co-organizers: City of Yokohama / Yokohama-Kawasaki International Port Corporation
HOW TO PARTICIPATE

Access the following URL to fill out an application form:

http://eventregist.com/e/LNG2017

Acceptance of applications will cease once full capacity has been reached (acceptance on first come, first served basis).

No reply will be sent unless your application is rejected due to oversubscription.

Applications due by: Tuesday, March 21, 2017
Feasibility Study Report on the LNG bunkering hub development plan at the Port of Yokohama (Summary)

Environmental regulations - Advantages of LNG

To build LNG bunkering Hub and enhance the competitiveness of Japanese ports, the Steering Committee conducts a feasibility study, focused on the port of Yokohama as a model case.

Purpose of the study

List of Member

- Tokyo Gas co., Ltd
- Nippon Yusen Kabushiki Kaisha (NYK Line)
- Yokohama Kawasaki International Port co., Ltd
- City of Yokohama
- Agency for Natural Resources and Energy
- Ports and Harbours Bureau, Ministry of Land, Infrastructure, Transport and Tourism(MLIT)
- Maritime Bureau, MLIT
- Japan Coast Guard Headquarters (Observer)
- Ministry of Economy, Trade and Industry
- Kanto Regional Development Bureau, MLIT

Adventages of the Port of Yokohama as a LNG bunkering Hub

The Steering committee for LNG bunkering at the port of Yokohama (the committee was held from Jun. to Dec. 2016)

Advanced existing infrastructure

There are many existing LNG bases located next to the port, and the supply cost can be reduced by using existing facility.

Operation of a LNG fuelled ship and LNG bunkering

The operation of a LNG fuelled tugboat "Sakigake" started in August 2015, and related business operators and administrative agencies accumulate know-how of LNG bunkering.

Geographical characteristics - Position as International Container Hub

The port of Yokohama is located on the Pacific side and it serves as the first or last bunkering base in the Asian side of the Transpacific route. It is designated as an International Container Hub, and many ships such as container ships, pure car carriers and cruise ships call at it.

Advantages of LNG basins in fuel oil.

SO\textsubscript{x} (Sulfur content in fuel oil) NO\textsubscript{x} (Emission regulations) CO\textsubscript{2} (Emission regulations)

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<td>SO\textsubscript{x}</td>
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<td>3%</td>
<td>4%</td>
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<td>NO\textsubscript{x}</td>
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<td>CO\textsubscript{2}</td>
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<td>40</td>
<td>30</td>
<td>20</td>
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</table>

Topics

Japan–Singapore Summit

Aiming at strengthening collaboration between Singapore and Japan on LNG Bunkering.

Conclusion of International MOU

The Port authorities of 8 representatives from 7 countries concluded the MOU to promote LNG as a marine fuel.

Emission Control Area (ECA): North Sea & Baltic Sea, the coast of North America and US Caribbean Sea

Coal Oil Natural gas

Emission regulations

SO\textsubscript{x} NO\textsubscript{x} CO\textsubscript{2}

Coal Oil Natural gas

Sulfur oxide (SO\textsubscript{x}) Nitrogen oxide (NO\textsubscript{x}) Carbon dioxide (CO\textsubscript{2})
**Roadmap for the development of LNG bunkering base**

**Phase I** (started)

**Optimization of “Truck to Ship” bunkering**
Optimize the existing “Truck to Ship” LNG Bunkering operation by approximating the LNG tank lorry and the LNG fuelled ship.
⇒ The optimization has been realized since November 2016.

**Investment**
Approx. 6 billion yen

**Phase II** (2020)

**Introduction of “Ship to Ship” Bunkering**
Introduce a LNG bunkering ship and start “Ship to Ship” bunkering, using the LNG terminal in Tokyo bay (Sodegaura terminal) where required facilities are already in place for supplying LNG to bunkering ships.

【Required facilities】
- LNG bunkering ship
- Improvement of LNG Terminal

**Investment**
Approx. 6 billion yen

**Phase III** (After the demand reaches a certain scale)

**Strengthen of “Ship to Ship” bunkering**
Strengthen of the bunkering operation by introducing new LNG supply system and 2nd bunkering ship at the Port of Yokohama.

【Required facilities】
- New LNG Supply system
- LNG bunkering ship (2nd vessel)

**Investment**
Approx. 10 billion yen

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**Demand forecast**

The demand of LNG fuel will moderately increase because new LNG fuelled ships will build mainly in the case of replacing existing ships.

<table>
<thead>
<tr>
<th>Period</th>
<th>Conversion rate to LNG fuel</th>
<th>Demand forecast of LNG fuel around Yokohama Port</th>
</tr>
</thead>
<tbody>
<tr>
<td>2025–2030</td>
<td>5%~27%</td>
<td><em>Forecast by various investigation institutions</em></td>
</tr>
</tbody>
</table>

**Business profitability**

It is necessary to increase the volume of demand around 100,000 ton to 150,000 ton per year to secure the business profitability in Phase II. It requires many efforts towards the realization of LNG Bunkering Hub due to the limitation of the demand at the beginning of Phase II.

**Towards the realization**

**Demand creation**
Promotion of the use of the Port of Yokohama by LNG fuelled ships
- Providing incentives to LNG fuelled ships
- Sales to shipping companies
- LNG fuelization of state-owned work vessels
- Unification of standards
- Diffusion of new technology

**Supply system**
Early realization of inexpensive and effective supply system
- Start-up support by government
- Realization of competitive LNG prices
- Cooperation with foreign countries
- Low-cost supply measures
- Safety standards, safety measures
- Complying with related laws and regulations

**Institutions, global cooperation**
Improvement of required institutions and contribution to the formation of global LNG fuel supply network

*Forecast by various investigation institutions*