Hydrogen Supply from Russia to Japan by SPERA Hydrogen Technology

Chiyoda Corporation
November 6th 2015
1.1 Chiyoda in brief - Who we are

68 years of projects experience in over 60 countries

Timely Delivery of plants

Reliability No.1 EPC Company

High Plant Availability: No unplanned shutdown

Courtesy of Qatargas Operating Company Limited
1.2 Chiyoda in brief - Key Figures (FY2014)

**Revenues**
- LNG: 9%
- Petroleum and Petrochemical: 22%
- Other Gas Related: 8%
- Fine Industries: 7%
- Others: 54%

**New Orders**
- LNG: 5%
- Petroleum and Petrochemical: 6%
- Other Gas Related: 7%
- Fine Industries: 7%
- Others: 74%

**Backlog**
- LNG: 2%
- Petroleum and Petrochemical: 12%
- Other Gas Related: 2%
- Fine Industries: 2%
- Others: 78%

**Bilion USD**
- Revenues: 4.0 Billion USD
- New Orders: 6.2 Billion USD
- Backlog: 11.8 Billion USD

As of March 2015
Exchange rate: JPY120/$
1.3 Chiyoda in brief - Global Track Record

World’s No. 1 LNG Contractor

Involved in over 40% of LNG projects over the decade

Executed 75 LNG receiving terminal projects

Over 800 refinery units constructed

Over 500 Petrochemicals / Chemicals plants constructed

Over 1,800 projects in various other fields

Courtesy of Qatargas Operating Company Limited
1.4 Chiyoda in brief - LNG Experience

25 EPC projects* & 31 FEED projects

Oman 2 EPC (3 Trains) 2 FEED
U.A.E. 2 EPC (3 Trains) 2 FEED
Qatar 9 EPC (15 Trains**2) 6 FEED
Egypt 1 FEED
Algeria 1 EPC (1 Trains)
Canada 1 FEED
USA 3 EPC (6 Trains) 1 FEED
Trinidad Tobago 1 FEED
Brazil 1 FEED
Nigeria 2 FEED
Mozambique 1 FEED

Russia 2 EPC (5 Trains) 2 FEED
Indonesia 4 EPC (5 Trains) 4 FEED
Malaysia 1 FEED
Papua New Guinea 1 EPC (2Trains) 1 FEED
Australia 1 EPC (2 Trains) 3 FEED

* 42 trains, 168 MTPA of LNG
**2 include debottlenecking

as of September 2015
2.1 SPERA hydrogen Technology – technology overview

Features:
1. Low Volume: $\text{H}_2$ volume is reduced to $<1/500$ in MCH
2. Handling: MCH handling classification is similar to petroleum.
3. Common Infrastructure: MCH is stored and transported using conventional petroleum infrastructures at ambient temperature and atmospheric pressure.
2.2 SPERA Hydrogen Technology

– Utilization of existing oil infrastructure

**Storage of hydrogen by conventional tank**

**Transport of hydrogen by conventional tanker, pipeline, tanker truck**
2.3 SPERA Hydrogen Technology - Hydrogen supply chain
2.4 SPERA Hydrogen Technology - Current Activities

Chiyoda is performing following activities on Hydrogen Business.

1. **Supply Chain from Oversea to Power Plant in Japan**
   Hydrogen procured oversea will be transported to Japan via SPERA Technology and supplied to the existing power plant. The demonstration operation is expected during the period of Tokyo Olympic and Paralympic Games in 2020. This program is supported by NEDO (the affiliated organization of METI).

2. **Power to Gas**
   Hydrogen generated by the electrolyzer using the simulated wind power will be converted into MCH in SPERA Process. The demonstration facilities are under construction at Chiyoda R&D Center and operation is scheduled to completed at the early 2018. This program is supported by NEDO.

3. **Dehydrogenation Unit for Fuel Cell**
   The dehydrogenation unit will be compacted from the plant size of mass capacity to the station size like refueling station for FCEV. Test unit is scheduled to operate in 2017. This program is supported by NEDO.
3.1 FS for RusHydro - Geography

- Hydropower is the most used form of renewable energy in Russia.
- There is large potential in Russia for more use of hydropower.
- Hydropower can be exported in the form of hydrogen produced by electrolysis.

**Case -1 Magadan**
- Region to export hydrogen
  - Electrolyser
  - Hydrogenation

**Case -2 Vladivostok**
- Region to import hydrogen
  - Dehydrogenation
3.2 FS for RusHydro - Schedule

Russia

Case Studies

Studies At Magadan

Studies At Vladivostok

Consideration of the Concept / Outline of the Project

Feasibility Study

Project Phase
(Engineering, Construction, Test operation)

Japan

Current

MOU

Approx. 2 year

Pre-study for Hydrogen Supply Chain

Case Studies are supported by NEDO (New Energy and Industrial Technology Development Organization) and conducted with the collaboration with Mitsui & Co., Ltd.

Hydrogen demand creation
(e.g. hydrogen power plant, fuel cell, chemicals)
3.3 FS for RusHydro - Block Flow
Natural gas currently exported from Russia to Japan in the form of LNG. Hydrogen is also produced as byproduct when Methanol/DME (dimethyl ether) is produced of natural gas. Chiyoda also conducts FS with Mitsui &Co., Ltd. under the Scientific-Technical Cooperation between GAZPROM and the Agency of Natural Resources and Energy of Japan.
THANK YOU

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