The Expansion of LNG Use in Japan

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The Position of Natural Gas in Japan’s Energy Policy

**the Basic Energy Plan** (Mar ’07)
- Promote the introduction and expanded use of natural gas

**Energy Supply-Demand Outlook for 2030** (Mar ’05)
- Increase in the overall share of natural gas through the spread of decentralized power sources
  (13% in 2000 to 16% in 2030)

**the Kyoto Protocol Targets Achievement Plan** (Apr ’05)
- Natural gas is a clean energy source, which has relatively small environmental impact
- Accelerated shift to natural gas while maintaining a balance with other energy sources
Sales Volume and Number of Customers

Trend of city gas sales volume and number of customers

Source: The Japan Gas Association
LNG Receiving Terminals in Japan

- Sin-Minato
- Sodegaura
- Futtsu
- Ohgishima
- Sodeshi
- Negishi
- Higashi-Ohgishima
- Yokkaichi (Chubu, Toho)
- Fukuhoku
- Kawagoe
- Chita, Chita Joint LNG, Chita Midorihama
- Ohita
- Yanai
- Hachinohe
- Sodegaura
- Nihonkai
- Himeji (Kansai, Osaka)
- Hatsukaichi
- Okayama
- Takamatsu
- Mizushima
- Hachodate
- Tobata
- Nihonkai
- Yanai
- Sodeshi
- Saga
- Sakai
- Kagoshima
- Nagasaki
- Okayama
- Himeji (Kansai, Osaka)
Newly Constructed LNG Facilities

LNG Terminals for Ocean Tankers

LNG Terminals for Coastal Tankers

LNG Satellite Terminals
Increasing approx. 10 terminals per annum
→ Sowa, Asahikawa, Kochi, etc.
Hokkaido Gas Hakodate Minato Terminal

Send-out gas capacity: 300,000 m³ per day

LNG Tank : 5,000 kl x 1unit
LNG Vaporizers: 2 t/h x 5units

Coastal Tanker
Length: 89.2 m; Width: 15.3 m
Cargo Quantity : 1,000 t
Tokyo Gas Sowa Satellite Terminal

<table>
<thead>
<tr>
<th>Units</th>
<th>Capacity</th>
<th>Units</th>
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<tbody>
<tr>
<td>Trains</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>LNG Storage Tanks</td>
<td>400 kl</td>
<td>2</td>
</tr>
<tr>
<td>LNG Vaporizers</td>
<td>2.4 t/h</td>
<td>6</td>
</tr>
<tr>
<td>Other Facilities: odorizing equipment, emergency generator</td>
<td></td>
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LNG Freight Train Transport

Load Capacity: 9.8 t and 10.5 t
Transport Distance:
350 km (Niigata-Kanazawa)
250 km (Yufutsu-Asahikawa)
Global Warming Countermeasures by Industry

- Keidanren Voluntary Action Plan on the Environment
- Annual check & review by the government

Gas industry has also established carbon dioxide reduction goals
Countermeasures for Environmental Issues at Receiving Terminals

1. Reducing CO$_2$ Emissions in the LNG re-gasification process
   - Using ORV for the base load and SCV for peak shaving

2. Using cryogenic energy
   - Liquefied nitrogen and oxygen extracted from liquefaction and separation of air, cold storage warehouses, cryogenic power production, etc.

3. Reducing the environmental burden from LNG tankers
   - 75% reduction in SOx emissions of LNG tankers at berth using BOG
ORV and SCV

Open-Rack Vaporizer
(for base load)

Submerged Combustion Vaporizer
(for emergencies/peak shaving)

Energy required for vaporizing 100 t of LNG:

Power Consumption: 600 kWh
Fuel Consumption: 1,800 m³ (natural gas)
Use of LNG Cryogenic Energy

Cryogenic Power Generation
Power Output : 4.4 MW
(Tokyo Gas, Negishi Terminal)

Cold Storage Warehouse
Storage temperature: -50°C or below
Main storage items: Tuna
Response to Environmental Problems at Receiving Terminals

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Addressing global environmental issues as energy suppliers will be essential to further expand the LNG market.