

Outline of an Interim Report from the Study Group for the Direction of the Japanese Gas Utility Business in a Low Carbon Society

1. Recent Development of Energy Sector

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| <ul style="list-style-type: none"> ● Concerns about increasing volatility of the energy market ● Actions against global warming <p>⇒ Need to strengthen the energy supply and demand structure</p> | <p>【Recent initiatives】</p> <ol style="list-style-type: none"> ① Action Plan for Achieving a Low Carbon Society (aiming to reduce GHG emissions by 60-80% from the present level by 2050) ② Review of earlier policies that emphasized the importance of alternative energy options to oil; shift of policies toward improving the energy supply structure ③ Formulation of Japan's mid-term target: reducing GHG emissions by 15% from the 2005 level by 2020 |
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2. Present Situation of Natural Gas and the Gas Utility Business

【Natural gas】

- Characteristics of natural gas
 - The cleanest of fossil fuels (CO2 emissions are 0.6 relative to oil, 0.75 relative to coal)
 - Potential source of hydrogen
- Recent developments concerning the global natural gas market
 - Recognition of high potential (abundant supply sources, plans of new projects, development of floating LNG production techniques, etc.)
 - Development of unconventional natural gas resources (coal bed methane, etc.)
 - Changes in the natural gas market (greater flexibility in the global market for LNG trading and increasing uncertainty of the supply-demand balance)
- Present situation of natural gas procurement, and possibility of domestic procurement (methane hydrate)
 - Long-term contracts
 - Diversification of supply sources
 - Possibility of methane hydrate development, etc.
 - Technical development and off-shore exploration (with geophysical exploration ships, etc.)
- Present usage of natural gas in the U.S. and Europe
 - Contribution of natural gas to the primary energy supply: Japan = 15%; United States = 22%; United Kingdom = 35%; Germany = 23%; Italy = 38%; Spain = 21%; Russia = 54%

【Japanese gas utility business】

- Recent Development of the gas utility business
 - Development driven mainly by the introduction of imported LNG
 - Expanded use of natural gas as a dominant source of city gas (as gas utilities switched to city gas of higher calorific value with the IGF21 plan for gas type integration)
 - Increasing demand from industry (switching to natural gas from other fuel options)
 - Infrastructure development remains an important challenge
- Gas utilities' efforts to reduce energy consumption and CO2 emissions
 - Development and deployment of highly efficient appliances, etc. (latent heat recovery type water heaters, gas air conditioning systems, natural gas vehicles, fuel cell systems, etc.)
 - Promoting the use of CHP systems (gas engine/turbine driven systems, fuel cell systems, waste heat utilization, etc.)
- Responding to institutional reforms for the gas utility business (increasing range of deregulation since 1995)
 - Reducing gas rates through competition, etc.

3. Mid- to Long-term Scenarios of the Gas Utility business development

Basic aims (political criteria)

- Stable and secure energy supply
- Actions against global warming

- Diversification of supply sources and channels (avoiding excessive dependency on a single supply source or channel)
- Smooth transition to a low carbon society in the mid to long term (smarter use of basic infrastructure, etc.)

- Achieving a low carbon society by advanced use of natural gas
 - Deployment of distributed energy systems
 - Contribution to creating a hydrogen-based society
 - Advanced use of natural gas in industry (to reduce energy consumption and CO2 emissions)
 - Introduction of renewable energy sources

【Deployment of distributed energy systems: pursuing the best mix of power and heat on both the supply and demand sides】

- Improving the overall energy efficiency of power and heat supply by using CHP systems
- Configuration of the smart energy networks for reducing energy consumption and CO2 emissions by optimizing the combination of power and heat on both the supply and demand sides by using information and communication technologies (IT)
- Deployment on different scales (household, condominiums, factory, district, city, etc.)

【Creation of a hydrogen-based society】

- Promoting the use of hydrogen
 - Hydrogen is a clean energy source that does not produce CO2 when used
 - Hydrogen production by reformation of natural gas
- Configuration of local hydrogen networks centered around fuel cell systems (combined with hydrogen stations, hydrogen pipelines and CCS facilities)

【Advanced use of natural gas in industry (for reduced energy consumption and CO2 emissions)】

- Reducing energy consumption and CO2 emissions by advanced use of natural gas (fossil fuel will remain important for thermal demand at high temperature)
 - Introduction of highly efficient burners and combustion systems
 - Extensive use of CHP systems

【Introduction of renewable energy sources】

- Utilization of biogas (onsite utilization, utilization as gas source for city gas, distribution through pipe, etc.)
- Promoting the combination of solar heat and natural gas as an advanced form of energy utilization
- Promoting the utilization of unused, non-conventional energy sources (exhaust heat, etc.)

4. Action plans for the Mid- to Long-term Scenarios

〈Deployment of distributed energy systems〉

- Development and deployment of CHP systems (gas engine/turbine driven systems and fuel cell systems)
- Demonstration, etc. concerning the combination of power and heat on the supply and demand sides (at different scales including household, condominiums, district, city, etc.)
- Development of information technologies (for visualization of energy-related information on the demand side, sensor networks, etc.)

〈Creation of a hydrogen-based society〉

- Development/deployment of fuel cell systems, and development of technologies for producing hydrogen
 - Development of PEFC and SOFC, establishment of technologies for mass production, and reducing production costs
 - Development of technologies for production, transportation, storage, etc. of hydrogen
- Development of hydrogen supply infrastructure (local hydrogen networks, etc.)
 - Technological development, demonstration, etc. for the development and deployment of hydrogen supply infrastructure (hydrogen pipelines and hydrogen stations)

〈Advanced use of natural gas in industry〉

- Development and deployment of highly efficient burners and combustion systems such as regenerative burners and fuel-oxygen burners
- Supporting advanced energy utilization at small- and medium-sized enterprises

〈Introduction of renewable energy sources〉

- Expanding the use of biogas by technological development and collaboration with relevant ministries/agencies, local governments, etc.
- Conducting research on technologies for using solar heat and promoting introduction of appliances that use solar heat
- Promoting the district-based utilization, etc. of unused, non-conventional energy sources (exhaust heat, etc.)

〈Development of infrastructure〉

- Ensuring a stable supply of natural gas (promoting "resource diplomacy" and developing technologies for producing methane hydrate)
- Development of pipelines and other basic infrastructure
- Transfer of energy conservation technologies to overseas
- Growing into providers of comprehensive energy services
- Creating a framework for supporting initiatives at the local community/government level
- Activities for distributing information and enlightening the public