

# Research & Development: A Key to the Future

Tokyo Gas has consistently emphasized technology development and the harnessing of new technology to develop business. As deregulation intensifies competition, we will focus on developing technologies that raise the speed and profitability of our operations, differentiate us from other companies, and contribute to business model innovation.

## Key R&D Objectives and Development Themes

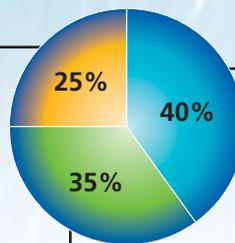
Tokyo Gas is concentrating on the following three key R&D objectives.

### ■ R&D Expenses By Objective

Total R&D Expenditures (Consolidated): ¥11.7 billion  
(Year ended March 31, 2003)

### 3. Creating profitable new businesses and improving customer satisfaction

Deploy proprietary technologies to create profitable new businesses, and develop technologies to expand the ability to supply high-value-added services that meet customers' needs.



### 1. Encouraging natural gas use

Improve the safety and dependability of gas appliances and further raise the superiority of city gas by developing technologies that increase efficiency while reducing space requirements and costs.

### 2. Strengthening the natural gas business base

Improve existing production and distribution infrastructure and lower the cost of maintenance. Develop technologies required to create a more efficient production, storage, transmission and supply system in order to expand the Company's natural gas business base.

## Business Model Innovation through Technology Development

Tokyo Gas is working to commercialize hydrogen energy and fuel cells, with the expected launch of a residential fuel cell cogeneration system in fiscal 2004. In addition, Tokyo Gas is deploying its technologies to contribute to the expansion of the hydrogen infrastructure in ways such as leveraging its city gas infrastructure in the Tokyo metropolitan area. Using its experience in natural gas vehicles and its highly efficient technology to produce hydrogen from city gas, Tokyo Gas is also working to develop a new business model focused on these efforts.

### Hydrogen Filling Station



The Senju Hydrogen Station, the first fixed hydrogen filling station in the metropolitan Tokyo area, was constructed as a joint venture between Tokyo Gas and Nippon Sanso Corporation as part of the Japan Hydrogen & Fuel Cell Demonstration (JHFC) Project. Once operations begin, the

station will conduct demonstrations of hydrogen production and supply technology and its operating know-how. It will also collect data on factors such as environmental impact, energy efficiency, safety and economic feasibility. This data will support the establishment of standards and regulations, validate the social suitability of hydrogen energy and fuel cells, and provide feedback that Tokyo Gas can use in developing technology and creating a new business model. Fuel cell vehicles and hydrogen filling stations were also the focus of attention at the 22nd World Gas Conference held in Tokyo.



### Cogeneration System for Residential Use

The polymer electrolyte fuel cell (PEFC) stationary cogeneration system for residential use features highly efficient power generation, minimal environmental impact and high overall energy efficiency. Using its proprietary technology, Tokyo Gas is pushing ahead with the development of a fuel processor for the PEFC system. Our initiatives, such as conducting field tests at actual homes, will promote the widespread use of this system.



### Methane Hydrate

The seabeds around Japan are estimated to hold reserves of methane hydrate – methane and water frozen into a sherbet-like consistency under high pressure – equivalent to Japan's natural gas consumption for a hundred years. For a country like Japan, which is almost totally reliant on imported energy resources, this is an extremely attractive source of energy. Tokyo Gas is continuing research into options for using methane hydrate as a future source of natural gas.

