### Strengthening the Natural Gas Value Chain

Generally speaking, city gas suppliers in Japan conventionally engage in a wide range of downstream activities from gas production, supply, and the sale of gas.

The Osaka Gas Group paid attention to the natural gas value chain at an early stage. Extending beyond downstream activities, the Group actively develops upstream operations and looks to expand across all businesses from LNG procurement to the sale of city gas.

# Upstream Businesses

The Production and Liquefaction of Natural Gas and LNG Transportation

#### The Business Domains of Certain

After the liquefaction processes, natural gas, a raw material used in the production of city gas, that has been produced overseas is imported into Japan as LNG.

Currently, the Group has concluded long-term agreements with natural gas suppliers in seven countries worldwide and is working to ensure stable LNG procurement.

In addition, every effort is being made to respond flexibly to changes in demand and other external factors, and to curtail transportation costs. For this reason, we are looking to put in place our own transportation fleet.



In order to ensure the stable procurement of competitively priced LNG, we are acquiring interests in gas fields. Accordingly, the Group participates in a host of overseas projects and is involved in resource development in its own right.





We own six LNG carriers. In addition to lowering the cost of LNG transportation, this initiative allows the Group to more flexibly respond at the time of a change in demand.

At the moment, the Group is constructing an additional two fuel-efficient LNG carriers.



Strengthening the Natural Gas Value Chain By making the most of its accumulated know-how nurtured through its past business activities, the Osaka Gas Group is taking up the challenge of actively expanding into new business domains both in Japan and overseas. In this manner, the Group is working diligently to further strengthen the natural gas value chain.

### Downstream Businesses



#### The Business Domains of Conventional Gas Suppliers

#### Gas Suppliers, including the Osaka Gas Group

Imported LNG is stored in tanks and subjected to an evaporation process using the heat from seawater. Gas is then produced by adjusting the amount of heat.

The Group is producing gas at two LNG terminals in Senboku and Himeji and is endeavoring to ensure the stable supply of city gas.



The Group is constructing the world's largest aboveground LNG tank at its Senboku LNG terminal in order to meet the growing demand for natural gas.

Complementing these activities, the Group is also effectively using gas production facilities, constructing natural gas power plants, and working to develop and expand its electric power business.



Focusing mainly on the Kyoto, Osaka and Kobe area, we are developing a gas pipeline network that covers the Kansai region. By employing this network, the Group is ensuring the stable delivery of gas to customers.

At the same time, the Group is actively engaged in promoting disaster countermeasure particularly in connection with earthquakes and tsunamis.



Steps are being taken to upgrade and expand its pipeline as a part of efforts to cultivate new city gas demand.

(The Himeji-Okayama gas pipeline opened in March 2014.)



The Group strives to put forward best-fit proposals that address a wide range of needs from the water heater, heating and cooling demands of households to the cooling, and heating requirements of plants and offices.



The Group is developing highly efficient appliances and putting forward proposals to promote the conservation of energy. These activities include the Group's efforts to advance gas cogeneration systems.



Drawing on its expertise across a wide range of areas including the conservation of energy consumption and the reduction of costs nurtured through its energy business activities in Japan, the Group is expanding its business in countries throughout Southeast Asia.



### **Characteristics of Natural Gas**

#### Environmental Friendliness of Natural Gas

Natural gas, a fossil fuel like petroleum and coal, is an energy resource which contains methane as its principal component. A major advantage of natural gas over petroleum and coal is its low emissions of carbon dioxide (CO<sub>2</sub>), a cause of global warming. When it is burned, natural gas emits only limited amounts of nitrogen oxide (NO<sub>x</sub>), a contributing factor in air pollution, because of its low nitrogen content, and emits no sulfur oxide (SO<sub>x</sub>), a contributor to acid rain.

#### Prospects of Natural Gas

Against a backdrop of increasing demand for energy in emerging countries, expanding use of unconventional natural gas and changing conditions in electricity supply and demand in Japan, natural gas has played an increasingly significant role. The International Energy Agency (IEA) projects that demand for natural gas will grow sharply through 2035 and account for around 25% of primary energy demand worldwide.



Sources: (CO<sub>2</sub> figures) The Institute of Applied Energy, "Report on Thermal Power Plant Atmospheric Impact Assessment Technology Demonstration Surveys" (March 1990) (SOx and NOx figures) International Energy Agency (IEA), "Natural Gas Prospects to 2010"(1986)

#### Primary Energy Consumption Forecasts (Global)



Sources: International Energy Agency (IEA), "New Policies Scenario Energy Demand, World Energy Outlook 2012" (2012)

#### Supply Stability of Natural Gas

Abundant reserves of natural gas have been discovered around the world, making it likely that a stable supply of natural gas will be available to meet growing demand. Proven reserves of natural gas are sufficient to satisfy global demand for more than 50 years.



#### Major Nations with Natural Gas Reserves

### Characteristics of Gas Business in Japan

#### Gas Pipeline Network

Gas pipeline networks are developed in each region of the country, separate from each other, with no trunk line running throughout the entire country connecting local networks.



Pipeline open-cut construction work

## Major pipeline network Planned pipelines and pipelines under construction

#### Transition to Liberalization of the Retail Gas Market

Liberalization of the retail gas sector began in 1995, and the scope of liberalization has expanded in phases since then. Currently, customers that have annual gas consumption contracts in excess of 100,000m<sup>3</sup> (46MJ/m<sup>3</sup>) fall within the scope of liberalization.

Moreover, debate has been advancing with regard to the full liberalization of the retail electricity and gas markets in accordance with changes in Japan's energy situation. The national government has decided to fully liberalize the electricity sector in 2016.



#### Fuel Cost Adjustment System

The purchasing prices of LNG and LPG, both raw materials for the gas supplied to customers, fluctuate in accordance with movements in foreign currency exchange rates and the price of crude oil. This gas-rate-determining mechanism is referred to as the Fuel Cost Adjustment System. In addition to reflecting external factors in gas rates, this system is designed to clarify the results of efforts in enhancing operating efficiency in areas other than raw material costs. Due to its structure, it also causes a time lag before price fluctuations of raw materials are reflected in gas rates, which impacts performance on a single fiscal-year basis. However, these impacts are neutralized over the medium to long term.

#### This system reflects changes in resource costs into gas rates. (Example)



#### Time lag

### **Domestic Energy Businesses**

The Kansai Region Gas Business
 Broad-Area Energy Business
 LPG Businesses and Industrial Gas Businesses
 Residential Gas Sales
 Electric Power Business
 Procurement of Energy Resources



In the fiscal year ended March 31, 2014, net sales from domestic energy businesses were ¥1,377.4 billion. Segment income came in at ¥75.9 billion accounting for around 73% of the Group's overall income.

Looking at operating conditions in the energy business, the environment is constantly in a state of flux. In addition to growing customer awareness toward energy conservation and the environment, operating conditions are being affected by a variety of factors including the price of raw materials hovering at a high level associated with the sharp rise in crude oil prices and weakening yen, and the decline in the population in the Kansai region.

Under these circumstances, the Osaka Gas Group will work diligently to address the increasingly diverse needs of customers by providing energy, mainly gas and electricity, and delivering packaged solutions that contribute to the efficient use of energy while enhancing energy security. Looking ahead, Osaka Gas will look to transform itself into a comprehensive energy business operator as a part of efforts to become the preferred choice of customers.



Segment Income\*

\* Segment Income = Operating income + Equity in earnings of affiliates



Segment Income\* (Billions of yen)



Gas LPG, electricity, and other energy

\* Segment Income = Operating income + Equity in earnings of affiliates

### The Kansai Region Gas Business

As a core pillar of the Osaka Gas Group's business, we provide comprehensive gasrelated services to customers in the Kansai area, ranging from the production, supply and sale of gas through the installation of gas pipes to the sale of gas appliances.

#### Overview of Gas Sales in the Fiscal Year under Review

In the fiscal year ended March 31, 2014, gas sales volume edged up 0.2% compared with the previous period, to 8,524 million m<sup>3</sup> for Osaka Gas on a non-consolidated basis. Sales volume of gas to industrial customers increased 2.5% year on year to 4,329 million m<sup>3</sup> on the back of successful efforts to capture new demand. Meanwhile sales volume of gas to residential customers declined 3.3% compared with the previous fiscal year, to 2,198 million m<sup>3</sup>. This largely reflected the trend toward higher atmospheric and water temperatures. Sales volume of gas for commercial use decreased 0.9% to 890 million m<sup>3</sup> while sales volume of gas for public and medical use edged down 0.6% to 638 million m<sup>3</sup>. This was primarily due to efforts to promote reductions in energy consumption by customers in the commercial, public and medical fields. On a wholesale basis, the volume of gas sold to other gas providers was 469 million m<sup>3</sup>. This was largely unchanged from the previous fiscal year.



#### Mie-Shiga and Himeji-Okayama Gas Pipelines Openings

The Mie-Shiga gas pipeline opened in January 2014 with the aim of enhancing the stability of gas supply to customers within the Group's service area. In a bid to cultivate new demand, the Himeji-Okayama gas pipeline opened in March 2014. Through these initiatives, we are striving to build a structure that provides customers with the safe and convenient use of natural gas.



## The Kansai Region Gas Business Residential Gas Sales

#### **Business Overview and Characteristics**

In the residential sector, we provide homes with a stable and safe supply of gas and also sell various gas appliances with the aim of encouraging increased gas usage. Recently, in the Kansai region, populations have been declining, and natural gas has continued to face increased competition from rival energy sources. In this challenging environment, we are taking steps to contribute to the realization of a low-carbon society through the efficient use of energy and by targeting higher levels of energy security through the increased usage of distributed power generation systems. In these ways, we are working to expand gas demand in the residential sector.

#### Initiatives Aimed at Promoting the Installation of the Residential Fuel Cell Cogeneration System "ENE-FARM"

Since the release of our residential gas engine cogeneration system "ECOWILL" in 2003, we have worked diligently to promote widespread use of distributed power generation in the residential sector. After launching our residential fuel cell cogeneration system "ENE-FARM" in 2009, we have been advancing optimal cogeneration system proposals that are designed to enhance customers' lifestyles.

The installation of cogeneration systems is expected to expand applications of natural gas as it is used to generate power to address a portion of the electricity consumed by households as well as for heating water and spaces in homes while contributing to reductions in energy consumption as well as CO<sub>2</sub> emissions.

Interest toward distributed power generation systems has risen in recent years due to concerns over energy security. Against this backdrop, the Osaka Gas Group is promoting practical application of its ENE-FARM system, which continues to operate during power outages and is working to address the broad demands of customers.

In the fiscal year ended March 31, 2014, ENE-FARM sales exceeded 11,000 units\* bringing cumulative sales to a total of around 23,000 units. The Company is looking to achieve cumulative sales total of 200,000 units in the fiscal year ending March 31, 2021.

Moving forward, we will continue to develop innovative products and technologies that help to increase the efficiency, decrease the size and lower the price of products and systems. We will place considerable emphasis on encouraging widespread use of products while helping customers to realize more comfortable lifestyles, reducing environmental load and enhancing energy security.

\*Results for the 15-month period from January 2013 to March 2014.

#### Residential Cogeneration System Lineup



\*1 PEFC stands for polymer electrolyte fuel cell. It is a fuel cell that uses an ion-conducting polymeric membrane as an electrolyte.

\*2 SOFC stands for solid oxide fuel cell. It is a fuel cell that uses a ceramic electrolyte. In addition to delivering a higher generation efficiency than PEFCs, SOFCs help to realize more compact products.





#### Release of a New ENE-FARM Product that Balances the Needs for Enhanced Efficiency and Substantial Reductions in Costs

In April 2014, Osaka Gas released a new product in its ENE-FARM series that offers increased power generation and total overall efficiency compared with existing products. With the lowered cost of fuel cell stack materials used for power generation and simplified structure of fuel reformer that generate hydrogen from gas, we have substantially reduced costs. As a result, the Company has been able to lower the price of its polymer electrolyte fuel cell (PEFC)-type ENE-FARM system by ¥660,000 from the existing product's price level.

Osaka Gas has further bolstered its lineup with products that accommodate LPG. Through these and other means, the Company is working diligently to promote increasingly widespread use.



Polymer electrolyte fuel cell (PEFC-type)

#### **ENE-FARM** Power Generation Mechanism

ENE-FARM is a system that generates electricity from hydrogen extracted from city gas and oxygen in the air.



#### Strengthening Equipment Repair Services Using Big Data

Osaka Gas is working to reinforce its equipment repair services to improve customer satisfaction. As a new initiative, utilizing big data including records of maintenance and repairs, the Company is developing a system to estimate the components required at the time of gas appliance repair. At the time a gas appliance becomes inoperable, customers require that repairs be undertaken at a time of their convenience. Utilizing Big Data, Osaka Gas is better positioned to complete the necessary work on the same day as the customer's call thereby significantly enhancing customer satisfaction.



#### Promoting the Use of the Warranty Insurance Service "RAKU-TOKU"

In a bid to secure the continued support of customers, Osaka Gas is working diligently to develop new services.

By paying a set monthly fee, customers can have their gas water heaters and built-in stoves repaired for free. This service also includes periodic inspections free of charge. Moreover, the service is available even for customers using gas water heaters and built-in stoves made by other companies. In this manner, the Company is providing warranty services to a broad spectrum of customers over an extended period.

Since the service was launched in 2011, the number of contracts for this "RAKU-TOKU" service has grown to around 180 thousand (as of March 31, 2014).



The Kansai Region Gas Business

### Commercial and Industrial Gas Sales

#### **Business Overview and Characteristics**

In the commercial and industrial sectors including public and medical institutions, Osaka Gas supplies gas to its customers for such wide-ranging applications as gas cogeneration systems and gas air conditioning systems. Harnessing its engineering capabilities, where the Company's strengths lie, Osaka Gas strives to contribute to the enhanced efficiency of gas usage by customers by proposing business solutions that are tailored to the specific needs of each customer.

In line with the opening of the Himeji-Okayama gas pipeline in March 2014, we are taking steps to promote the use of natural gas by customers living in the area who are currently using other forms of energy.

#### Cultivating Demand Along the Route of the New Himeji-Okayama Gas Pipeline

We estimate that the latent demand for natural gas along the Himeji-Okayama gas pipeline that links Himeji City, Hyogo Prefecture with Okayama City, Okayama Prefecture stands at around 400 to 500 million m<sup>3</sup>. We will aggressively put forward proposals to encourage potential customers along the line including large factories to use gas.

In addition, plans are in place to supply natural gas to the Aioi No. 1 and No. 3 power generation plants owned and operated by Kansai Electric Power Co., Inc., and which are scheduled for renewal from the fiscal year ending March 31, 2017. Each plant has a rated output of 375 MW.

#### Expanding the Use of Gas Cogeneration and Air Conditioning Systems

Due to recent pressures on the demand and supply balance of electricity, the need for power supply security has become increasingly pronounced. This has in turn triggered a growing insistence on cutting consumption during the peak periods and curtailing the use of electric power in general. Against this backdrop, Osaka Gas is promoting cogeneration systems as a backup source of electric power and a stable source during periods of power outage and gas air conditioning systems as part of efforts to reduce the electric power consumption load.

The cumulative capacity of gas cogeneration systems stood at 1.5 GW as of March 31, 2014. This is helping to alleviate the imbalance between electric power supply and demand. Looking ahead, we will work diligently to expand the use of cogeneration systems to meet the cumulative capacity target of 2 GW in 2020.

With robust sales of gas air conditioning systems including gas heat pumps and natural chillers (absorption water cooling and heating units), cumulative capacity stands at 4.4 million refrigeration tons as of March 31, 2014. Osaka Gas is looking to lift this cumulative total to 5.5 million refrigeration tons in 2020.



Gas Cogeneration System



Gas Air Conditioning System

#### Differences between Conventional Generation Systems and Cogeneration Systems

Power Generation System Using Conventional Methods\*

Code Pipeline Gas production plant Power plant Electrical energy 40% Electrical energy 25-48% Primary energy Primary energy 100% 100% Usable waste heat 30-50% (LNG) 2% Transmission loss 58% Exhaust heat Difficult to recycle exhaust heat 15-30% not recycled d of in sea Energy efficiency rate Energy efficiency rate 40% -85%\*

Cogeneration System

\*LHV standard thermal power plant thermal generation efficiency and integration loss is computed based on the operating results of nine electric utilities and power wholesale companies.

### **Broad-Area Energy Business**

#### **Business Overview and Characteristics**

In addition to supplying natural gas to customers within its service area, the Osaka Gas Group sells part of the LNG it procures to largescale customers outside the Kansai region, and to other utilities, by transporting gas by truck or ship. Following LNG supply using largescale LNG carriers to Nippon Gas Co., Ltd. and Okinawa Electric Power Company, Inc., the Group will begin providing LNG to Shizuoka Gas Co., Ltd. from the fiscal year ending March 31, 2015. Going forward, we will expand the volume of LNG we deal in with the aim of enhancing competitiveness from a resource procurement standpoint, and will continue to provide energy solutions that address the needs of customers while pursuing alliances with regional utilities.



### LPG Business and Industrial Gas Businesses

#### **Business Overview and Characteristics**

The Osaka Gas Group's LPG business mainly serves customers outside its city gas service area by providing retail and wholesale supplies of LPG. The Group takes full advantage of its natural gas operating knowhow as well as its nationwide sales network to enhance its competitiveness in LPG. At the same time, the Group is working to provide multi-energy services that combine gas and electricity for a wide range of applications from residential to industrial use.

Moreover, in the industrial gas business, the Group utilizes cryogenic technologies to engage in such businesses as air separation as well as the manufacture and sale of liquefied carbon dioxide and dry ice. We are also expanding our business using proprietary low-temperature crushing technologies.



LPG business



Industrial gas business (low-temperature crushing technologies)

#### LPG Business Locations



### **Electric Power Business**

#### **Business Overview and Characteristics**

The electric power business is mainly conducted across two business domains: power generation and power marketing. Fully leveraging the Group's know-how nurtured through its gas operations, the electric power business is evolving into a second core business after gas. In its power generation activities, the Group relies heavily on the use of natural gas fired thermal power plants. At the same time, we are actively involved in renewable energy operations encompassing a wide range of areas including wind and solar power generation. In power marketing, we are working to build a well-balanced optimal marketing portfolio that combines wholesaling operations to electric power producers, ENNET Corporation, a joint venture between Osaka gas and other companies, and Japan Electric Power Exchange (JEPX).

The total power generation capacity of our domestic power resources currently amounts to approximately 1.8 GW, with our flagship power plant being the Senboku Natural Gas Power Plant, which has a capacity of approximately 1.1 GW. Combining our domestic capacity with our overseas capacity, we boast a total power generation capacity of approximately 3.0 GW. Taking into consideration a variety of factors including continued liberalization of the electricity market, we are looking to double our capacity to 6.0 GW by the 2020s.

#### Overview of the Fiscal Year under Review

In the fiscal year ended March 31, 2014, the Osaka Gas Group's electricity sales volume climbed 7% year-on-year to 8,432 GWh. This helped to partially alleviate the tight supply-and- demand situation across the nation.

While contributing to relieving the power supply shortage, the Osaka Gas Group will work to expand its electric power business.





#### **Electricity Industry Reform**

In response to incidents at a nuclear power station, and the subsequent electricity shortages, there has been much debate in Japan about expanding the scope of electricity interchange between power utilities and full liberalization of the retail electricity market.

Since 2013, a variety of topics have been earnestly discussed, including practical issues on administration and system design. In June 2014, revisions to the Electric Utilities Industry Law, which outlines the direction applicable to full liberalization, were ratified by Japan's Diet. Under these circumstances, Osaka Gas will take all necessary preparatory steps toward providing one-stop services of gas and electricity.

#### Electricity industry reform policy

| 2015: | Establishment of a regional electric power system operator agency |
|-------|---|
| 2016: | Full liberalization of the retail sale of electricity             |

generation and distribution

#### Efforts to Expand the Electric Power Business

The Osaka Gas Group continues to closely monitor recent discussions surrounding energy policy as well as future trends in the demand and supply of electricity. Taking into consideration the dual needs to ensure the stable supply of electricity to customers and steady business growth, we are working to expand our total power generation capacity and are developing fresh sources of power on a nationwide scale.

In addition to natural gas-fired thermal power plants, which form a central component of the Group's power resources, we are engaging in coal fired power generation as well as renewable energy in an effort to build an optimal power source portfolio.



To 2020: Legal separation of powe

In March 2014, the Company decided to expand generation capacity by 110 MW with a coal-fired power station in Aichi Prefecture. Plans are in place to generate electricity by combining with biomass in a bid to reduce environmental load. Looking ahead, we will supplement our generation portfolio with coal-fired power stations as the base load power source while maintaining the central role of our natural gas-fired thermal power plants in order to be better positioned to address the increasingly diversified needs of customers.

#### Expanding Electric Power Business Nationwide

The Osaka Gas Group will expand its electric power business nationwide with a focus on western Japan.

#### Power sources currently owned by the Osaka Gas Group

Thermal



#### Power Sources Owned by the Osaka Gas Group (As of May 2014)

| Domestic power plant  | Capacity       |
|---|----------------|
| 1 Torishima Energy Center (Natural gas)                       | 150MW          |
| 2 Nakayama Joint Power Generation (Natural gas)               | 149MW          |
| 3 Nakayama Nagoya Joint Power Generation (Coal)               | 149MW          |
| 4 Himeji Power Plant (Natural gas)                            | 55MW           |
| Senboku Natural Gas Power Plant (Natural gas)                 | 1,109MW        |
| 6 Hayama Wind Farm Power Plant (Renewable energy)             | 20MW           |
| 🥑 Hirogawa Myojin-yama Wind Power Plant (Renewable energy)    | 16MW           |
| 8 Yura Wind Power Plant (Renewable energy)                    | 10MW           |
| <ul> <li>Hizen Wind Power Plant (Renewable energy)</li> </ul> | 30MW           |
| 1 (International Content (Benewable energy)                   | 9MW            |
| 1 Nikki Mirai Solar Plant (Renewable energy)                  | 27MW           |
| Others  | 116MW          |
| Total   | 1,840MW        |
| Company share of cap  | acity: 1,819MW |

In addition to the above, 1.1 GW (Group stake) is sourced abroad. Data in parentheses indicate the fuel used for power generation



Expansion at the Nakayama Nagoya Joint Power Generation Plant (110MW level) Operations scheduled to commence in the fiscal year ending March 31, 2017



Senboku Natural Gas Power Plant (Osaka Prefecture)

#### Initiatives Aimed at Expanding the Use of Renewable Energy

The Osaka Gas Group is actively engaged in solar and wind power generation projects in Japan and overseas. These initiatives reflect the Group's commitment to expanding the use of renewable energies that are easy on the global environment and helping to realize a lowcarbon society.

The Osaka Gas Group maintains five wind power generation installations in the prefectures of Wakayama, Kochi, Yamaguchi, and Saga and six solar power generation plants in the prefectures of Osaka, Wakayama, Okayama, Mie, and Oita (as of May 31, 2014).



Hirogawa Myojin-yama Wind Power Plant (Wakavama Prefecture)



Torishima Solar Power Plant (Osaka Prefecture)

### Procurement of Energy Resources

#### **Business Overview and Characteristics**

The gas supplied by the Osaka Gas Group to customers is made from LNG, which is imported entirely from overseas. Taking into consideration growing global demand, the Group's ability to secure stable and competitive supplies of LNG is a critical issue of business management.

Under these circumstances, the Osaka Gas Group is making every effort to lower the procurement cost of energy resources by diversifying its suppliers and, procuring new natural gas resources including shale gas as well as varying the terms and conditions of contracts, including the pricing mechanisms of LNG.

#### **Diversifying Sources of Supply**

Currently, the Osaka Gas Group procures supplies of LNG under long-term agreements concluded with producers from the seven countries of Brunei, Indonesia, Malaysia, Australia, Qatar, Oman, and Russia.

Plans are also in place to begin procuring LNG from Papua New Guinea from the fiscal year ending March 31, 2015. Looking further into the future, we are pursuing opportunities to source supplies from the United States\*.

\*Please refer to "Investment in the Freeport LNG Project" on page 34.

#### Status of Energy Resource Procurement



#### LNG Carrier Construction

In order to further stabilize the procurement of energy resources while reducing the costs of transportation, the Osaka Gas Group now has two new fuel-efficient LNG carriers under construction. The first carrier is scheduled to come into service during the fiscal year ending March 31, 2015, while the second carrier some time during the following fiscal year. Both carriers have been earmarked to service mainly new contracts of LNG from Australia and Papua New Guinea.

Each carrier also represents a new model that will incorporate an innovative steam turbine engine. Compared with existing vessels, these new models are expected to cut fuel expenditure by 20% while also addressing environmental concerns through reductions in emissions of CO<sub>2</sub> and sulfur oxide (SOx).



Image of the fuel efficient LNG carriers under construction

#### Diversifying the Terms and Conditions of Agreements

LNG procurement prices in Japan are generally linked to the crude oil price. In recent years, the LNG price in Japan has continued to hover at a high level due mainly to the sharp increase in crude oil prices.

The Osaka Gas Group is striving to establish new pricing mechanisms in LNG procurement. As one example, the Group is aiming to introduce pricing mechanisms indexed to Henry Hub\* prices instead of crude oil prices to contracts of LNG from the United States. By diversifying pricing mechanisms in agreements, we are working to reduce the price of LNG.

\*The name given to a natural gas price index in the United States

### International Energy Businesses

• Upstream Businesses • Downstream Businesses



In the fiscal year ended March 31, 2014, net sales from international energy businesses amounted to ¥13.3 billion. Segment income came in at ¥7.7 billion, accounting for around 7% of the Group's total income.

As a supplier of energy, the Osaka Gas Group focused its attention on the natural gas value chain from an early stage. Comprehensive efforts have been directed toward expanding business activities from such upstream businesses as the production of natural gas overseas to downstream businesses including LNG terminal operations, the independent power producer (IPP) business, and the energy service business.

Moreover, the Group is taking steps to expand its trading businesses by leveraging its own fleet of LNG carriers.

#### Segment Income\*

(2014.3)



 International Energy Businesses
 \* Segment Income = Operating income + Equity in earnings of affiliates



#### Segment Income\*



### **Upstream Businesses**

#### **Business Overview and Characteristics**

While contributing to raising profits of the Osaka Gas Group and accumulating valuable expertise and experience in the field of LNG procurement, the energy resource development business activities of Osaka Gas are helping to stabilize profits of the entire Group by serving as a natural hedge against fluctuations in crude oil prices and foreign currency exchange rates.

Looking ahead, we will cast a keen eye on new projects in which to participate and secure around 30% of essential future volumes of LNG while steadily advancing projects we have already decided to participate in.

#### Investment in the Freeport LNG Project

In February 2014, Osaka Gas made the decision to take an equity stake in the Freeport LNG Project (Texas, U.S.) with Chubu Electric Power Co., Inc., as part of efforts to launch a natural gas liquefaction business.

At the Freeport LNG receiving terminal partly owned by Osaka Gas, plans are in place to construct a natural gas liquefaction facility. After obtaining construction authorization from the Federal Energy Regulatory Commission, steps will be taken to make a final investment decision and commence construction in the fiscal year ending March 31, 2015.

Under the equity participation agreement with Freeport LNG, Osaka Gas and Chubu Electric will respectively acquire 25% equity of the project company of the first train (4.4 million tons per annum), of which both companies have executed a liquefaction tolling agreement.

In addition to diversifying sources of supply and pricing indices, developing LNG imports without destination restrictions will help Osaka Gas achieve stable and competitive LNG supplies in the future.



Freeport LNG terminal (Houston, Texas, U.S.A.) Photograph courtesy of Freeport LNG Development, L.P.

### **Downstream Businesses**

#### **Business Overview and Characteristics**

The Osaka Gas Group has actively participated in LNG terminal projects and IPP projects as part of its efforts to channel its know-how accumulated through the domestic energy business toward the development of business opportunities overseas and to secure a stable stream of earnings.

From the fiscal year ended March 31, 2014, the Group commenced the sale of natural gas while providing energy services in Southeast Asia. Through these activities, we are working to further broaden our business domains.

#### Developing an Energy Service Business in Thailand

The Osaka Gas Group established a new company in Thailand and launched an energy service business in the industrial markets in Thailand from January 2014. This initiative will allow us to harness our engineering capabilities relating to the use of natural gas, and represents the second country in Southeast Asia after Singapore in which we are working to develop our business.

One of the strengths of the service business of Osaka Gas is demonstrated in our endeavor in Thailand, where customers will be able to install natural gas facilities by simply paying a fee that corresponds to the amount of energy used without any initial investment.



Conducting activities in Thailand

Depending on customers' energy conservation needs, the Osaka Gas Group will install natural gas facilities including boilers and furnaces and provide energy in a variety of forms including steam. By also providing a comprehensive service that encompasses energy use management and maintenance after the facility is installed, we are ensuring the stable supply of energy.

In Thailand, which is exhibiting considerable potential for ongoing economic growth, the Osaka Gas Group will provide services proposals mainly to Japanese companies operating locally. By promoting the shift from such energy sources as heavy fuel oils to natural gas, which is clean energy, we will contribute to energy conservation endeavors in Thailand.

#### Investments in International Energy Businesses



Sagunto LNG Terminal

#### Participation in Upstream Projects (LNG, gas fields, etc.)

 Norwegian North Sea (Idemitsu Snorre Oil Development Co., Ltd.)
 Stake since 2005: 2-5%

3 Qalhat LNG Stake since 2006: 3% Liquefaction capacity: 3.3 million tons/year

 Gorgon Project Gas Field
 Stake since 2009: 1.25%
 Projected LNG output: 15 million tons/year (planned)
 (Start of production scheduled for 2015)

O Universe Gas & Oil Company, Inc. (Sanga Sanga Gas Field) Stake since 1990: 1.5%

 Japan CBM Limited (Sanga Sanga CBM)
 Stake since 2011: 1.8%

8 Crux Gas and Condensate Field Stake since 2007: 3%

 Sunrise LNG Project
 Stake since 2000: 10%
 Projected LNG output: about 4 million tons/ year (planned) 10 Evans Shoal Gas Field

#### Stake since 2000: 10%

Ichthys LNG Project
 Stake since 2012: 1.2%
 Projected LNG output: 8.4 million tons/year
 (planned)

(Start of production scheduled for 2016)

Western Papua New Guinea Gas and Condensate Field Stake since 2013: 10-20% (ratio depends on

field)
(B) Cordova Shale Gas Development Project

Stake since 2011: 7.5%
 Pearsall Shale Gas and Liquids

Development Project Stake since 2012: 35%

#### Participation in Downstream Projects (LNG receiving terminals, IPPs, etc.)

Affiliates (Related to international energy businesses)

Osagunto LNG Terminal Ownership interest since 2010: 20% Vaporization capacity: 6.4 million tons/year

#### 📀 Shuweihat S2 IWPP

Ownership interest since 2011: 10% (25% equity interest in the operation and maintenance company) Power generation capacity: 151 MW Freshwater processing capacity: 10 million gallons/day

Ell (Energy Infrastructure Investments) Ownership interest since 2008: 30.2% Four pipelines, two gas-refining facilities, two power plants, two interconnected power lines

Power generation capacity: 18 MW

Hallett 4 Wind Farm Project
 Ownership interest since 2009: 39.9%
 Power generation capacity: 53 MW

Marianas Energy IPP
 Ownership interest since 2005: 100%
 Power generation capacity: 87 MW

CITY-OG Gas Energy Services Stake since 2013: 49% Gas Retail Business Osaka Gas Thailand
 Ownership interest since 2013
 Energy Services Business

#### 😳 Osaka Gas Power America

Ownership interest since 2005: 8 IPP projects Power generation capacity\*: 359 MW \* Excludes 50% interest in 87 MW generation capacity of Marianas Energy IPP

2 Tenaska Gateway IPP Ownership interest since 2004: 40% Power generation capacity: 338 MW

#### Preeport LNG Terminal

Ownership interest since 2008: 10% Vaporization capacity: 13 million tons/year

Aurora Solar Power Generation Project Ownership interest since 2012: 50% Power generation capacity: 51MW

\*In a bid to optimize its asset holdings, Osaka Gas sold all of its equity interest in a power generation plant located in Amorebieta-Etxano in Spain in May 2014.