OSAKA GAS

Daigas Group

# Downstream Business

# Key Facts

## A century of experience in gas business

- Started gas supply business in 1905
- A major natural gas and energy services provider in Japan with 5.2 million units for gas supply
- Reliable gas operations with rich technological expertise
- Accounts for about 25% of the natural gas supply market in Japan
- A major importer of LNG in Japan (8.5 milliontons in 2019)

## Increasing global presence

- Pioneering innovative LNG procurement and trading
- Aggressive investments along energy value chain
- Over 20 years experience in international engineering and consultancy services

## Strong financial position

- Credit ratings : S&P AA- / Moody's A1 (as of March 2020)

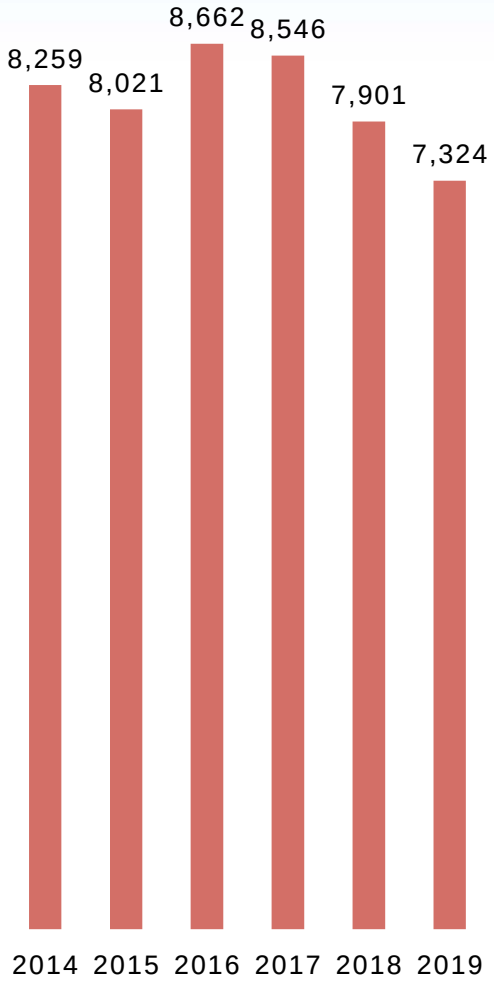
Key Financial Results(Million USD)

| | 2019 results |
|---|---|
| Operating revenues | 12,576 |
| Operating income | 769 |
| Net income | 383 |
| FCF | 1,151 |
| Total assets | 19,668 |
| Net assets | 9,442 |

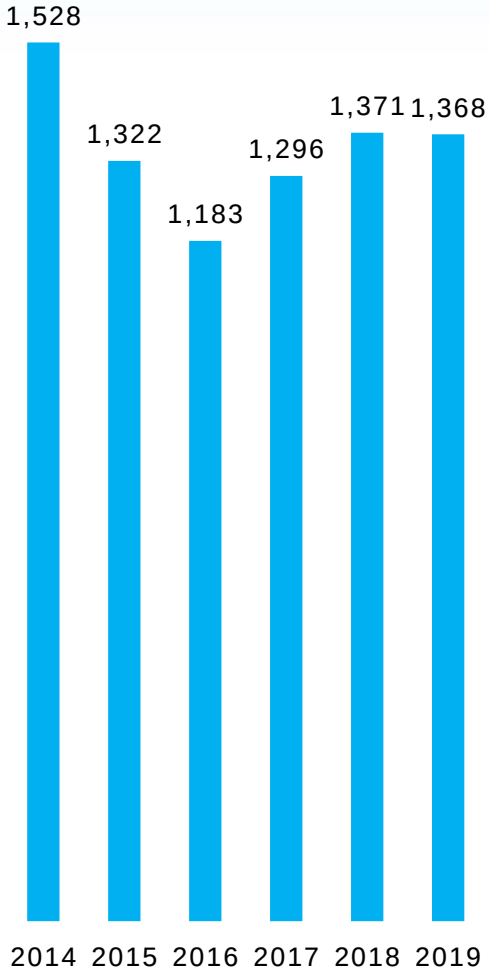
(1USD = 108.83 yen)

# Key Facts

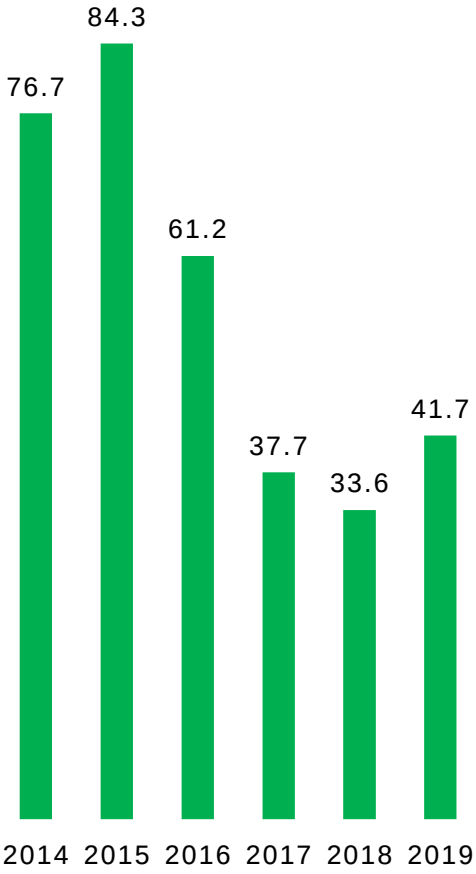
## Gas Sales Volume
(Million $m^3$)



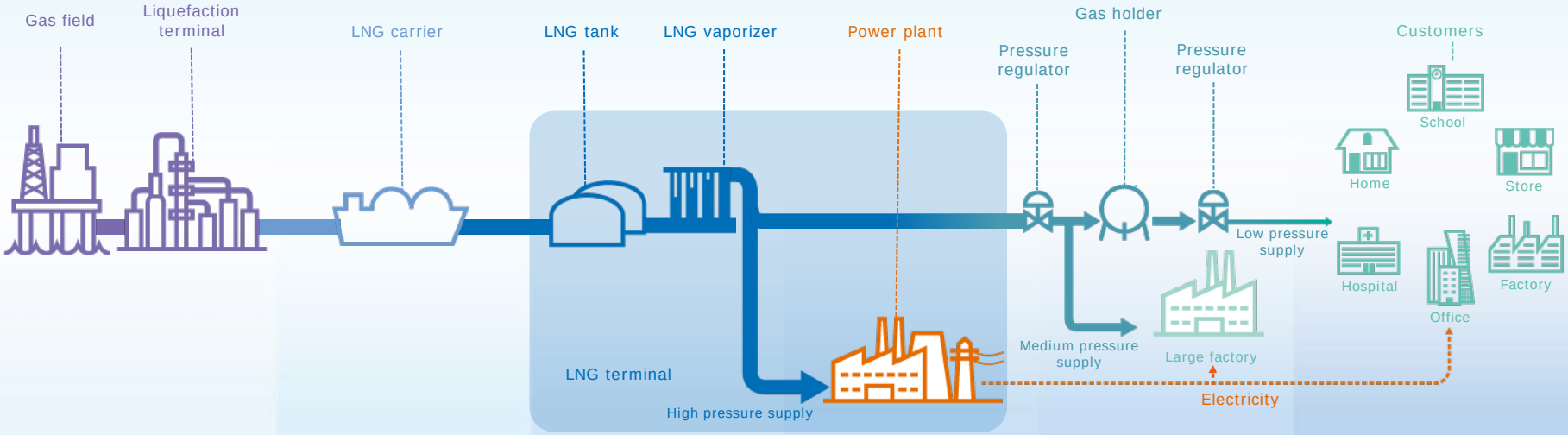

## Operating Revenues
(Billion Yen)




## Net Income
(Billion Yen)



# Energy Business Value Chain of Osaka Gas




## Upstream Investment / LNG Procurement

Import:

**8.5** million tons per year from

**9** countries

## LNG Transportation

Ownership of

**8** LNG carriers

## LNG Receiving Terminals

**3** LNG terminals

Over **50** years of operational experience (**26** tanks)

## Power Business

Development and Operation of power plants

(approx. **4,500** MW)

-Senboku Power Plant (*1,109*MW)

-*8* wind farms

## Gas Transmission and Distribution

Operation and maintenance of

**62,400** km pipelines

with maximum pressure of *7*MPa

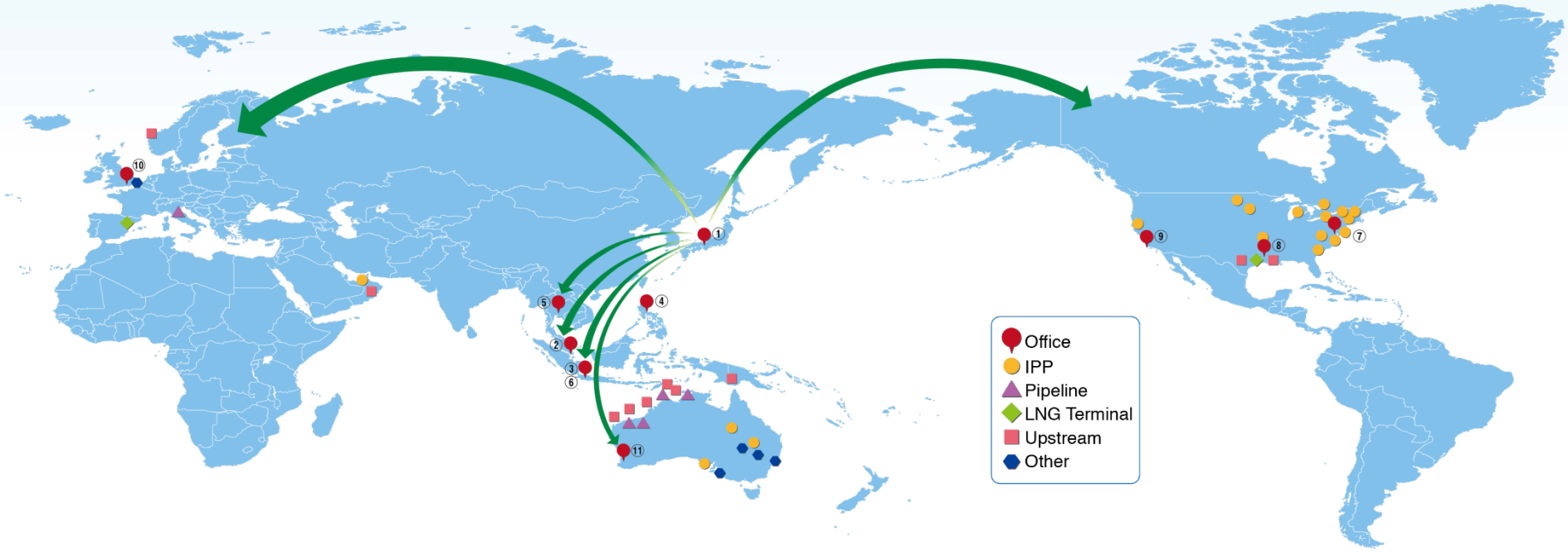
## Gas Marketing

**5.2** million customers

Cogeneration: *1,600* MW

Residential cogeneration systems (engines, fuel cells)

# Global Presence of Osaka Gas Group




| No. | Office |
|---|---|
| ① | Osaka Gas Head Office |
| ② | Osaka Gas Singapore |
| ③ | Jakarta Representative Office |
| ④ | Manila Representative Office |
| ⑤ | OSAKA GAS (THAILAND) Co., Ltd. |
| ⑥ | PT OSAKA GAS INDONESIA |

| No. | Office |
|---|---|
| ⑦ | Osaka Gas USA (New York) |
| ⑧ | Osaka Gas USA (Houston HQ) |
| ⑨ | Osaka Gas USA (Silicon Valley) |
| ⑩ | Osaka Gas UK |
| ⑪ | Osaka Gas Australia |

# Striving to become carbon neutral by 2050

We strive to become carbon neutral by 2050 through decarbonization of our gas and electricity by introducing methanation* to generate gas with renewable energy and hydrogen and by increasing the share of renewables in our power generation portfolio. And as an innovative energy and services company, we plan to provide solutions for the realization of a sustainable society.

While technologies are being developed to realize a carbon neutral society, we also strive to contribute to radical reduction of CO2 emissions by promoting advanced utilization of natural gas and wider usage of renewable energy, aiming for a CO2 emissions reduction contribution target of more than 8.5 million tons/year**, which was previously set for 2030.

**Ⅰ Striving to become carbon neutral in our group business through innovation**

**2050**

**Carbon Neutral**

**Ⅱ Contributing to the reduction of CO2 emissions throughout society**

**FY2031.3**

- **5 GW of renewables development contribution on a global basis**
- **Nearly 50% of our power portfolio in Japan consisting of renewables*****
- **10 million tons/year****** of CO2 emissions reduction contribution**

* Methane generation technology using hydrogen and CO2

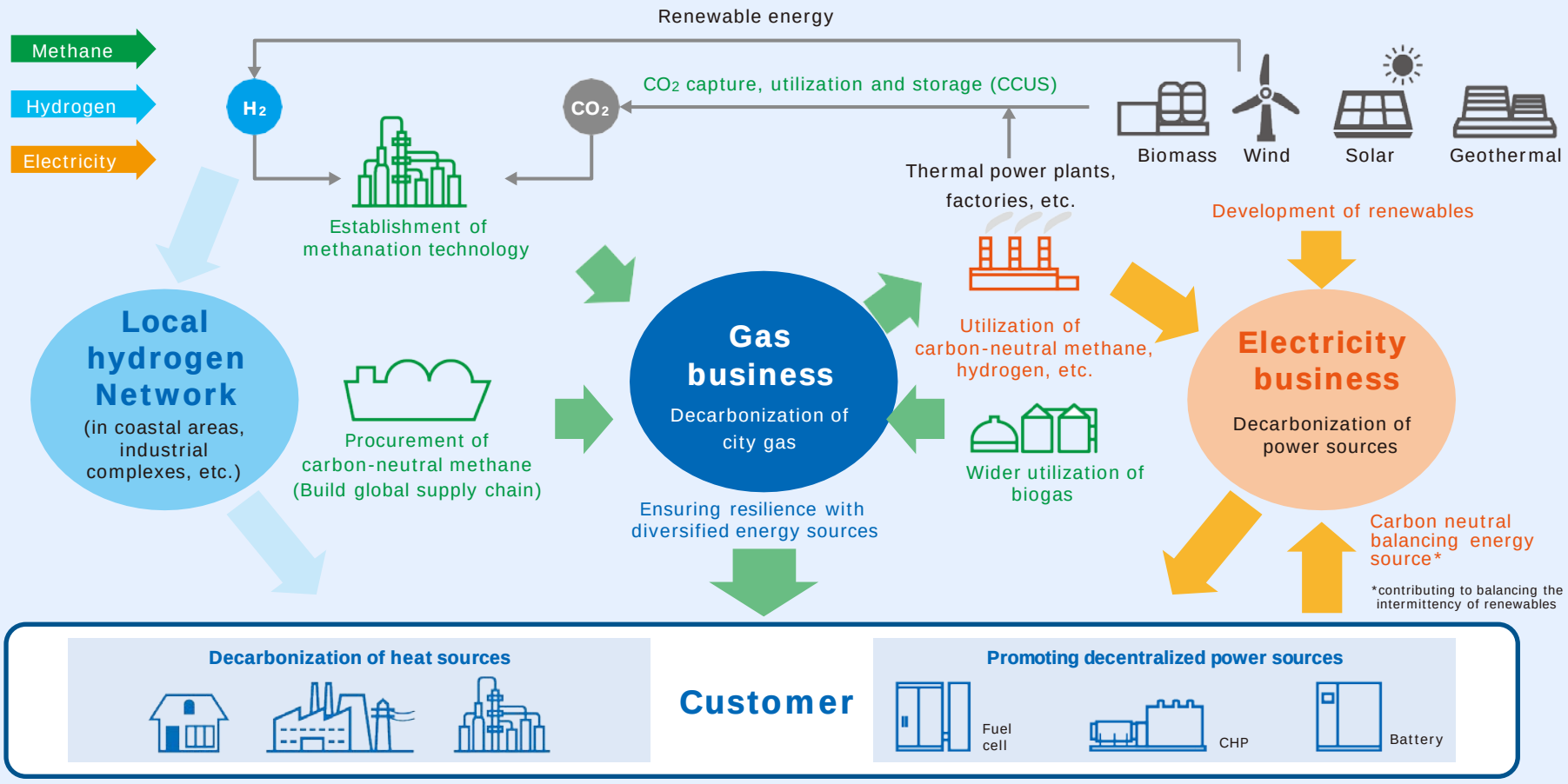
** Our CO2 emissions reduction contribution annual target for 2030 set out in our long-term management vision announced in 2017 (2030 cumulative target: 70 million tons)

*** Including solar, wind, and biomass power projects, which are eligible for the feed-in tariff (FIT) scheme

**** Equivalent to one third of the CO2 emissions currently produced in our business and by our customers (33 million tons/year)

# Our energy business in the era of carbon neutrality

How to achieve carbon neutrality should be flexibly selected in light of progress in energy innovation and changes in social circumstances. We aim to achieve our carbon neutrality goal with a comprehensive approach throughout our supply chain including customers, taking into account future technological advances and economic rationality.



# Energy Consulting Line up

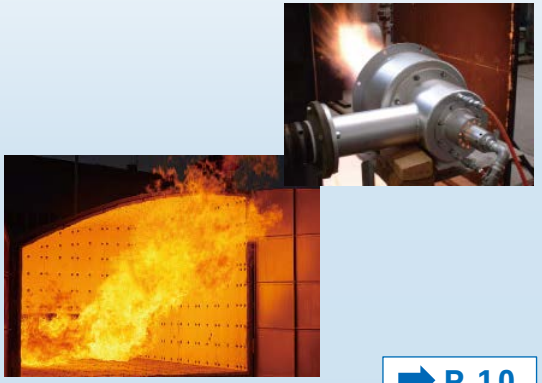
## Cogeneration systems

Highly efficient in producing heat and electricity by utilizing the exhaust heat of the system.

P.9

## Industrial gas burners and furnaces

Custom-made to meet specific needs of each customer.



P.10

## Gas Boilers

Gas-fired boiler that is more efficient than the oil-fired boilers.

P.11

## Biogas Upgrading System

Surplus biogas utilization system developed by OSAKA GAS.

P.12

## Natural gas transportation

Natural gas supplying system to locations outside the gas pipeline network in the form of CNG or LNG.

P.13

## Satellite LNG system

Natural gas supplying system to customers around LNG satellite station.

P.14

# One Stop Service

Osaka Gas offers one-stop service of enhancing energy efficiency and switching fuel to natural gas, meeting customers' various needs with our expertise accumulated through experiences in highly complex engineering, procurement and construction projects in Japan.

## 1 Energy audit

Conduct a diagnosis on customers' equipment (furnaces, boilers, etc.) and analyze energy flows.

## 2 Energy consulting

Provide quantitative evaluation and propose efficiency improvement measures.

## 3 Engineering, procurement & construction

Design and produce reliable facilities that are best suited to customers' needs.

## 4 Financial consulting

Propose arrangements for customers' capital investment.

## 5 Fuel supply

Design natural gas receiving facilities (pipeline, LNG lorry, CNG lorry, etc.)

## 6 Energy monitoring and maintenance

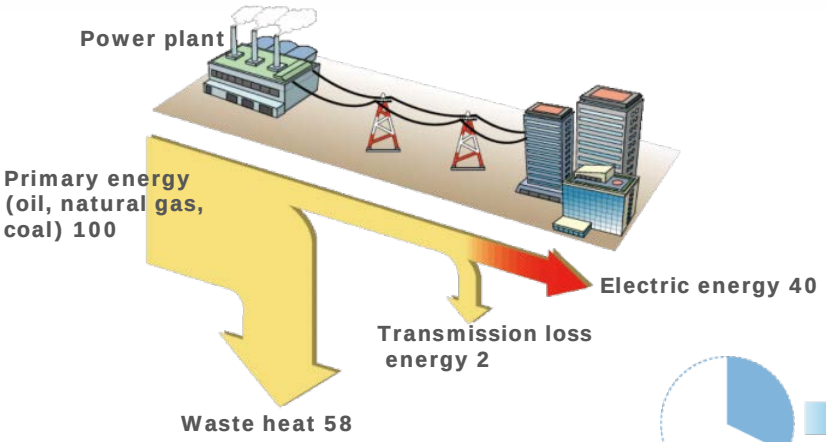
Verify the enhancement of energy efficiency and the reduction of energy cost and maintain the target level of efficiency.

# Cogeneration systems

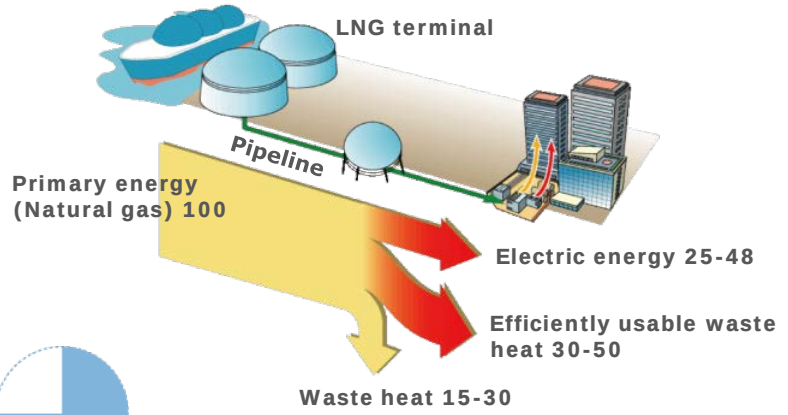
Highly efficient in producing heat and electricity by utilizing the exhaust heat of the system.

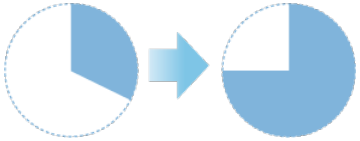
## Cogeneration system

**Traditional thermal power generation system**




**Higher efficiency cogeneration system**



Energy use Av.40% 70-85% (LHV standard)

## Introduction of cogeneration system will...

- Save energy by enhancing efficiency
- Reduce $CO_2$ emissions
- Produce higher output
- Cut down on energy expenses
- Provide backup generation in case of blackout

Mirror cycle gas engine

Gas Turbine

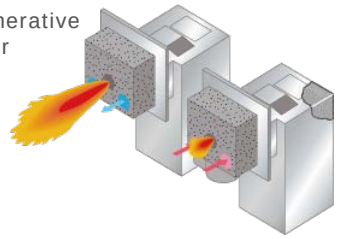
# Industrial gas burners and furnaces

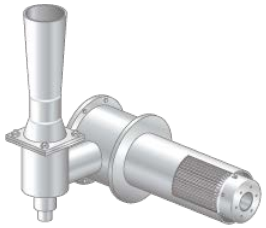
Custom-made to meet specific needs of each customer.

## Energy-efficient gas burners

Our regenerative, recuperative, and other energy-efficient gas burners are widely used by businesses operating small and medium-sized industrial furnaces.

Regenerative burner





Recuperative burner

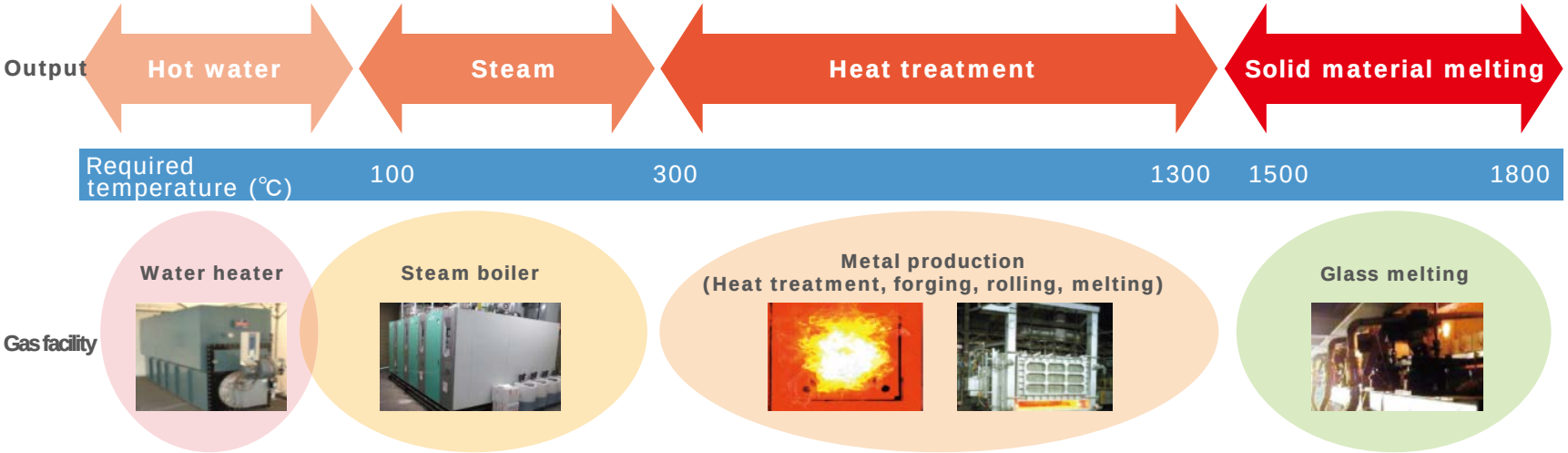
## Special-purpose burners & equipment

Custom-made burners and equipment are based on several prototypes tested in our lab, the largest gas equipment testing facility in Japan.

Highly efficient continuous fryer for better efficiency and flavor

Gas burner for glass melting furnace

## Wide variety of natural gas utilization



# Gas Boilers

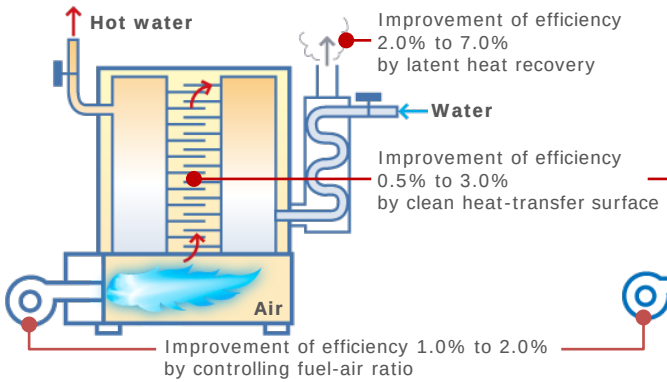
Gas-fired boiler that is more efficient than the oil-fired boilers.

## Save energy by enhancing efficiency

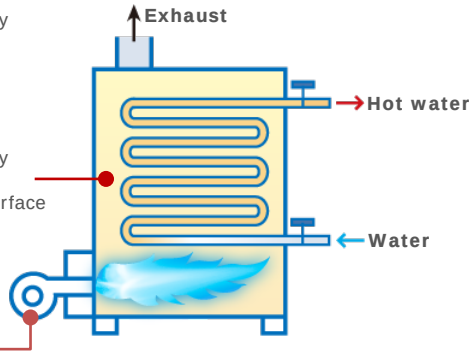
### Gas hot water boiler

Save 4 to 12% more energy than oil-fired boiler

**Fire-tube**

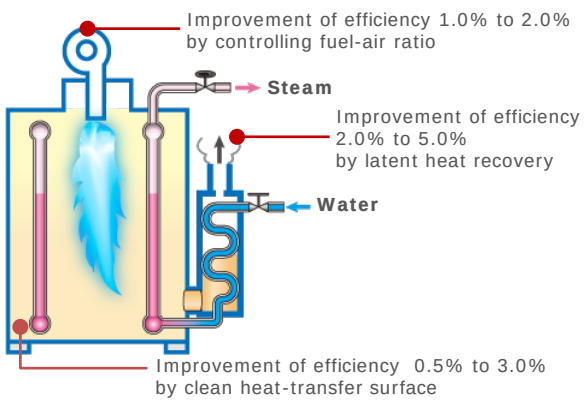



**Once-Through**




### Gas fired steam boiler

Save 3 to 10% more energy than oil-fired boiler




## Introduction of the gas boiler will...

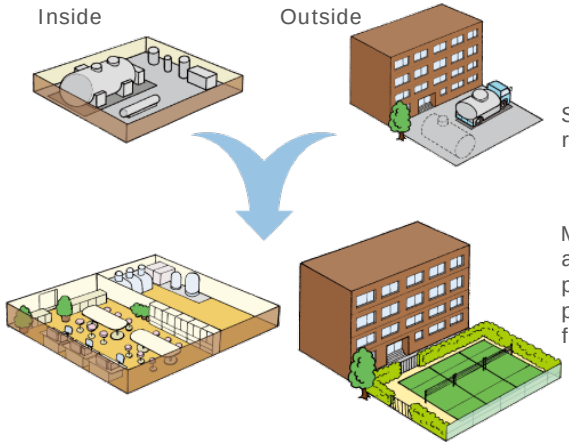
### Require no work of fuel replenishment

**Ex. Replenishment of oil**

Time : 30 min.
Frequency : 1-3 times/week

No fuel replenishment

### Create more space




Space necessary for receiving and storing oil

Make extra space available for other purposes such as car parks and recreational facilities.

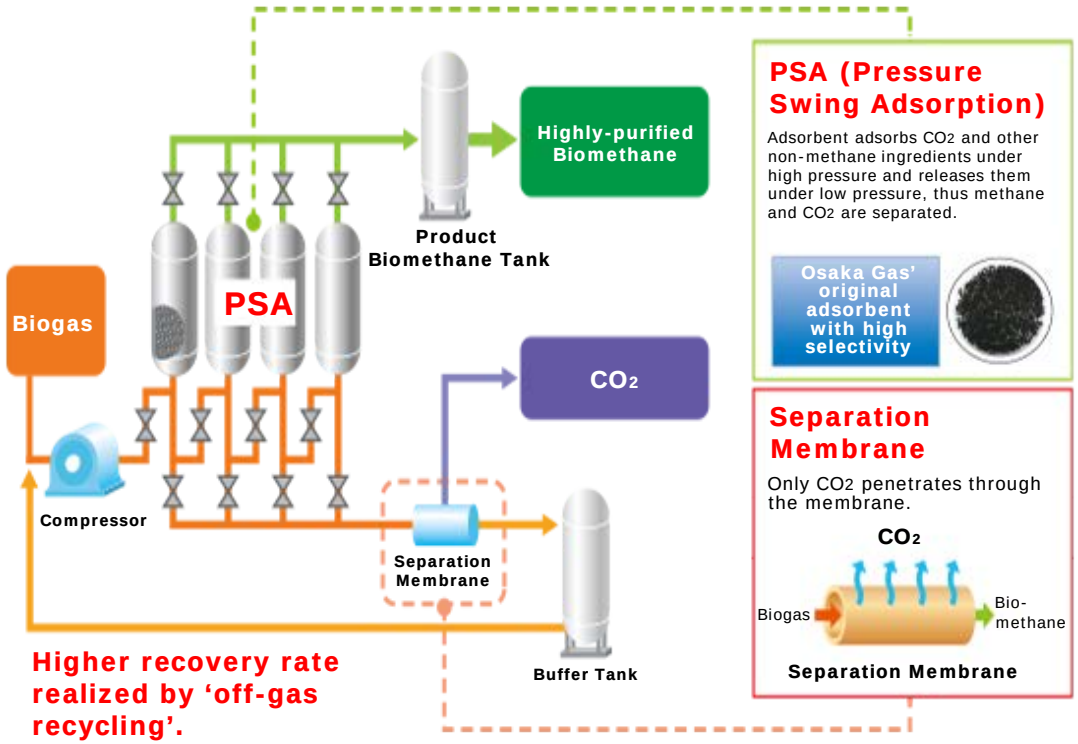
# Biogas Upgrading System

Gas-fired boiler that is more efficient than the oil-fired boilers.

## Feature of Osaka Gas Technology

・Osaka Gas' Original "Hybrid Biogas Upgrading System" features a combination of PSA (Pressure Swing Adsorption) and CO2 separation membrane.
Osaka Gas' original adsorbent is stuffed in the PSA for selective adsorption of CO2.

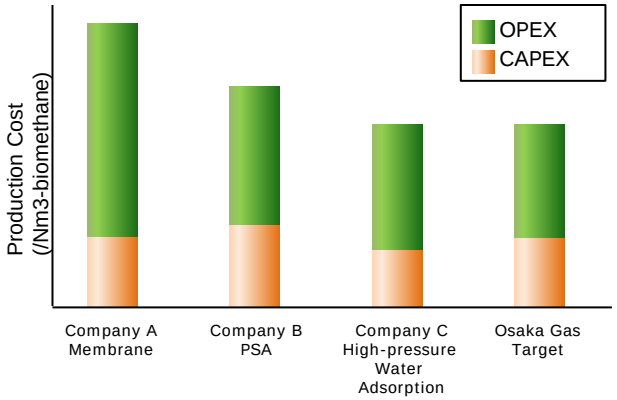
・Methane gas contained in the off-gas from PSA is then recovered with membrane, thus realizing a biomethane production with higher methane recovery rate and lower cost.




### Higher Methane Recovery Rate

| Company A | Company B | Company C | Osaka Gas Target |
|---|---|---|---|
| Membrane | PSA | High-pressure Water Adsorption | 'Hybrid Biogas Upgrading' |
| 98% | 93% | 98% | >99% |

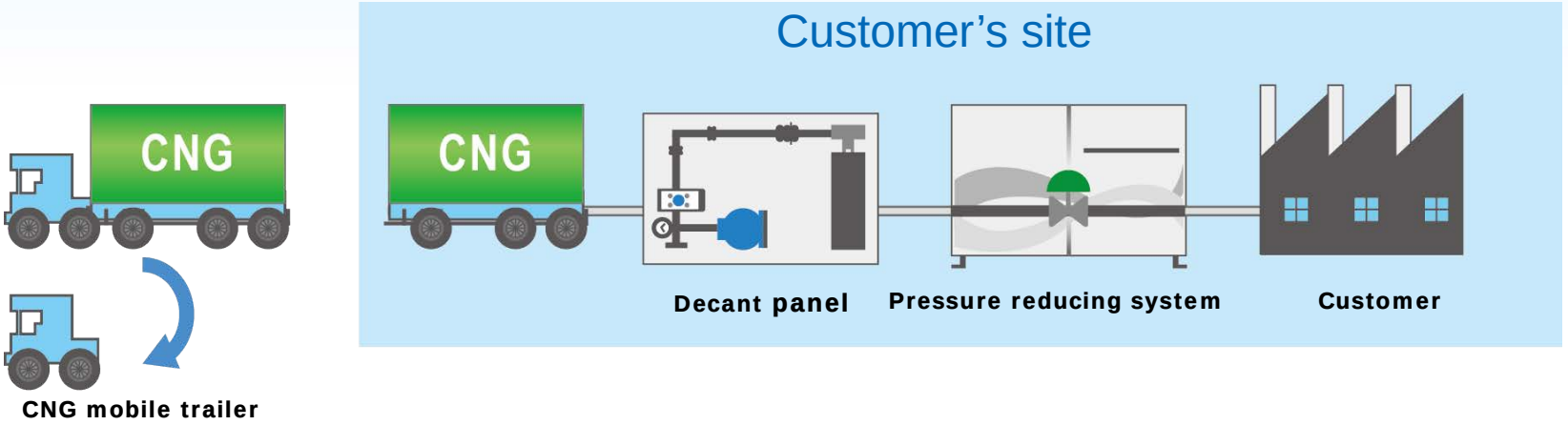
### Lower Biomethane Production Cost



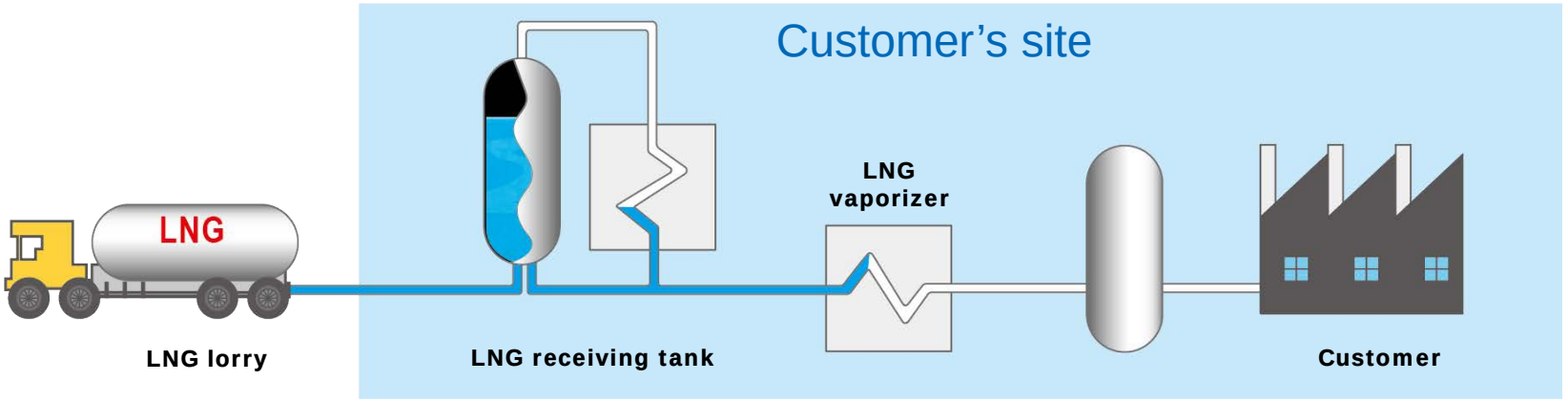
# Natural gas transportation

Natural gas supplying system to locations outside the gas pipeline network in the form of CNG or LNG.

## CNG supply system

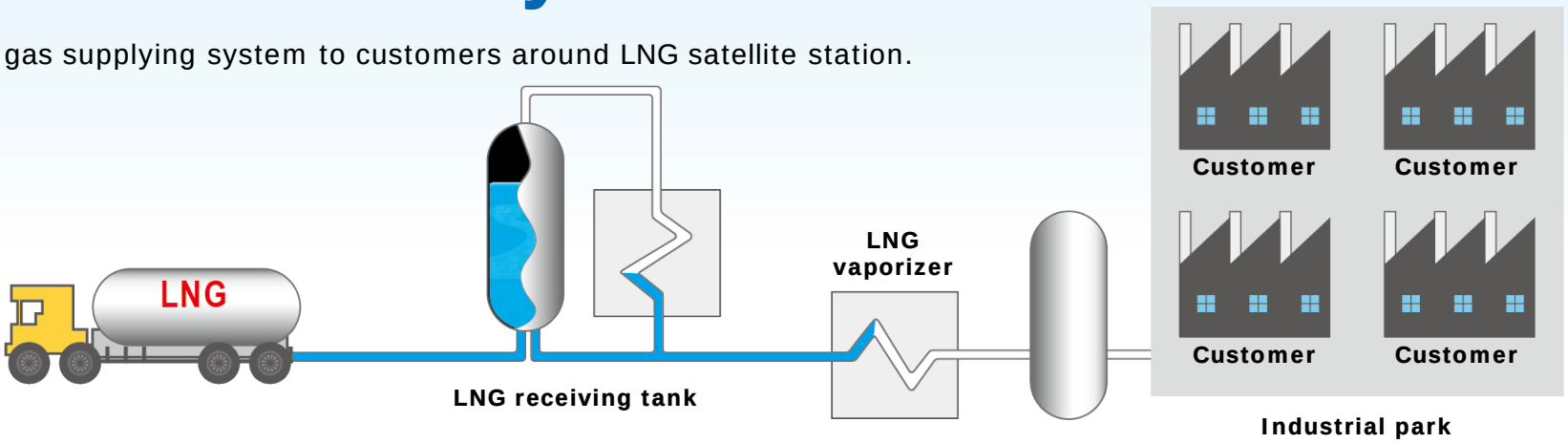


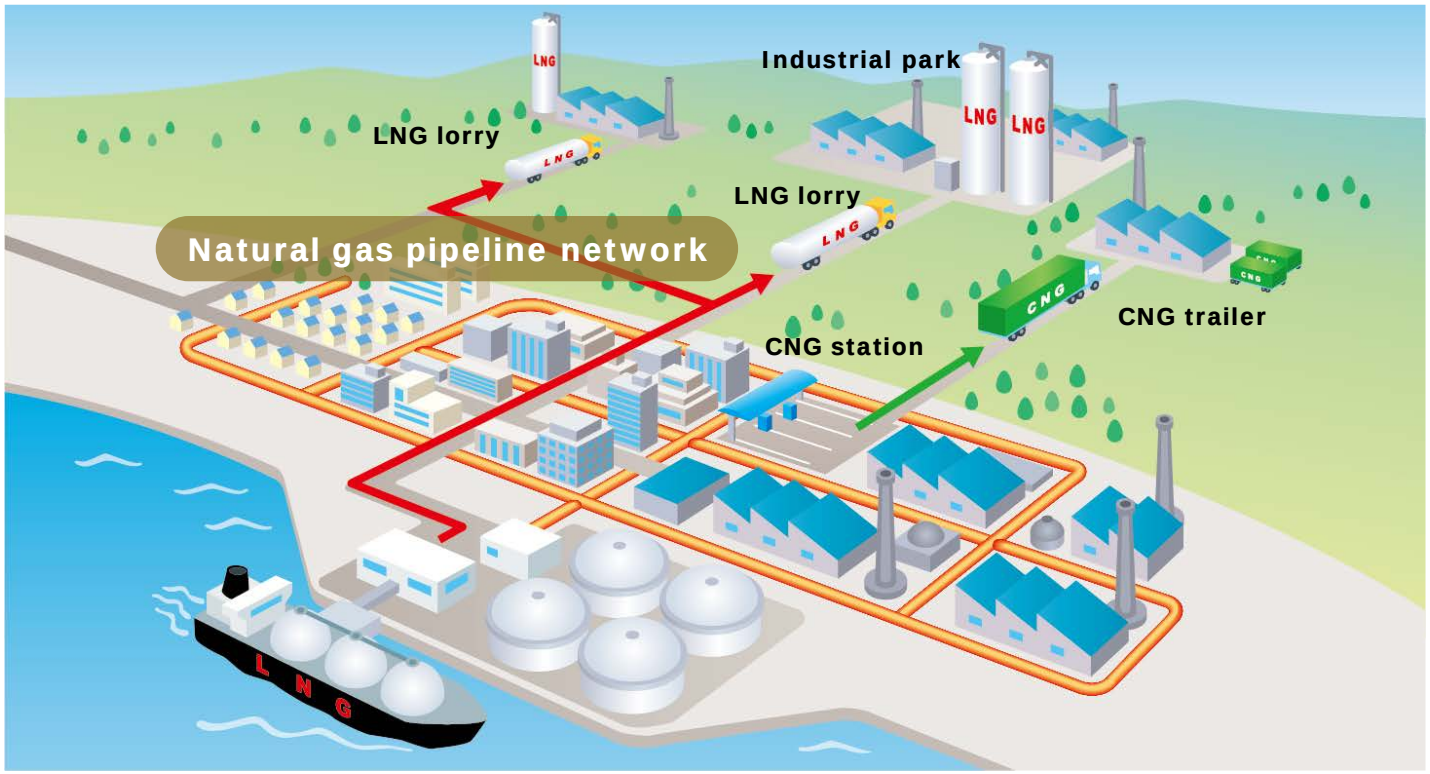

## LNG supply system



# Satellite LNG system

Natural gas supplying system to customers around LNG satellite station.



# Energy Technology Center

One of Osaka Gas R&D facilities to develop a wide range of gas equipment with advanced gas combustion technologies.

## Combustion testing facility

- Test burners' performance to meet customer needs
- Test new combustion methods to enhance the energy efficiency

**Outdoor testing facility**

**Indoor testing facility**

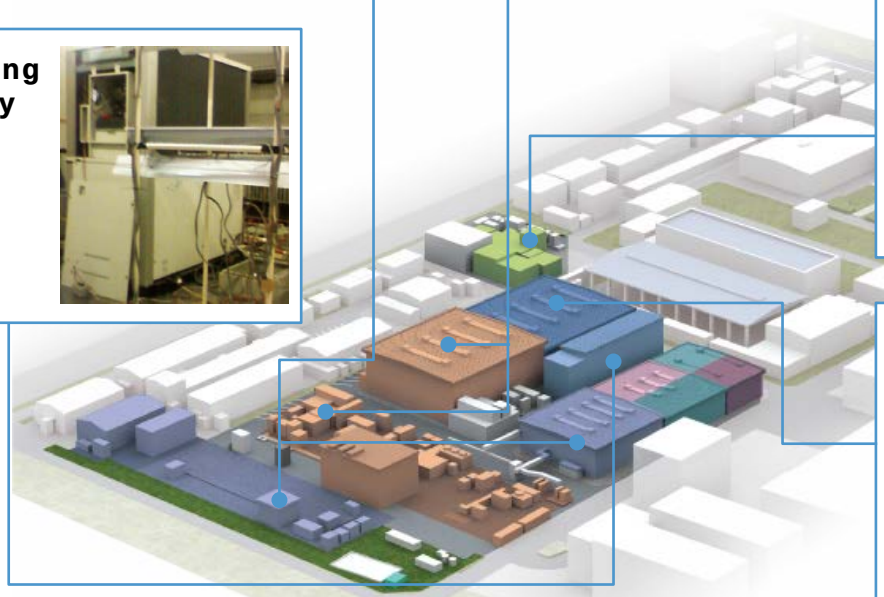
## Cogeneration testing facility

Test performance and durability of the gas engines used in cogeneration system to create products with added value and reduce costs (e.g. lubricant oil, spark plugs, etc.)

## Air conditioning testing facility

Conduct verification test on gas heat pumps and other air conditioning equipment.





## Environmental testing facility

Develop technologies to reduce carbon emissions including biogas generation and wastewater treatment technologies.

## Engineering testing facility

Test newly developed technologies designed to enhance the energy efficiency and quality of industrial furnaces for various usages.

# Organization Chart

【Corporate Headquarters (HQS) Divisions】

Board of Directors

Chairman President

Executive Board

Corporate Auditors / Board of Corporate Auditors

Corporate Auditors' Office

Corporate Planning HQS

R&D HQS

Other HQS Depts.

【Business Units】

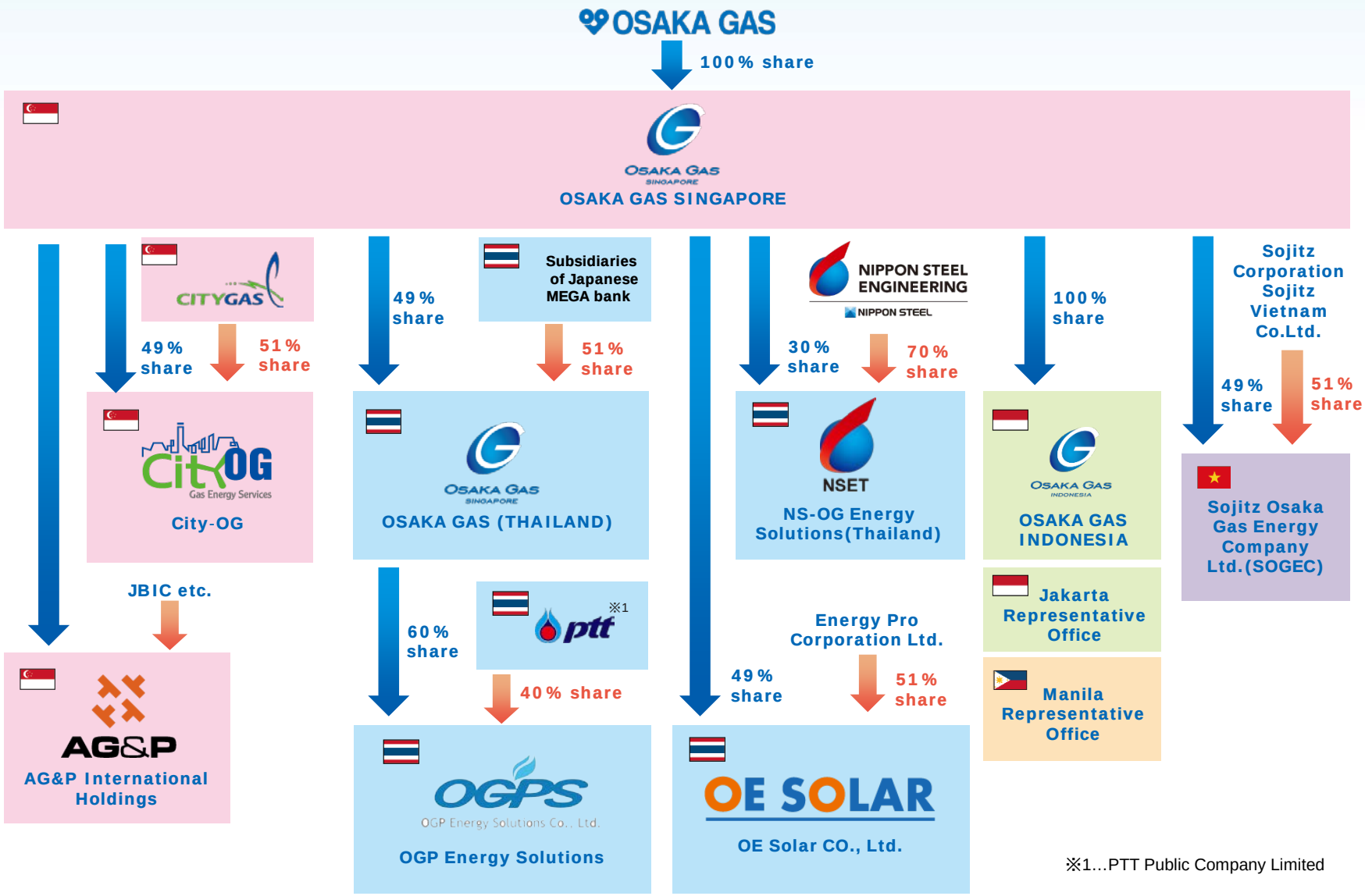
Energy Solution Business Unit

LNG Terminal & Power Generation Business Unit

Pipeline Network Company

Energy Resources & International Business Unit

# Structure of Osaka Gas Group in Southeast Asia




※1…PTT Public Company Limited

# Supplying natural gas and helping customers reduce energy costs in Singapore, Thailand, Indonesia and Vietnam

Singapore

## City-OG Gas Energy Services

### Natural gas retail business

**City-OG Gas Energy Services, a joint venture between CITY GAS and OSAKA GAS SINGAPORE, markets and sells natural gas to the industrial customers.**

Osaka Gas SINGAPORE
Osaka Gas 100% subsidiary

Energy saving technologies

Joint venture
City-OG Gas Energy Services
City-OG Gas Energy Services

Local business know-how and regulation knowledge

CITYGAS
(Gas utility company in Singapore)

Natural gas supply

Energy cost reduction

Industrial customers

Customer's factory

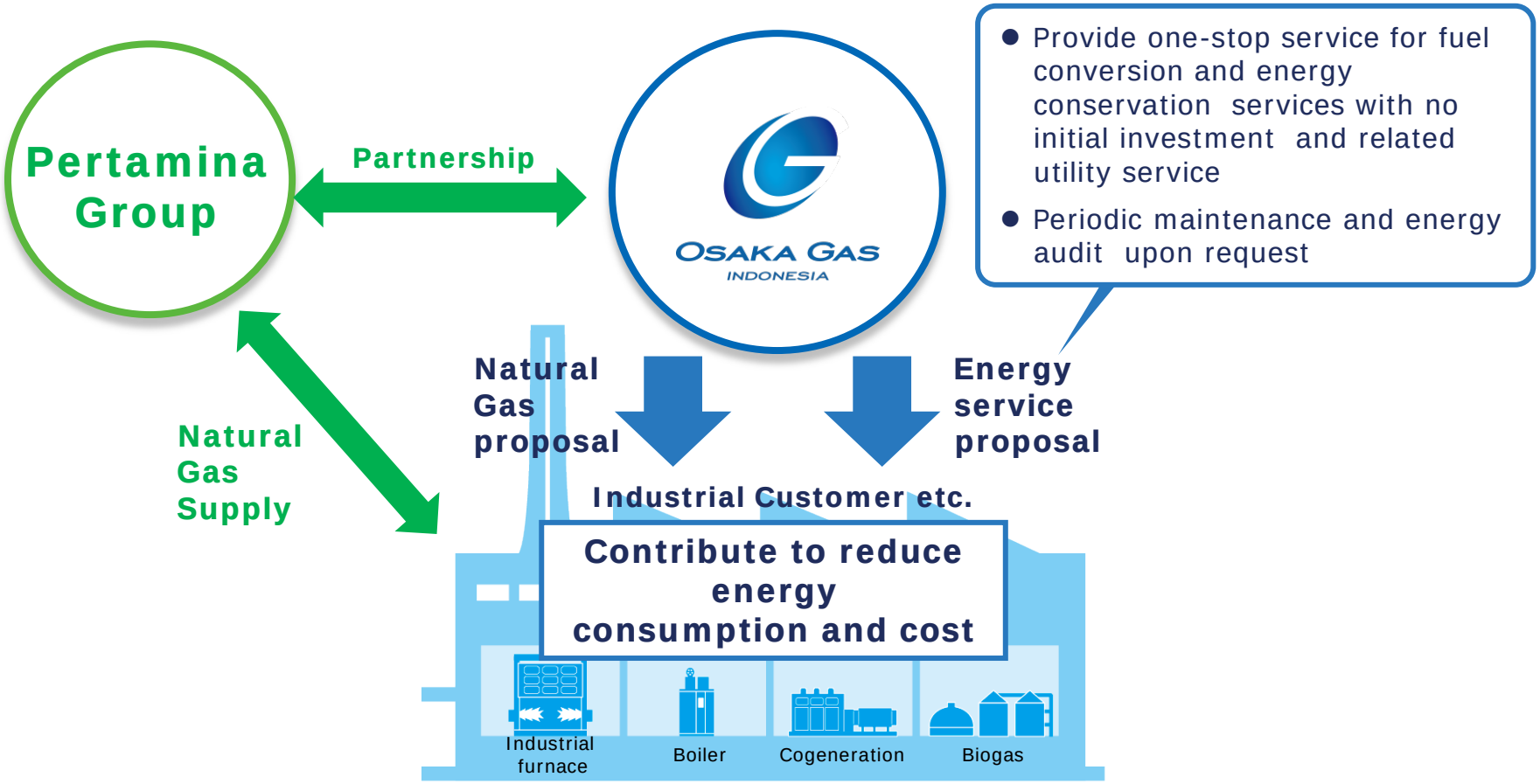
Industrial park

Indonesia

# PT OSAKA GAS INDONESIA(OGIDN)

## Gas Marketing and Energy Service Business

**Contribute to energy conservation and environmental footprint reduction in Indonesia through energy efficiency advisory, natural gas utilization by fuel-switching and cogeneration systems and development of biogas solutions.**




- Provide one-stop service for fuel conversion and energy conservation services with no initial investment and related utility service
- Periodic maintenance and energy audit upon request

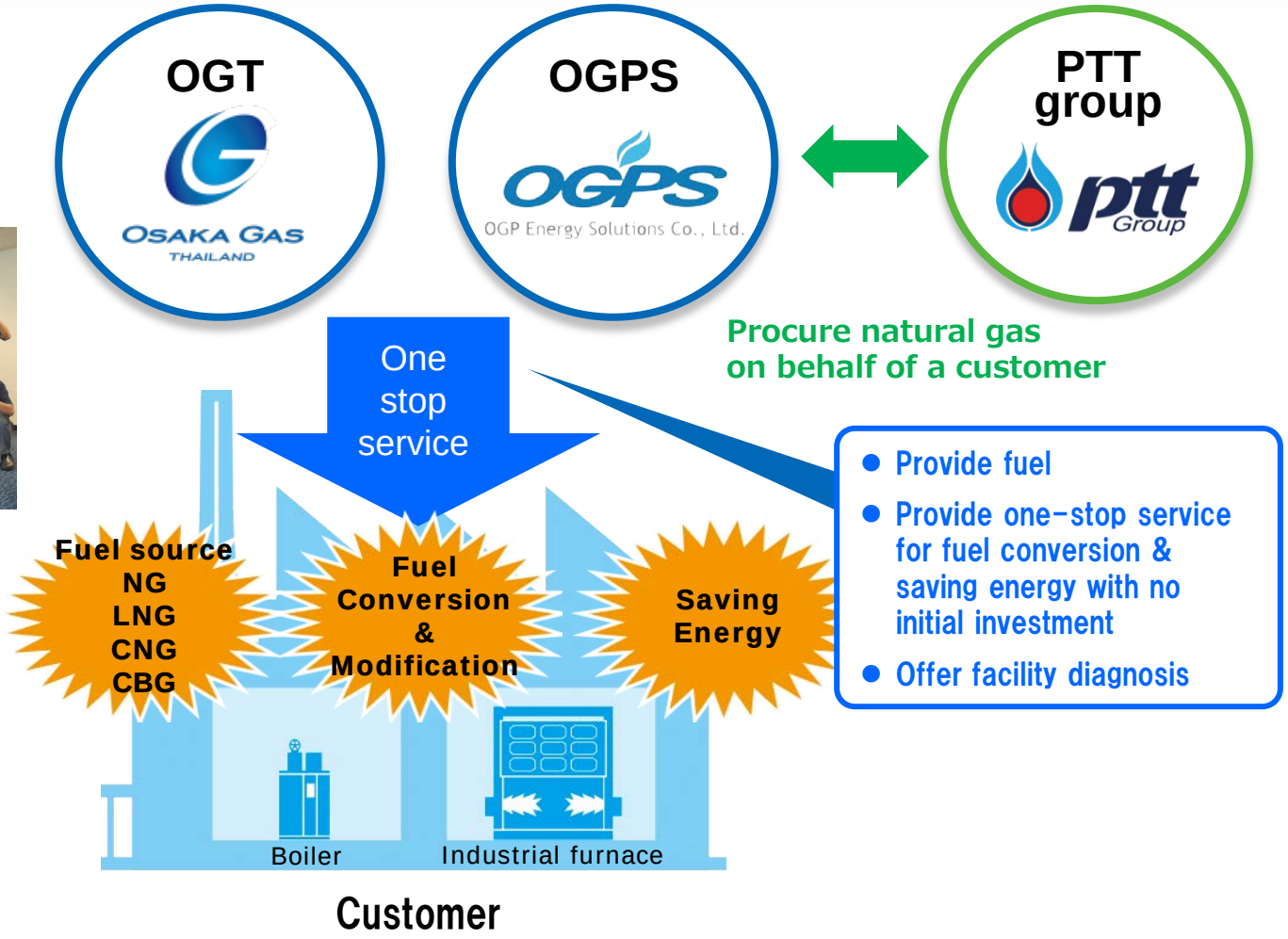
Thailand

# OSAKA GAS THAILAND (OGT)&OGP Energy Solutions(OGPS)

## Comprehensive utility business

**Sales of gas products including Boilers, Furnaces, Compressed Natural Gas, Compressed Biogas, Biogas Upgrading system, Water Process and utility business for industrial users**

OGT OGPS members



Thailand

# NS-OG Energy Solutions (NSET)

## Cogeneration energy service business

**Offer energy efficiency enhancement and energy cost reduction services by installing cogeneration system at customers' site.**

NSET members

- No initial investment
- Offer options and maintenance service

OSAKA GAS SINGAPORE

NIPPON STEEL ENGINEERING

NIPPON STEEL

**Customer**

**Contribute to reduce energy consumption and cost**

Boiler

Cogeneration

**Provide service**

NSET

Singapore

# AGP International Holdings

## Natural Gas Value Chain Business

- **Construction: Modular construction, Onsite Construction, Field Deployment**
- **LNG: Engineering & Commissioning, LNG Terminals & Floating Solutions, LNG Break-bulking & Logistics**
- **City Gas Distribution: Transport, Commercial & Industrial, Households**

OSAKA GAS SINGAPORE

Contribute to:
- O&M consulting
- LNG supply
- Demand creation
- Joint project development

AG&P

- Increased access to Japanese companies
- Potential project Financing on a case-by-case basis

JBIC JAPAN BANK FOR INTERNATIONAL COOPERATION

| AG&P Engineering Services (Singapore) | AG&P City Gas Distribution (Singapore) | AG&P LNG Terminals & Logistics (Singapore) | AG&P Construction Solutions (Philippines) | AG&P Shared Services (Philippines) |
|---|---|---|---|---|
| ・GAS Entec | ・Transport | ・LNG Terminals | ・Modularization | ・Estimation |
| ・Design, Build, Commission | ・Households | ・Bunkering | ・Site works | ・Supply Chain/Procurement |
| ・Terminals FSRUs | ・Commercial | ・Break-bulking | ・International Deployment | ・Contracts |
| ・Bunker Vessels | ・Industrial | ・LNG Marketing | | ・IT Support & Systems |
| ・LNG Marine Fuel Systems | | | | ・Project Financials |
| ・CGD Infrastructure | | | | ・HR |
| ・Equipment to Monetize Stranded Gas | | | | ・Proposals |
| | | | | ・Administration |

Vietnam

# SOJITZ OSAKA GAS ENERGY COMPANY (SOGEC)

## Natural gas retail business with energy savings

**SOGEC sales natural gas to industrial customers by pipeline in Phu My 3 specialized industrial park and by CNG in other area with energy savings.**

SOGEC members

OSAKA GAS SINGAPORE

- Natural gas utilizing know-how
- Gas Business experience in Japan and south east asia

**Sojitz Osaka Gas Energy Company**

**(SOGEC)**

**Established in Oct.2019**

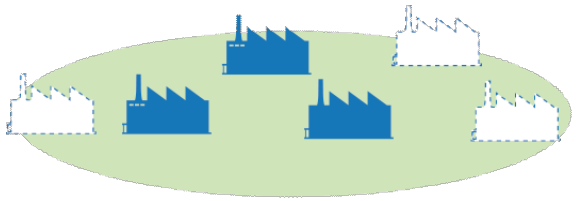
- Local Network
- Gas Business Experience in Vietnam
- Regulation knowledge

sojitz

**Sojitz Group**

Gas supply station

**Phu My 3 S.I.P. (Pipeline supply)**



**Individual industrial customers (CNG supply)**

Thailand

# OE Solar

## Solar Power Business

Supply of electricity generated from solar energy to customers in the industrial and commercial sectors.

OSAKA GAS SINGAPORE

EPC (EPC Contactor In Thailand)

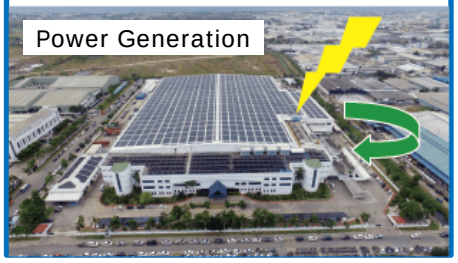
Knowledge of solar business in Thailand

OE SOLAR

Facility Installation without initial investment by customers

Power Purchase Agreement

**Commercial & Industrial Customers**



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