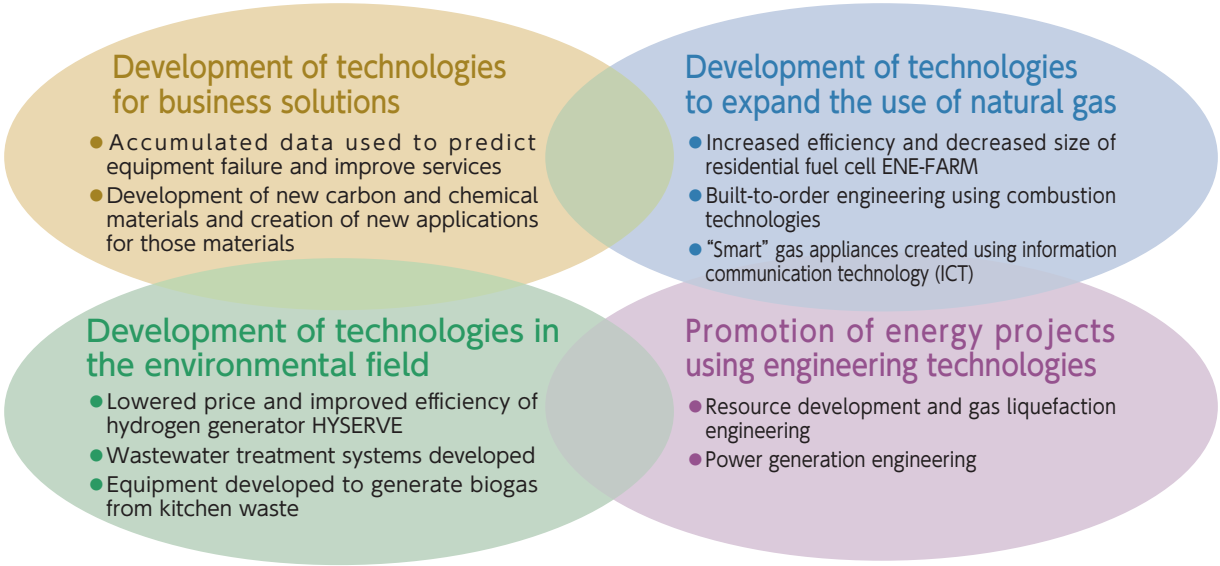
Technological Development

Technological Development Strategy

Technology-Driven Solutions and Innovation

The Osaka Gas Group aims to spur innovation for the next generation and provide optimal solutions to its customers by leveraging its accumulated core technologies.



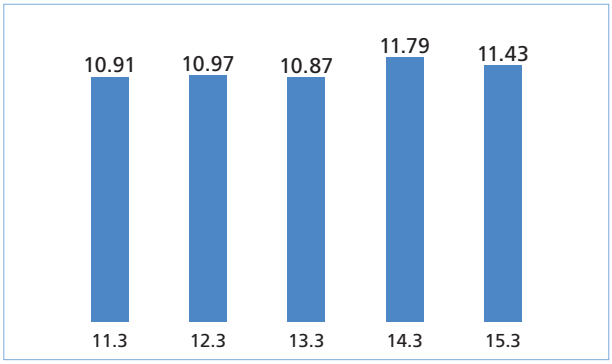
Priority Fields in Technological Development

Osaka Gas aims to improve its engineering capabilities in growth fields, including upstream business and the electric power business.

Looking ahead to the full liberalization of electric power and gas retailing, Osaka Gas is developing new gas equipment, such as fuel cells, to increase its competitiveness in gas equipment sales. Osaka Gas is also focusing its efforts on information communications technology (ICT) and big data analysis to provide new services that enhance value in the gas and electricity businesses.

Efforts are also being made to develop a wide range of materials and expand the materials solutions business.

Research and Development Expenses (Consolidated) (Billions of yen)



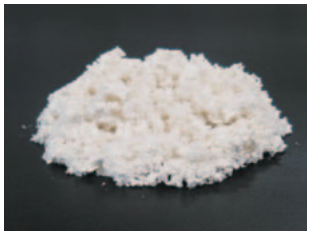
Development of Technologies for Business Solutions [Major Initiatives] —— Development of New Materials

Development of fluorene cellulose as a material to serve as a resin fiber (fiber for strengthening resin)

Fluorene, a coal-derived material, is processed by the Osaka Gas Group into fluorene derivatives that have excellent optical properties and heat resistance. Fluorene derivatives are used in liquid crystal displays, mobile phone camera lenses and other devices.

Osaka Gas developed hydrophobized* fluorene cellulose by reacting the cellulose fiber surface with a fluorene derivative. Cellulose is a biomass material, and fiber made from cellulose (cellulose fiber) is one-fifth the weight of steel but has more than five times its strength, plus exceptional heat resistance. By mixing with plastic, a strong, lightweight plastic can be created for home appliances, automotive structural members, and other applications. It is a promising material with low environmental impact.

It will soon become possible to mass produce the material, further improve its performance, and lower cost; its imminent commercialization is highly anticipated.



Fluorene cellulose

* Having a low affinity with water, meaning it does not mix well with water. Cellulose fiber is highly hydrophilic, so mixing it with plastics and other materials had previously been problematic.

Development of Technologies in the Environmental Field [Major Initiatives] ——— Toward a Hydrogen Society

Clean energy hydrogen stations

The HYSERVE-300 system produces hydrogen from city gas and was developed by Osaka Gas for use at commercial onsite hydrogen stations. This system was installed and went into operation in Ibaraki, Osaka in April 2015. A mobile hydrogen station also using the system is being built in Minami-ku, Kyoto, scheduled to go into operation by the end of FY2015. Osaka Gas is helping to build a low-carbon society by providing automakers with hydrogen fuel for fuel cell vehicles developed for the general public, and selling HYSERVE systems for hydrogen stations.

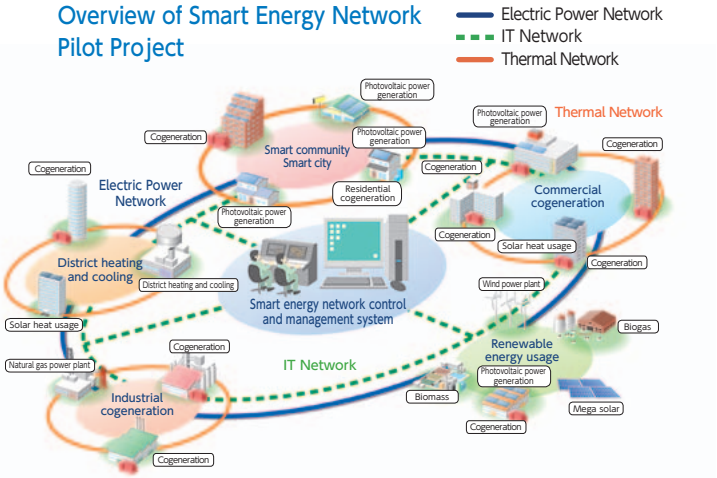
Kita-Osaka Hydrogen Station (Began operation in Ibaraki, Osaka in April 2015)

Development of Technologies to Expand the Use of Natural Gas [Major Initiatives] ——— Smart Energy Networks

Next generation energy systems

A "smart energy network" is essentially an energy community that is composed of gas cogeneration systems, renewable energy, and information and communication technology (ICT). Beyond providing energy flexibility, smart energy networks are next-generation energy systems that create new value by combining distributed energy sources through a process of integrated control. In specific terms, this new value is derived from: (1) the pursuit of further reductions in energy consumption and CO_2 emissions; (2) efforts to enhance energy security; and (3) the growing use of renewable energy. In June 2013, Osaka Gas incorporated a smart energy network into a redevelopment project in the Iwasaki area of Nishi-ku, Osaka and began supplying electric power* as a PPS.

Overview of Smart Energy Network Pilot Project



* The supply of electric power represents the first designated electricity supplier application in Japan since the relaxation of requirements following revisions to Japan's Electric Utilities Industry Law in the fiscal year ended March 31, 2012.

Promotion of Energy Projects Using Engineering Technologies [Major Initiatives] —— Construction of a Large-Capacity PCLNG Tank*

A large-capacity LNG tank (230,000 m³) that uses the latest technology is currently under construction at Osaka Gas' Senboku No. 1 Works, with a scheduled completion date of winter 2015.

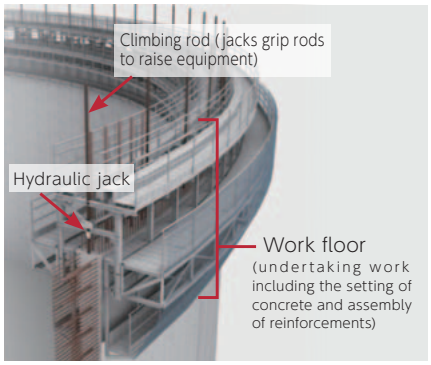
Development and commercialization of 7% nickel steel that reduces use of rare earth metals

Until recently, the material used for the internal lining of LNG tanks was 9% nickel steel (containing 9% nickel, a rare earth metal). Now Osaka Gas has developed and commercialized a new 7% Ni-TMCP steel to be used in tanks, successfully reducing material costs.

Slipform construction method considerably shortens time to build outer tank

Osaka Gas built an outer tank using the slipform construction method, a first for a PCLNG tank in Japan. This construction method uses hydraulic jacks to raise integrated formwork and scaffolding equipment, allowing for the continuous placing of reinforcements and concrete without construction joints.

The slipform construction method replaces the previous method, which required nine months to construct a PCLNG tank, with one that takes just 20 days.



Visual representation of the slipform construction method