

Osaka Gas to Release a New Product of ENE-FARM Type S, Household Fuel Cells Characterized by the Highest Power Generation Efficiency in the World and Improved Installation due to Significant Downsizing

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Osaka Gas Co., Ltd.

Osaka Gas Co., Ltd. (President: Takehiro Honjo; hereinafter, "Osaka Gas") today announced that it has developed a new model of solid oxide fuel cell for household use (hereinafter, "ENE-FARM Type S") in collaboration with AISIN SEIKI Co., Ltd. (President: Kiyotaka Ise; hereinafter, "AISIN SEIKI"), Kyocera Corporation (President: Hideo Tanimoto; hereinafter, "Kyocera"), Noritz Corporation (President: Soichiro Kokui; hereinafter, "Noritz"), PURPOSE CO., LTD. (President: Hiromi Tagaki; hereinafter, "PURPOSE"), and Rinnai Corporation (President: Hiroyasu Naito; hereinafter, "Rinnai").*¹ The new product will be released in April 2020.

1. Release of the new model, ENE-FARM Type S

ENE-FARM Type S has been commercialized based on technology developed by Osaka Gas, AISIN SEIKI, Kyocera, and Toyota Motor Corporation (President: Akio Toyoda). The lineup includes a function to continue power generation during outages to ensure electricity availability. The new product attains the highest power generation efficiency in the world*² of 55%.*³ Installation has been improved by significantly downsizing the main unit. A convenient switch, which has been added to the remote controller, works with a special smartphone app to enhance IoT services, as well.

<Main features>

(1) Improved power generation efficiency

The new product achieves the highest power generation efficiency in the world (55%) by improving the cell stack and the control program of the power generation units. This is higher than the previous highest world-leading power generation efficiency of 53.5%*⁴ attained by the current product. The new product can reduce annual lighting and heating expenses by about 121,000 yen*⁶ and CO₂ emissions by about 2.3 tons*⁶ compared to using a conventional hot-water supply and heating system.*⁵

(2) Improved installation

The width has been reduced from 780 mm (current product) to 600 mm by reducing the number of cells in the cell stack and downsizing the power conditioners. As a result, the installation area has been reduced by about 20%.

(3) Improved customer convenience

The new product works with a special smartphone app. When the remote controller switch is pressed, push notifications are delivered to the user's smartphone. Messages



sent from the smartphone are displayed on the remote controller at home. These convenient functions are designed to facilitate communication in the family.

(4) Improved durability

By reviewing the durability of the cell stack, which is the main device, the service life of the power generation unit has been extended from 10 years (conventional product) to 12 years so that the product can be used for a longer period.

Osaka Gas strives to achieve further technology development and cost reduction and remains committed to helping customers achieve a comfortable lifestyle, reducing environmental impacts, and improving energy security.

[Appearance of the new product & remote controller]

	Power generation unit and backup heat source unit (Power generation unit is manufactured by AISIN SEIKI.)	Kitchen remote controller / Bathroom remote controller
Manufactured by Noritz	 <p>Models 192-AS11/AS12 Model 136-N450</p>	 <p>Model 138-N430</p>
Manufactured by PURPOSE	 <p>Models 192-AS11/AS12 Model 136-T451</p>	 <p>Model 138-T451</p>
Manufactured by Rinnai	 <p>Models 192-AS11/AS12 Model 136-R450</p>	 <p>Model 138-R413</p>

[Specifications]

■ Fuel cell power generation unit

		New product Models 192-AS11 (independent operation type) / AS12 (standard type)	(Reference) Current product Models 192-AS07 (independent operation type) / Model AS08 (standard type)
Release date		April 1, 2020 (planned)*7	April 2, 2018
Performance	Power generation output	During normal operation: 50 W to 700 W During independent operation: 700 W	Same as on left
	Rated power generation efficiency*8	55% (LHV) *3 49.6% (HHV)	53.5% (LHV) *8 48.3% (HHV)
	Overall rated efficiency*8	87% (LHV) 78.5% (HHV)	Same as on left
	Capacity of hot water storage tank	25 L	28 L
	Exhaust heat recovery temperature	About 65°C	About 70°C
Dimensions		W 600 × H 1274 × D 330 (mm)	W 780 × H 1195 × D 330 (mm)
Weight		86 kg (independent operation type) 85 kg (standard type)	106 kg (independent operation type) 100 kg (standard type)
Installation space for single-family detached home		About 1.1 m ²	About 1.4 m ²
Gas type		City gas 13A, LP gas	Same as on left
Maintenance support period		10 years	Same as on left

■ Backup heat source unit

Equipment model number (main models)	136-N450 (standard)	136-T451 (standard)	136-R450 (standard)
Hot water supply capacity (liters/min of hot water at 25°C rise)	24	24	24
Heating capacity	14 kW	14 kW	14 kW
Dimensions	H 750 × W 480 × D 240 (mm)	H 750 × W 480 × D 250 (mm)	H 750 × W 480 × D 250 (mm)
Weight	36 kg	42 kg	38 kg

Remote controller model No. (main models)	138-N430	138-T451	138-R413
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■ **Manufacturer's suggested retail price**

Fuel cell power generation unit, heat source unit, and intercom remote controller (equipped with wireless LAN)* ⁹	Excl. tax	1,680,000 yen
Fuel cell power generation unit, remote controller to link with power generation for retrofittable configuration (equipped with wireless LAN)* ¹⁰	Excl. tax	1,320,000 yen

*1 ENE-FARM Type S is an environmentally friendly energy system that generates power through chemical reaction between hydrogen, which is extracted from clean natural gas, and oxygen in the air. The generated power can be used at home, and hot water generated in the power generation process can also be used effectively. In development, we utilized some of the results obtained from the project commissioned from the New Energy and Industrial Technology Development Organization (NEDO).

*2 The highest power generation efficiency in the world in terms of fuel cells for household use whose rated output is 1 kW or less (based on a survey conducted by Osaka Gas as of the end of January 2020).

*3 Power generation efficiency when rated power generation is continued for at least three hours (e.g. under the surplus electricity purchase system). In cases other than above, the rated power generation efficiency is 54% (overall efficiency: 87%). The power generation efficiency for LP gas is 53% (overall efficiency: 85%). The values were calculated based on the Lower Heating Value. LHV refers to a calorific value that does not include the latent heat of condensation of water vapor, which is generated when the fuel gas is subject to complete combustion, in the heat output.

*4 Power generation efficiency when rated power generation is continued for at least 10 hours (e.g. under the surplus electricity purchase system). In cases other than above, the rated power generation efficiency is 52% (overall efficiency: 87%). The power generation efficiency for LP gas is 51% (overall efficiency: 85%). The values were calculated based on the Lower Heating Value.

*5 Room heating and water heating system: using a gas combination room heater and water heater, gas hot water floor heating (living/dining room), gas hot water bathroom heater and dryer equipped with a mist sauna function, gas stove, and electric air conditioner.

*6 The value was calculated in a trial by Osaka Gas on the assumption that the gas combination room heater and water heater of the room heating and water heating system is replaced by the new model of ENE-FARM Type S (for a family of four in a single-family detached home).

[Applicable rate] "Room Heating and Water Heating System"

Gas: Floor Heating Rate Standard Plan (optional discount: 9%), electricity: Residential Lighting A ENE-FARM Type S

Gas: My Home Power Generation Rate (optional discount: 9%), electricity: Residential Lighting A

* The gas and electricity rates are unit prices (including tax) of Osaka Gas and Kansai Electric Power, respectively, as of October 2019. The Renewable Energy Power Promotion Surcharge for the electricity rate is valid as of FY2019. The purchase unit price of surplus electricity is valid as of October 2019.

[CO₂ emission coefficient] Gas: 2.29 kg-CO₂ /m³ (our data),

Electricity: 0.65 kg-CO₂/ kWh

(based on the mean coefficient of the thermal power source in FY2013 set out in the Plan for Global Warming Countermeasures [decided by the Cabinet in May 2016])

*7 Logistics operations are scheduled to start in mid-April.

*8 Calculated based on the Lower Heating Value and the Higher Heating Value). HHV refers to a calorific value that includes the latent heat of condensation of water vapor, which is generated when the fuel gas is subject to complete combustion, in the heat output.

*9 Manufacturer's suggested retail price for the fuel cell power generation unit (without the independent operation function): model 192-AS12, heat source unit (hot water supply capacity: 24, automatic, compact): model 136-N240, and intercom remote controller (equipped with intercom and wireless LAN): model 138-N430. Excluding installation costs.

*10 Manufacturer's suggested retail price for the fuel cell power generation unit (without the independent operation function): model 192-AS12 and the remote controller to link with power generation for retrofittable configuration (equipped with wireless LAN): model 138-N434. Excluding installation costs.