IGRC Seoul 2011
International Gas Union Research Conference

TOKYO GAS

Experience and Future Prospects of Fuel Cell mCHP for Residential Use

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Residential Fuel Cell Business Development Dept.

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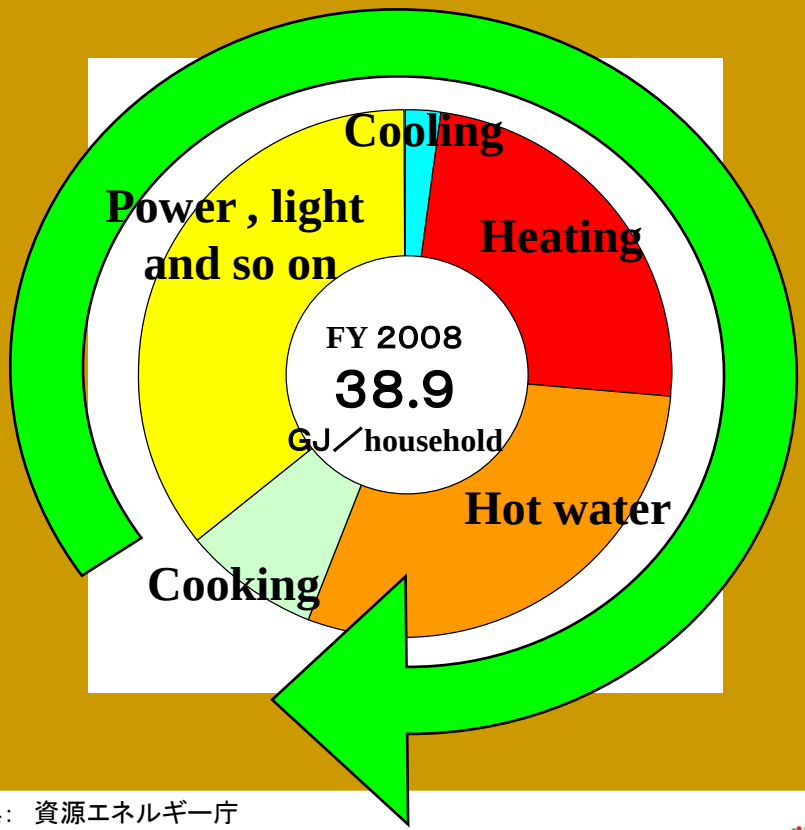
ENE·FARM
エネファーム

Energy Demand Profile at House Sector in Japan

CHP can contribute to an energy saving in house from supply side.

High efficient electricity and hot water



出典： 資源エネルギー庁
「平成21年度 エネルギーに関する年次報告書（エネルギー白書2010）」

Japan's Policies Related to Residential FC mCHP Systems

< 1997 accepted the "Kyoto Protocol to UNFCCC >

The "Millennium Project" was announced

1999 The government advocated developing and introducing fuel cell systems as a next generation technology to prevent global warming.

Prime Minister Koizumi's administrative policy speech

2002 Prime Minister Koizumi made a declaration that residential fuel cell systems would be commercialized in 3 years.

FY **2002～2004** **Residential Fuel Cell Demonstrative Research Project**

2005 **Start Large Scale Demonstration project**

FY **2005～2008**

Prime Minister Abe announced "Cool Earth 50"

2007 The government chose a stationary fuel cell co-generation system as an innovative energy technology for "Cool Earth."

Prime Minister Fukuda announced "Fukuda vision"

2008 The Hokkaido Toyako Summit

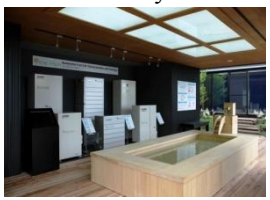
2009 Japan succeeded in commercializing residential FC co-generation systems as a Japan's world-leading environmentally-friendly technology.

FY **2009～** Introduction subsidy

Installed a prototype of ENE-FARM in the prime minister's official residence (2005)

Large-scale stationary fuel cell demonstration project (2005-2008)

The Hokkaido Toyako Summit

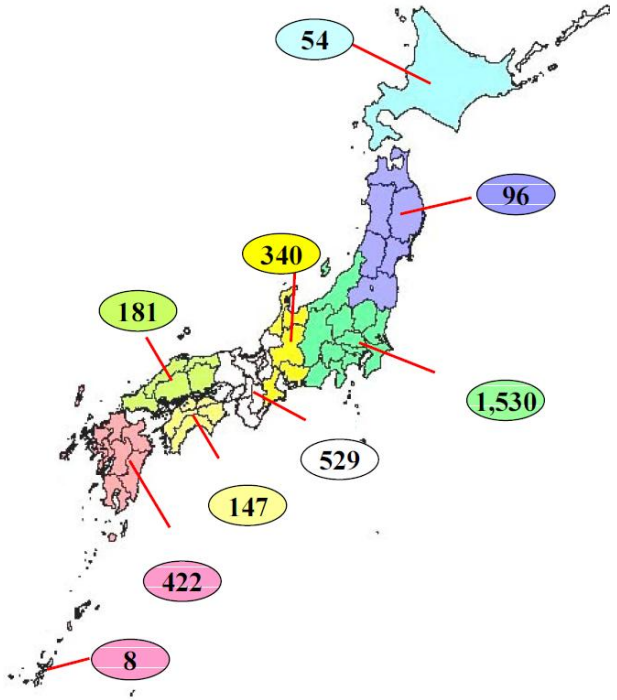


Universal Product Logo

Large Scale Stationary Fuel Cell Demonstration Project

NEDO/NEF

3,307 systems were installed in Japan !



PEFC maker	LPG	City Gas	Kerosene	total
ENEOS CELLTECH Co., Ltd.	**1,062**	**191**	**0**	**1,253**
EBARA COPORATION	**0**	**396**	**314**	**710**
TOSHIBA FUEL CELL POWER SYSTEM CORPORATION	**554**	**194**	**0**	**748**
Panasonic Corporation	**0**	**520**	**0**	**520**
TOYOTA MOTOR CORPORATION	**0**	**76**	**0**	**76**
total	**1,616**	**1,377**	**3314**	**3,307**

ref.) The handout distributed at the debrief session on 2008 Large Scale Stationary Fuel Cell Demonstration Project. (held on 10 March 2009)

2009 Model of ENE-FARM

Panasonic and Tokyo Gas commercialized Fuel Cell mCHP for residential use, “ENE-FARM”, on May 1st ,2009.

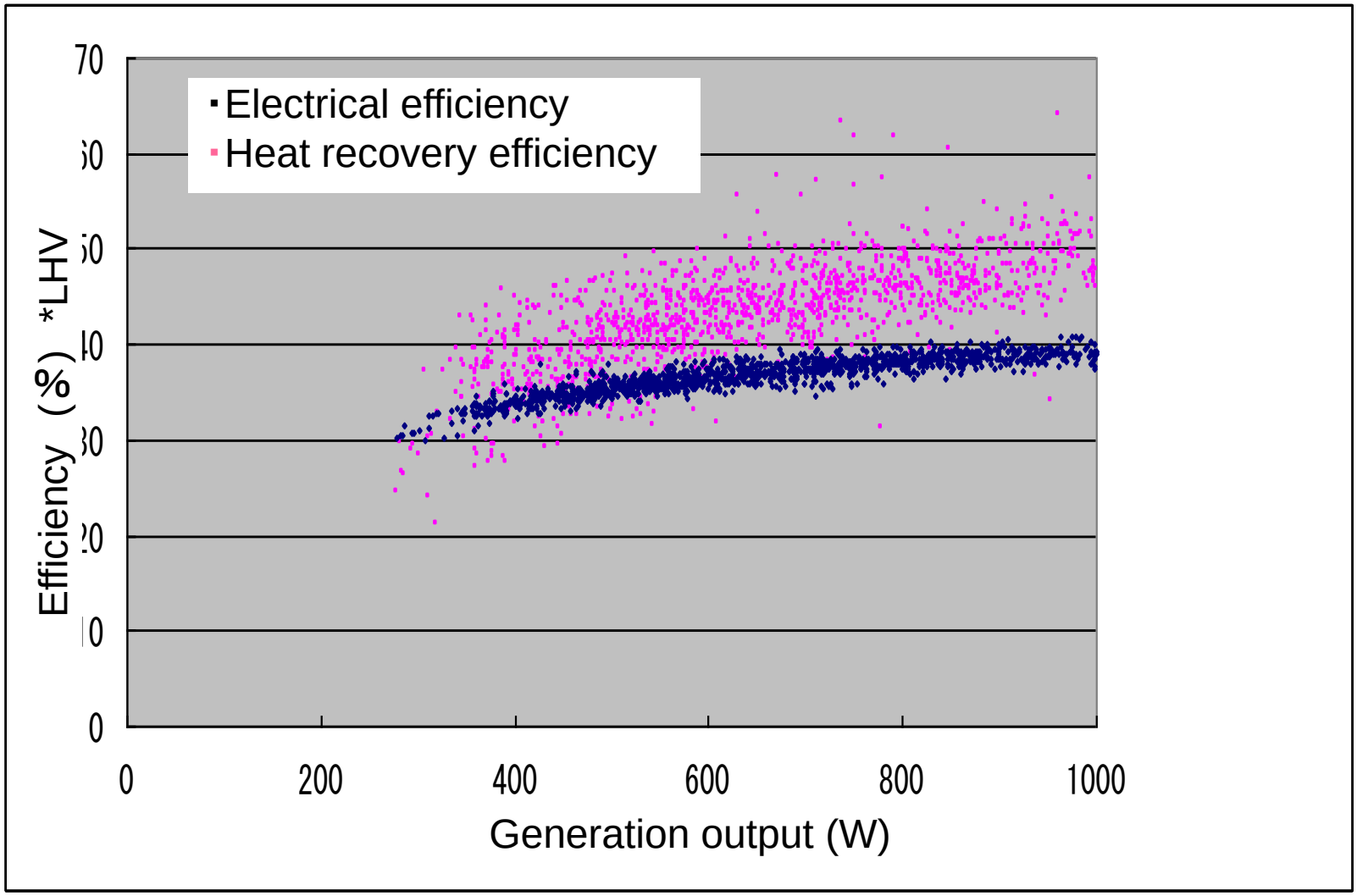
Electrical Out put	**300W～1kW**
Electrical Efficiency	**33%HHV** **37%LHV**
Thermal Efficiency	**47%HHV** **52%LHV**
Capacity of Hot water tank	**200 litter** **(60℃)**

Panasonic
ideas for life

TOKYO GAS

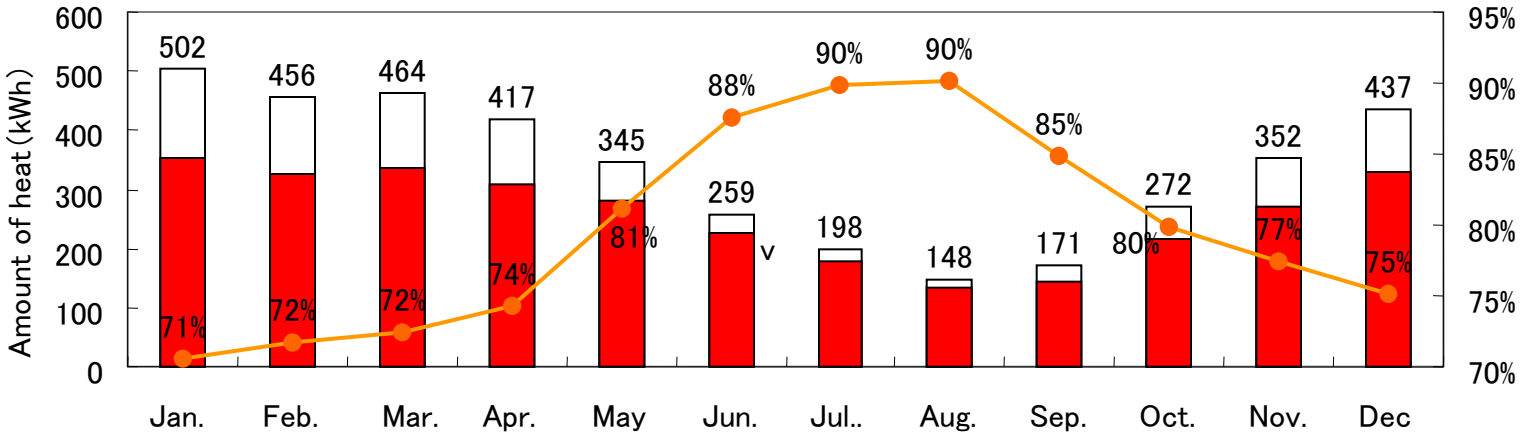
- ✓ Durability: 40,000hrs / 4000 SS-cycles / 10 years
- ✓Type of Fuel Cell: PEFC

Results of 2009 Model's Performance



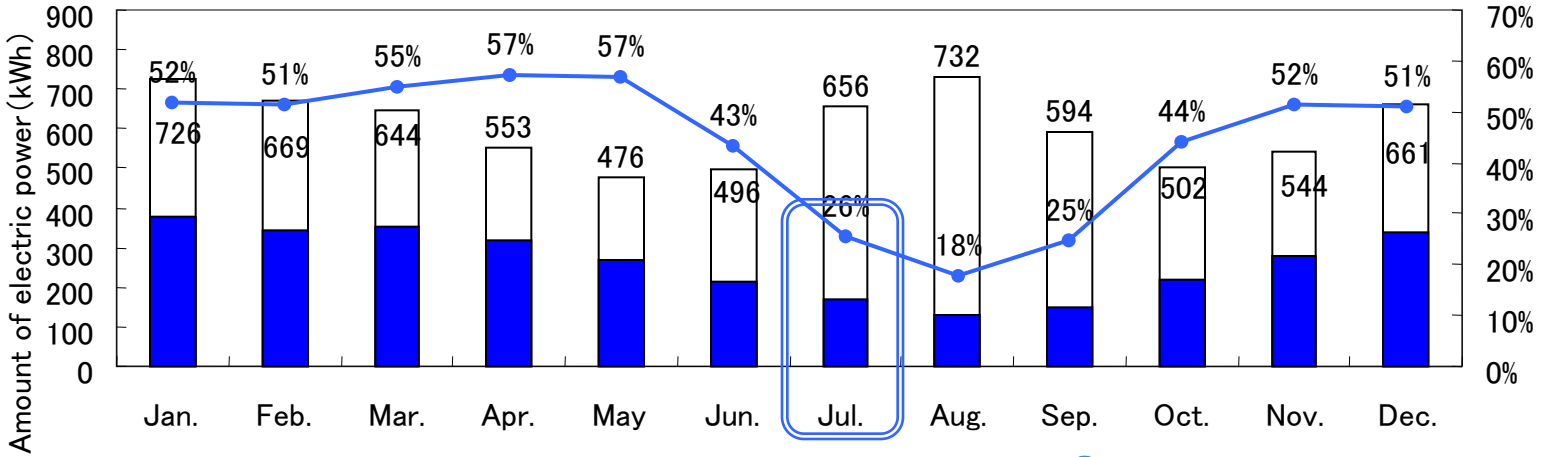
Monthly Operation Data

Hot water



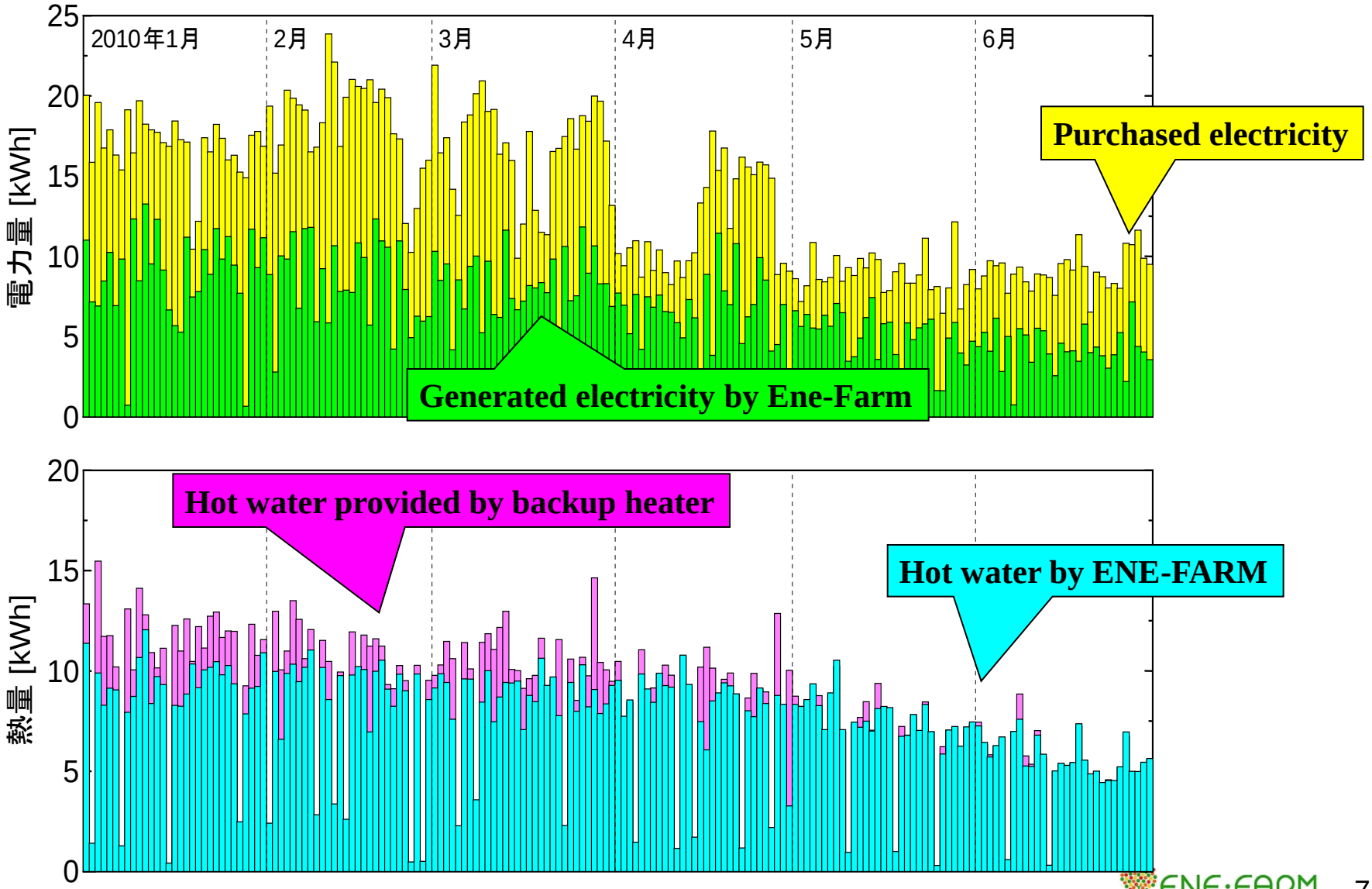
☐Amount of hot water used at home ■Hot water made from FC ●Contribution rate

Electricity



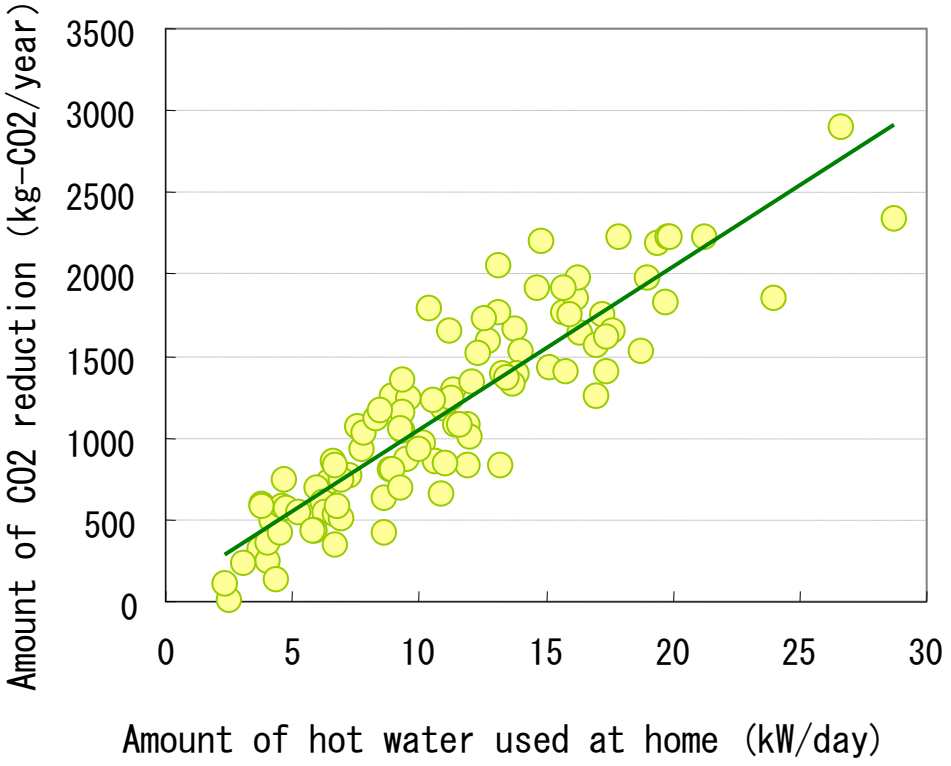
☐Amount of hot power used at home ■power made from FC ●Contribution rate

Daily Operation Data

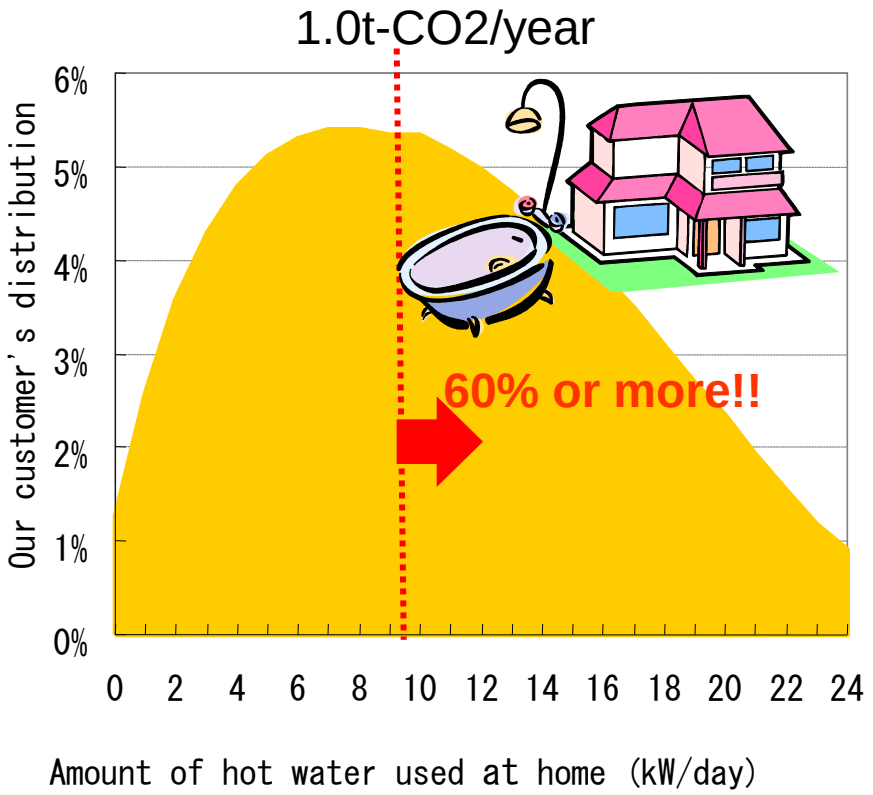


Potential Market of ENE-FARM

● **CO2 reduction by ENE-FARM vs. Hot water demand**



● **Hot water demand distribution of Tokyo Gas's customers**



2011 Model of ENE-FARM

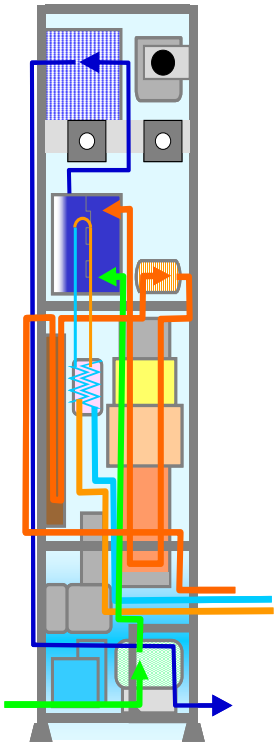
2011 model of ENE-FARM launched on April1st, 2011.
Features of new model are price down, size compact, higher performance and improvement user interface.

Electrical Out put	**250W～750kW**
Electrical Efficiency	**36%HHV** **40%LHV**
Thermal Efficiency	**45%HHV** **50%LHV**
Capacity of Hot water tank	**200 litter** **(60℃)**

- ✓ Durability: 50,000hrs / 4000 SS-cycles / 10 years
- ✓Type of Fuel Cell: PEFC

Price Down

Price 2.76 M JPY
（Reduce by 21%）

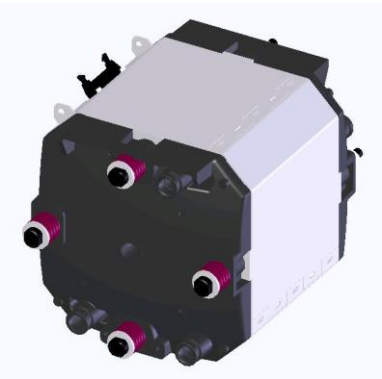


•All the components of the system,including the PEFC Stack and the fuel processor , were re-designed or re-selected from scratch to reduce manufacturing cost .(Reduce by **30%)**

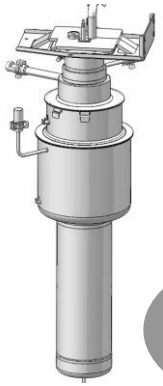
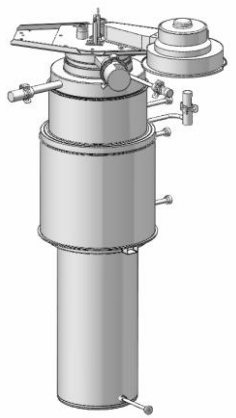
•The weight is reduced by 20% .

Price Down & Size Compact

PEFC stack

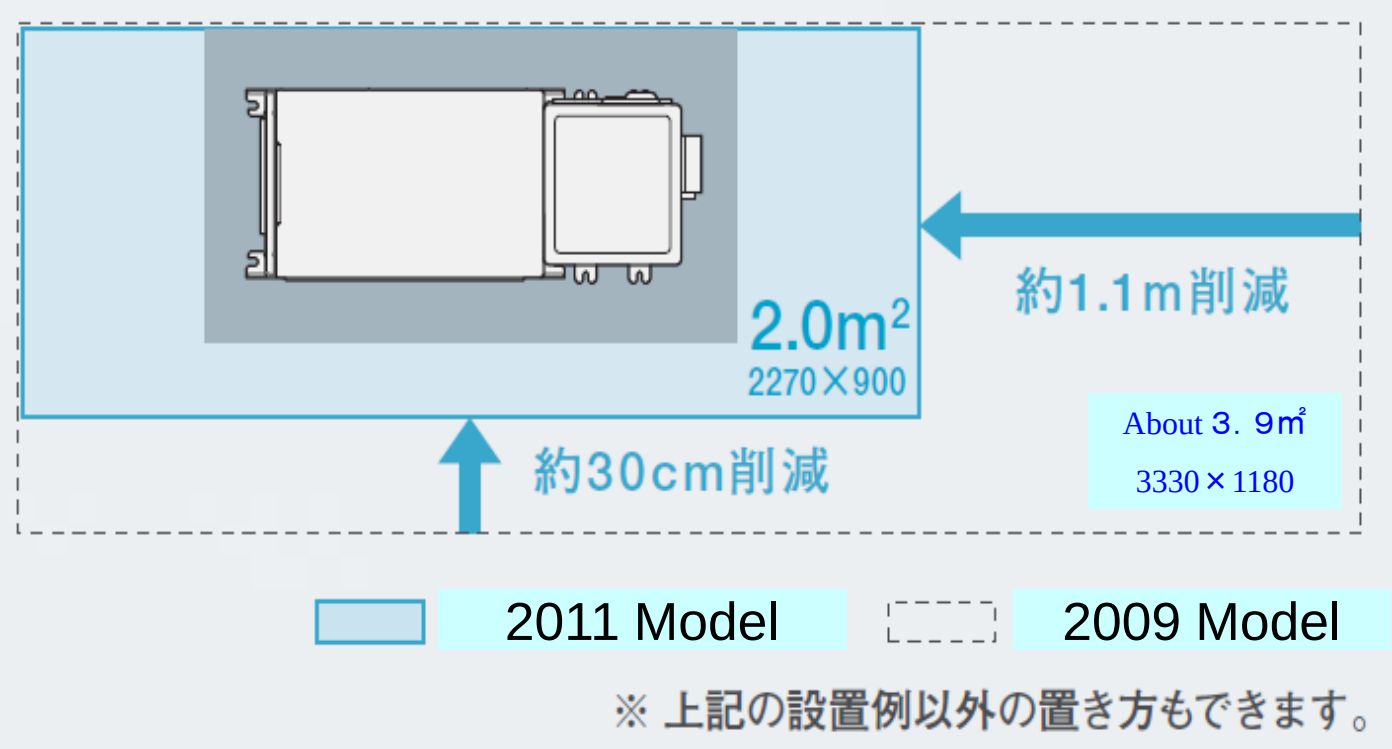
	New Model	2009 Model
Figure	 33% Downsizing	

Fuel Processor

	New Model	2009 Model
Figure	 40% Downsizing	

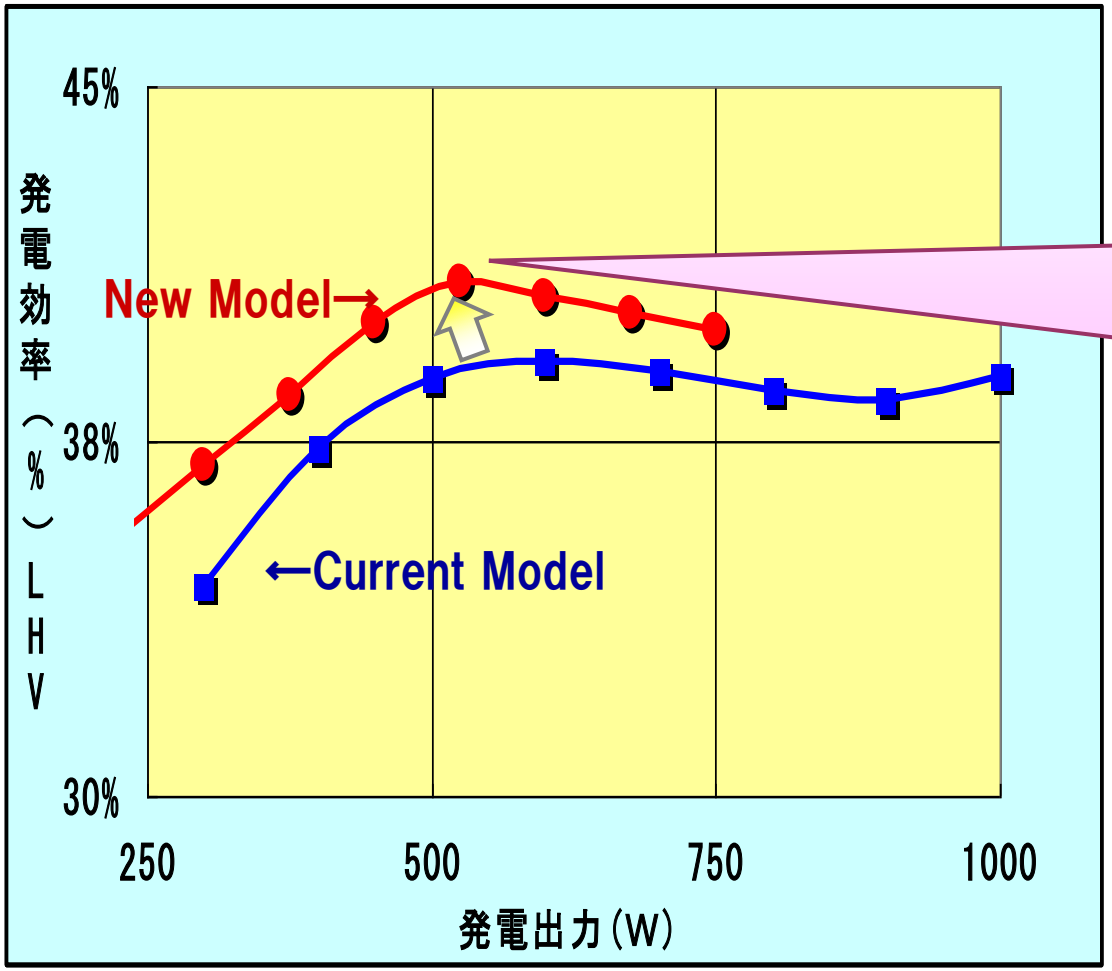
Size Compact

About 50% reduction of installation space



Higher Performance

Generation efficiency 40%LHV



Maximum efficiency

41%(LHV)※500W

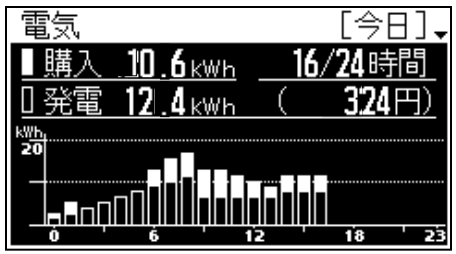
（40%(LHV)※750W）

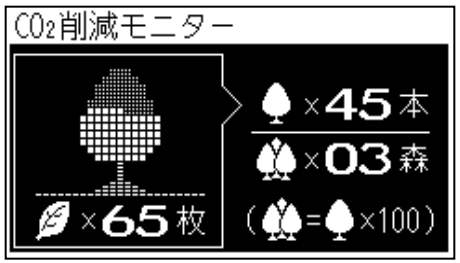
Improvement of User Interface

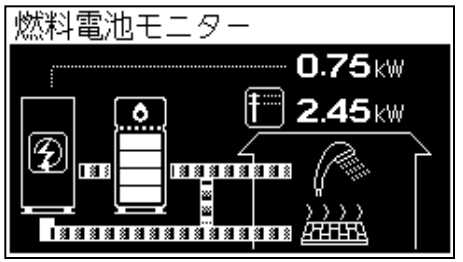
For user-friendliness

(Current Model)

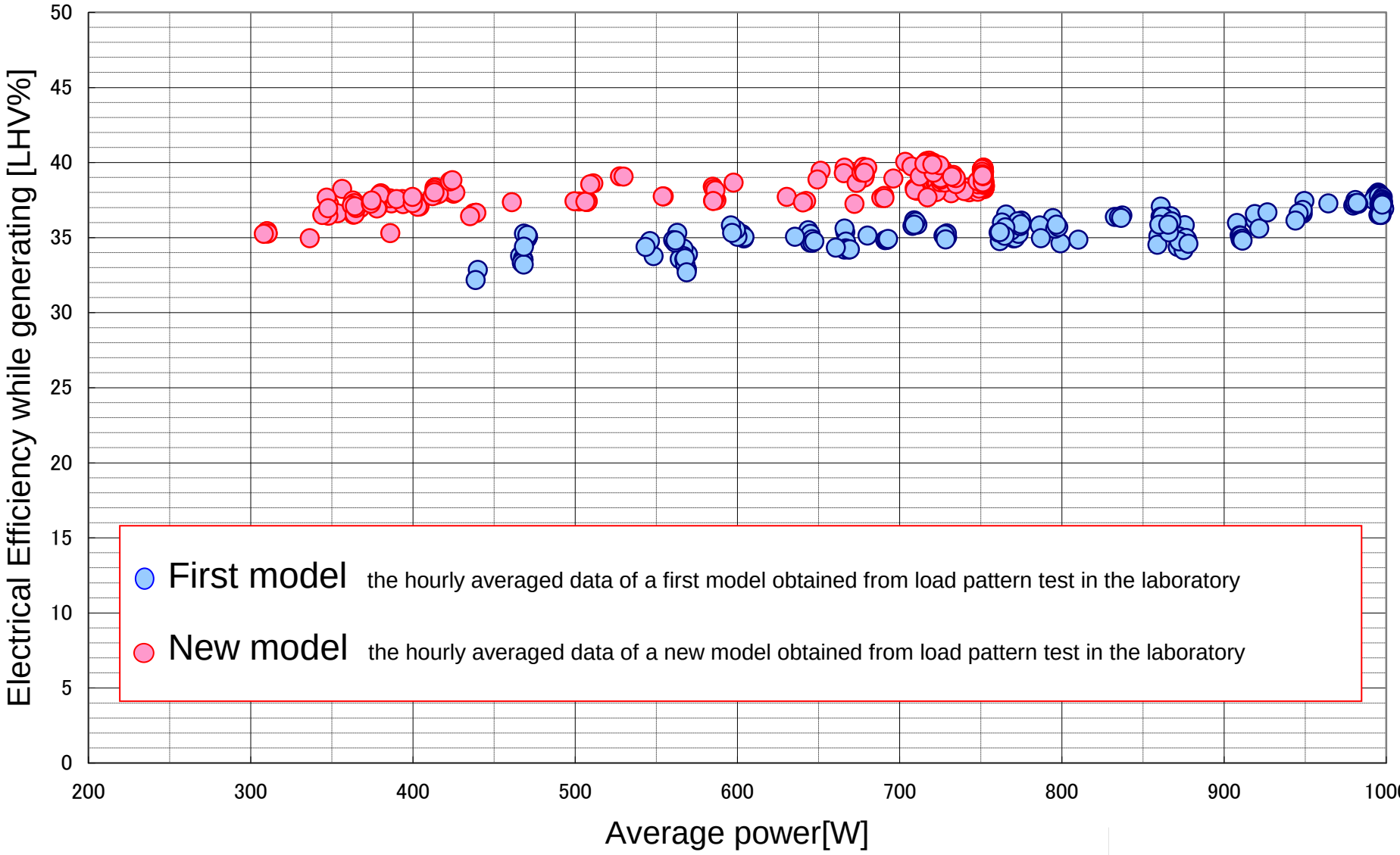
e.g.



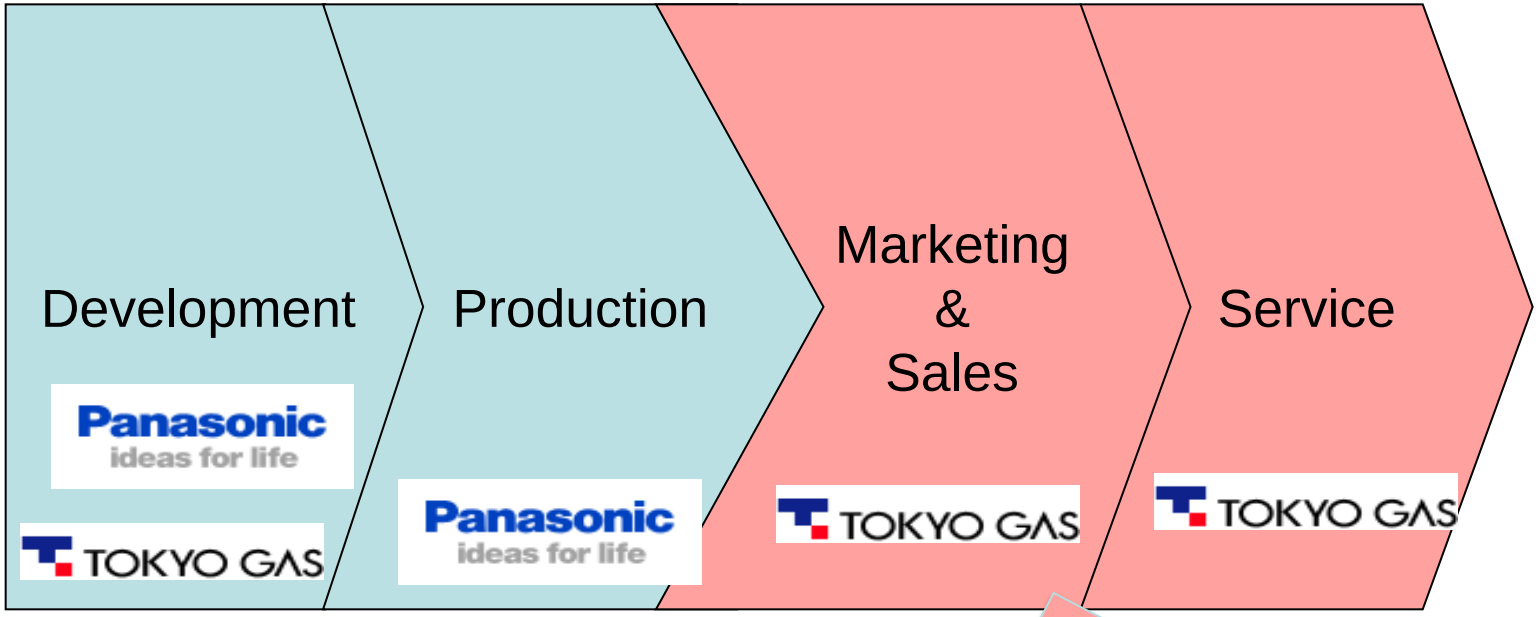




Results of 2011 Model's Electrical Efficiency



Value Chain of ENE-FARM Business



- Sales system : Newly built house, existing house
- Pricing: Subsidy, gas tariff
- Maintenance: Periodic maintenance, repairing

Sales System of ENE-FARM

Newly built market

Customer ⇔ House Builder ⇔ ※ TOKYO GAS LIFEVAL ⇔ TOKYO GAS

Collaboration with house builders having a strategy that provides eco-friendly house

Existing house market

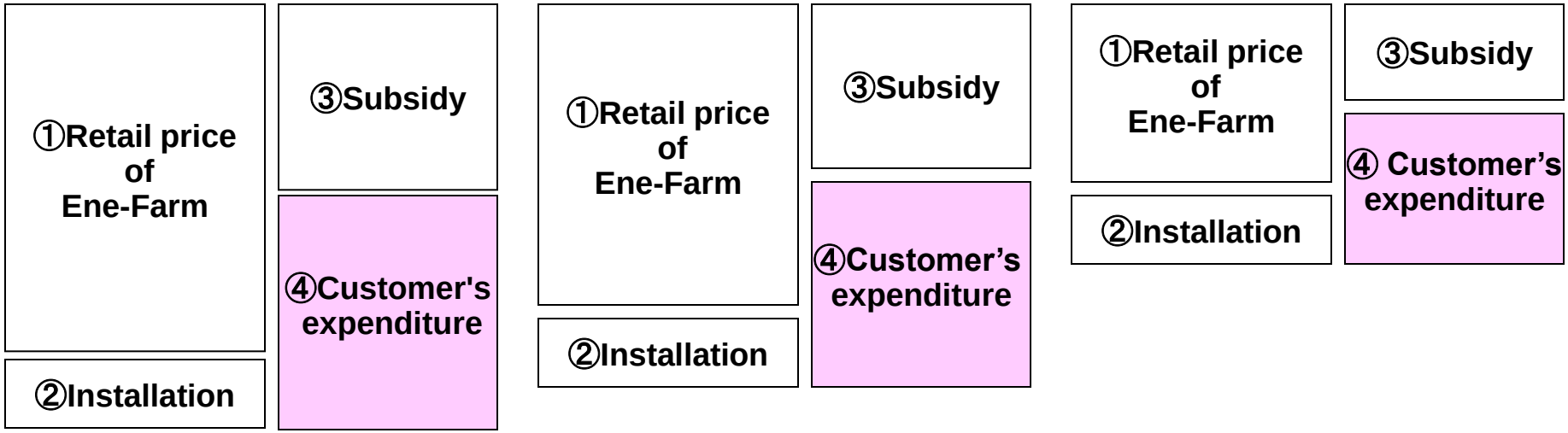
Customer ⇔ ※ TOKYO GAS LIFEVAL ⇔ TOKYO GAS

Who is ENE-FARM customer?
- -Chance to replacing a boiler
- -Heavy gas user
- -Friendly-relationship with Tokyo Gas

Supporting LIFEVAL to develop new customers
- -Education
- -Publishing a pamphlet

※ LIFEVAL : Retail shop of Tokyo Gas Group

Price Structure of ENE-FARM



①+②	:	3,100 K JPY
③	:	1,400 K JPY
④	:	1,700 K JPY

*Model case

①+②	:	2,830 K JPY
③	:	1,300 K JPY
④	:	1,530 K JPY

*Model case

①+②	:	2,330 K JPY
③	:	1,050 K JPY
④	:	1,280 K JPY

*Model case

The scheme of subsidy

[(①−230 KJPY*) +②] × 1／2 or MAX.

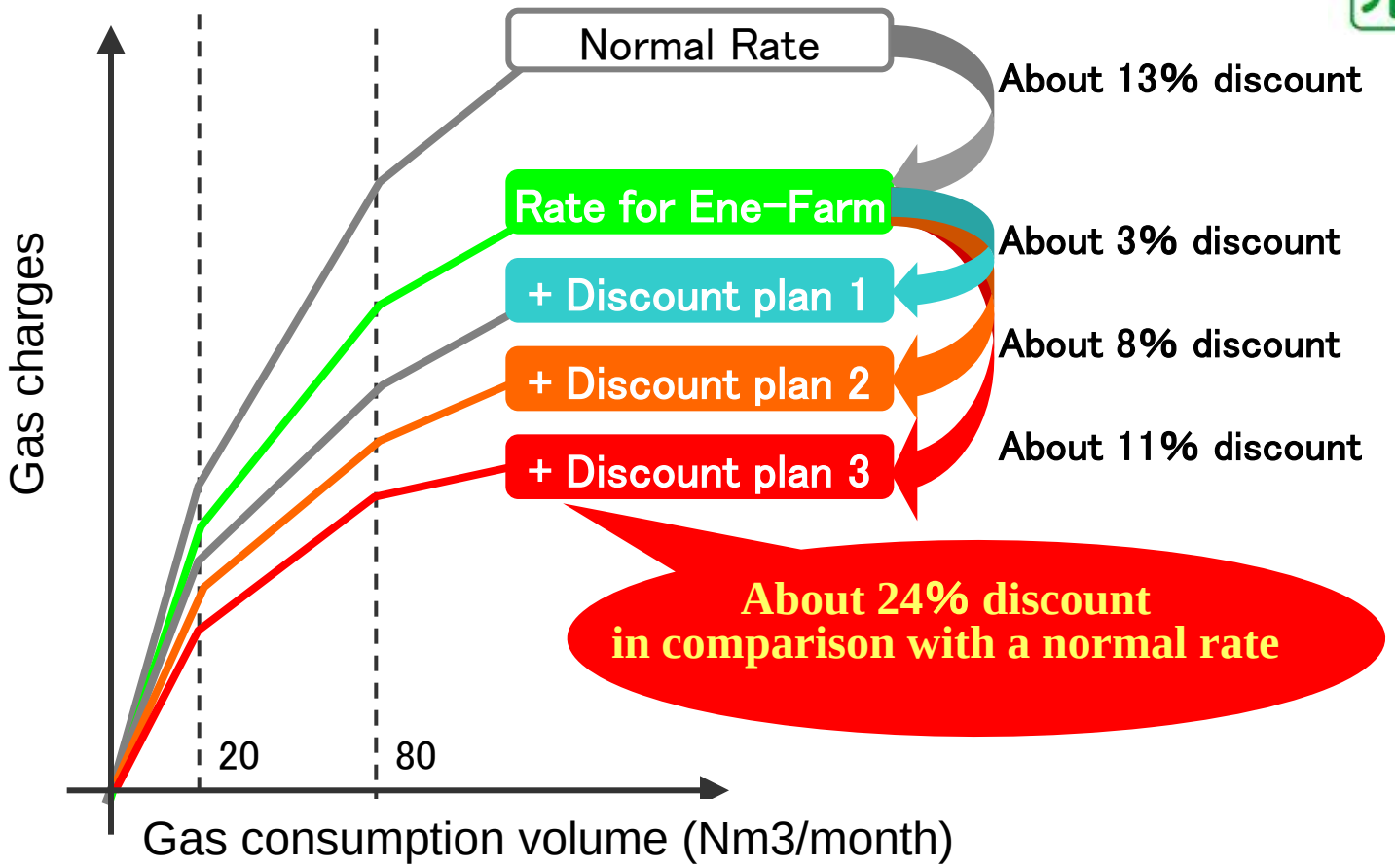
* The price of conventional boiler

MAX. of the subsidy (K JPY)

1,400 (2009), 1,300 (2010), 1,050 (2011)

Image of ENE-FARM's Gas Tariff

In the case of the winter season



Discount plan 1 : Install a bathroom dryer as well as a Ene-Farm
Discount plan 2 : Install a floor heater as well as a Ene-Farm
Discount plan 3 : Install a bathroom dryer and a floor heater as well as Ene-Farm

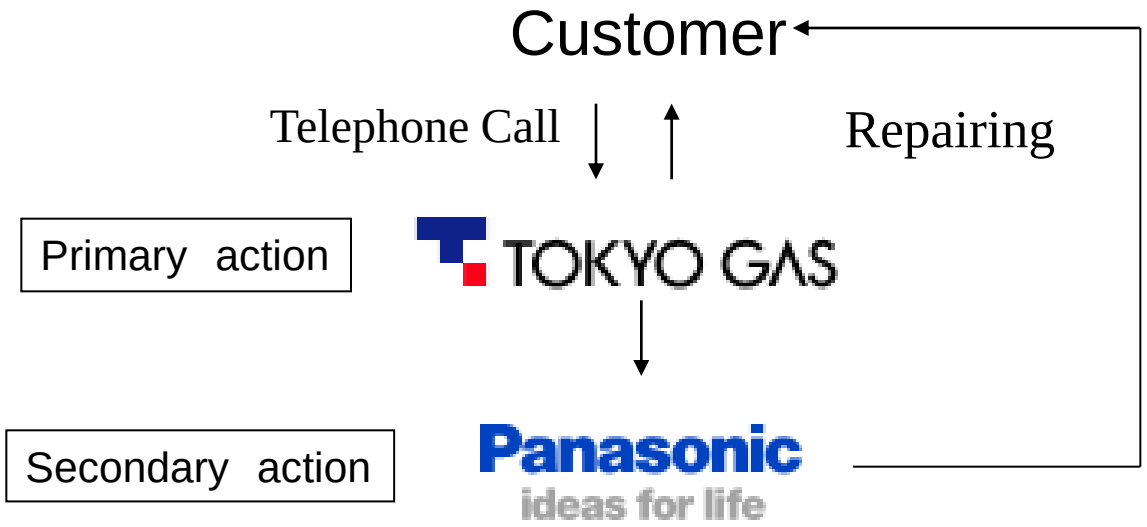
Maintenance of ENE-FARM

Tokyo Gas provides the service free of charge and guarantee as long as 10 years.

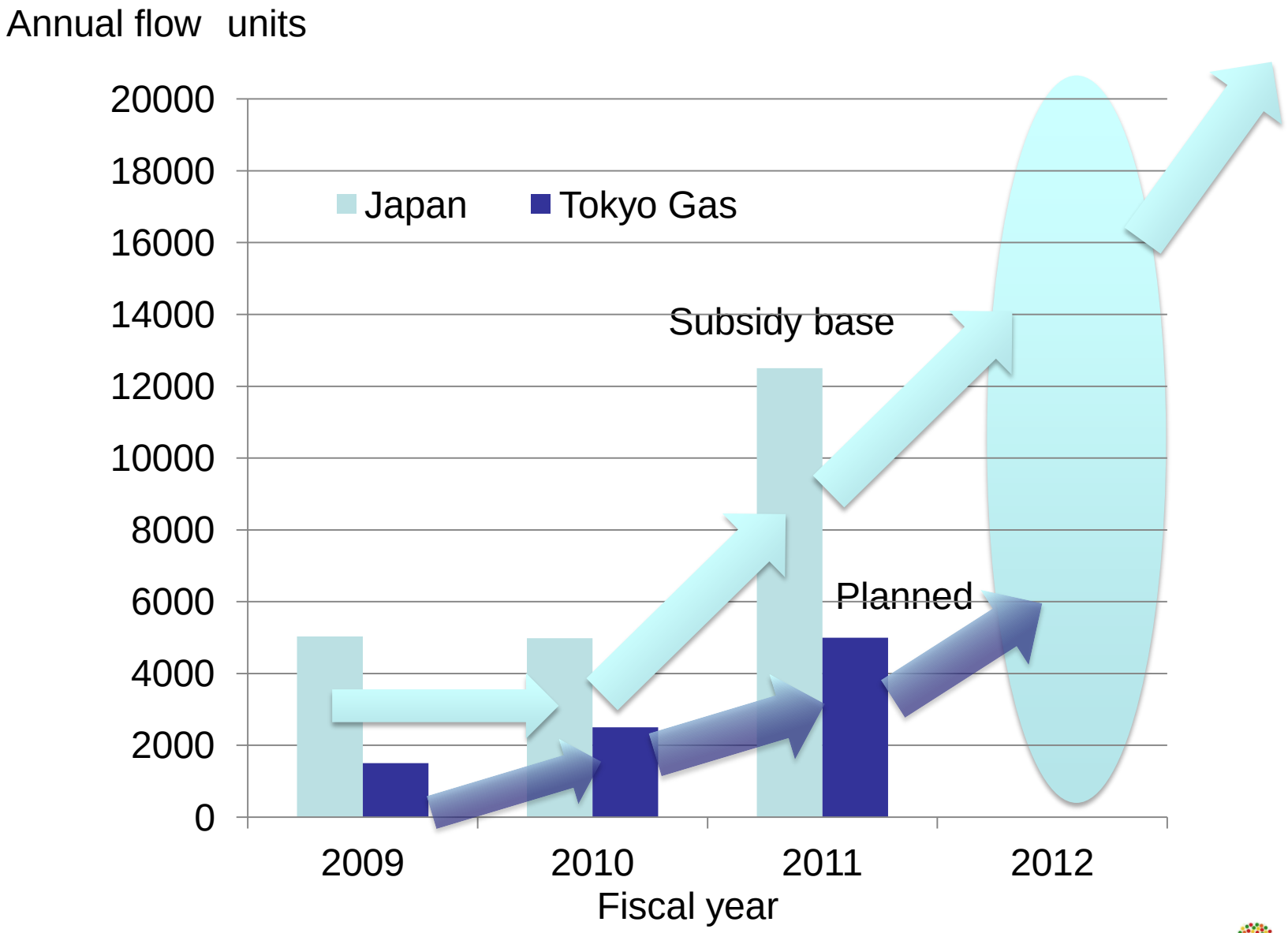
■ Periodic Maintenance Interval

- 2009 model : once / year
- 2011 model : once / 2 or 3 years

■ Formation in Case of Repairing



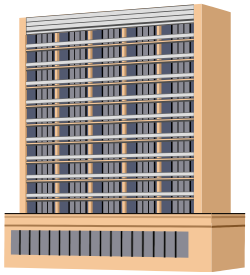
Sales Results of ENE-FARM



Future Prospects of mCHP for Residential Use

Cost reduction of ENE-FARM itself is the top priority to expand the market.
Size-compact is essential in Japan's market.

- Cost reduction
- Size compact



- Applicable to lower purity NG