



# NEDO's Activities on Fuel Cell

New Energy and Industrial Technology Development Organization  
(NEDO)

New Energy Technology Department  
Fuel Cell & Hydrogen Technology Group

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1. ENE-FARM
2. NEDO Projects on PEFC & SOFC

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# 1.Ene-Farm



# ENE FARM

- 700W FC cogeneration system for households
- NG/LPG dual fuel
- Total efficiency 95%, 10 years warranty
- Commercial sale since 2009
- 50% capex subsidy by government
- More than 120,000 installations by March 2015





# History of ENE-FARM development

~2000

2001~2004

2005~2008

2009~

★ Basic R&D phase  
for PEM ( 1992 ~ )

★ Developing small  
scale co-generation  
system using PEFC

- Improving cell stack efficiency
- Reducing system cost
- Proving system durability
- Develop commercial model of PEFC system

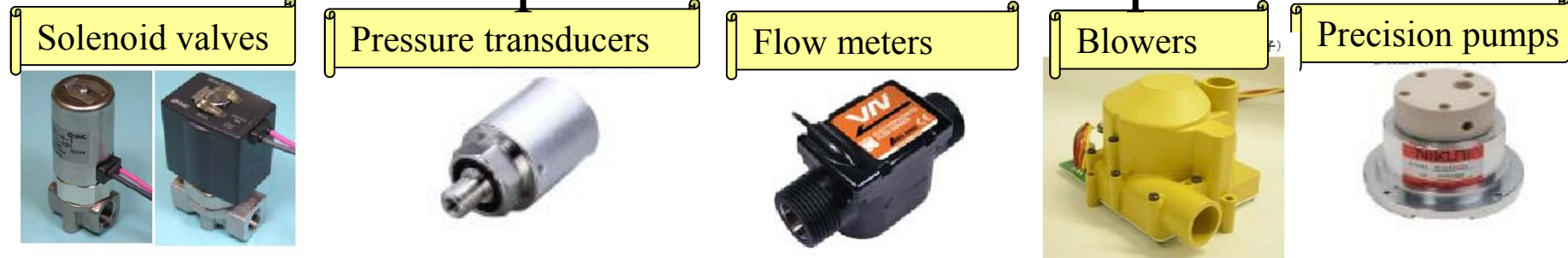
★ Large -scale  
Demonstration  
program

- Verification with various fuels and load patterns in Japanese market
- Creation of initial market
- Common design for peripherals
- Modify codes and regulations

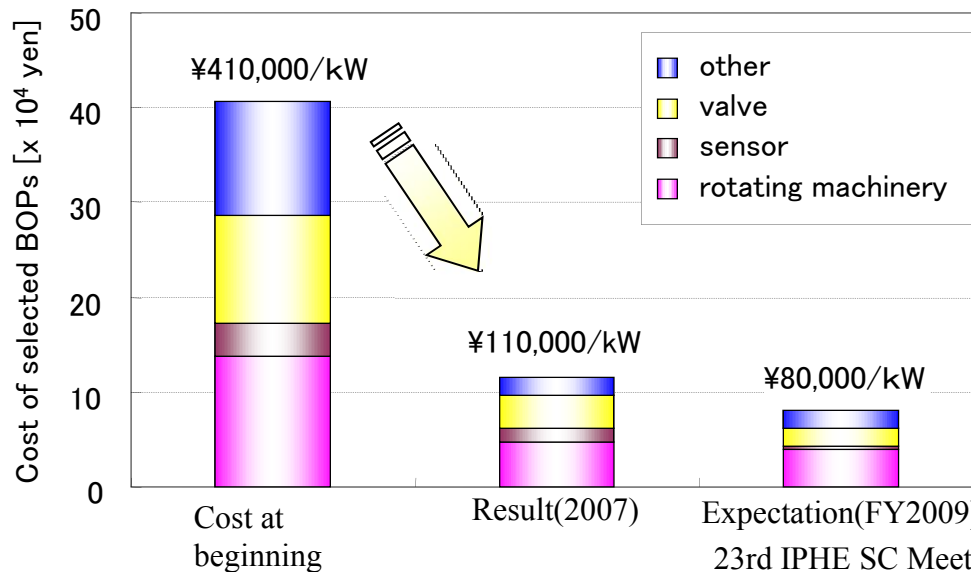
★  
Commence  
commercial  
sale  
in 2009



# Common Specifications for Peripherals



- System manufacturers agreed to develop common designs for some peripherals in PEFC co-generation systems
- Peripherals suppliers participated in the development of common designs
- Contributed standardize the performance, durability and further reduced cost.



○ As a results of this program (06~07)  
 ¥410,000/kw ⇒ ¥110,000/kw

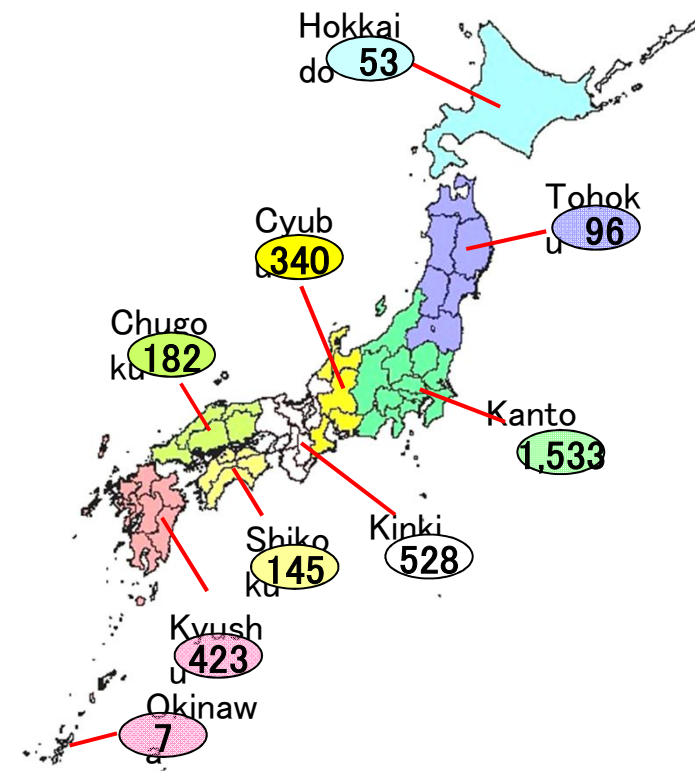
○ Suppliers further continued efforts to  
 ¥80,000/kw (2009)



# Large-scale Demonstration program (FY2005-2008)

- 3,307 units installed broadly in Japan
- System performance verified under various fuels and load patterns in Japan
- System suppliers and energy providers worked together which contributed to establish new market

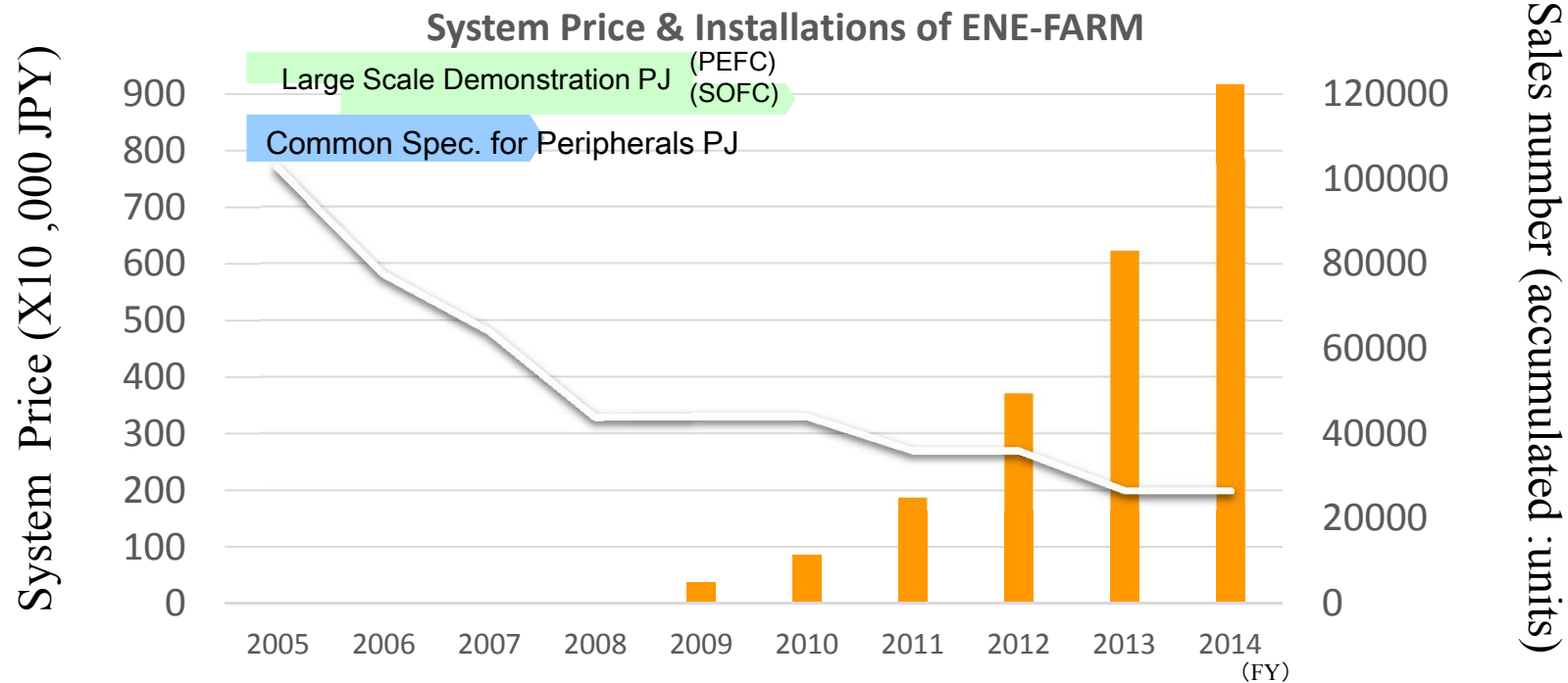
Manufacturer	LPG	CH4	Kerosene	Total
ENEOS Celltech	1,062	191	0	1,253
Ebara Ballard	0	396	314	710
Toshiba FCP	552	196	0	748
Panasonic	0	520	0	520
Toyota	0	76	0	76
<b>Total</b>	<b>1,614</b>	<b>1,379</b>	<b>314</b>	<b>3,307</b>





# System Price Reduction (ENE FARM)

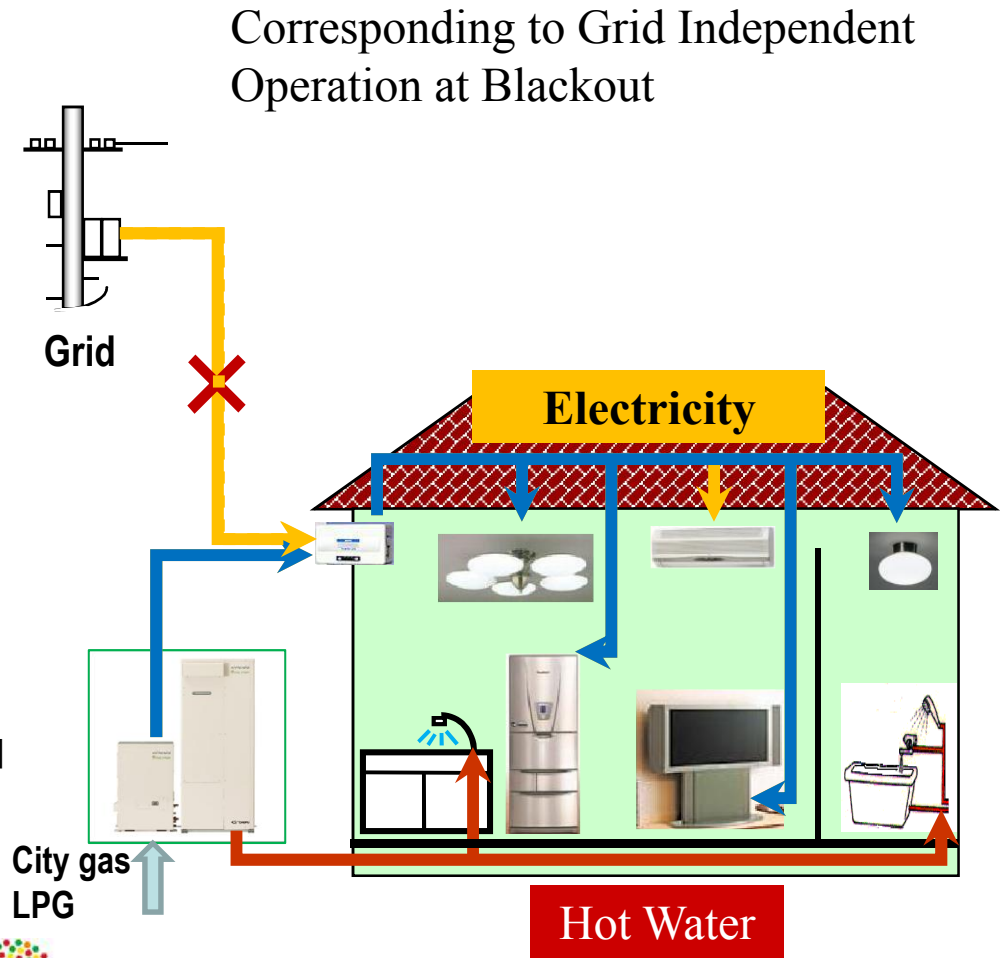
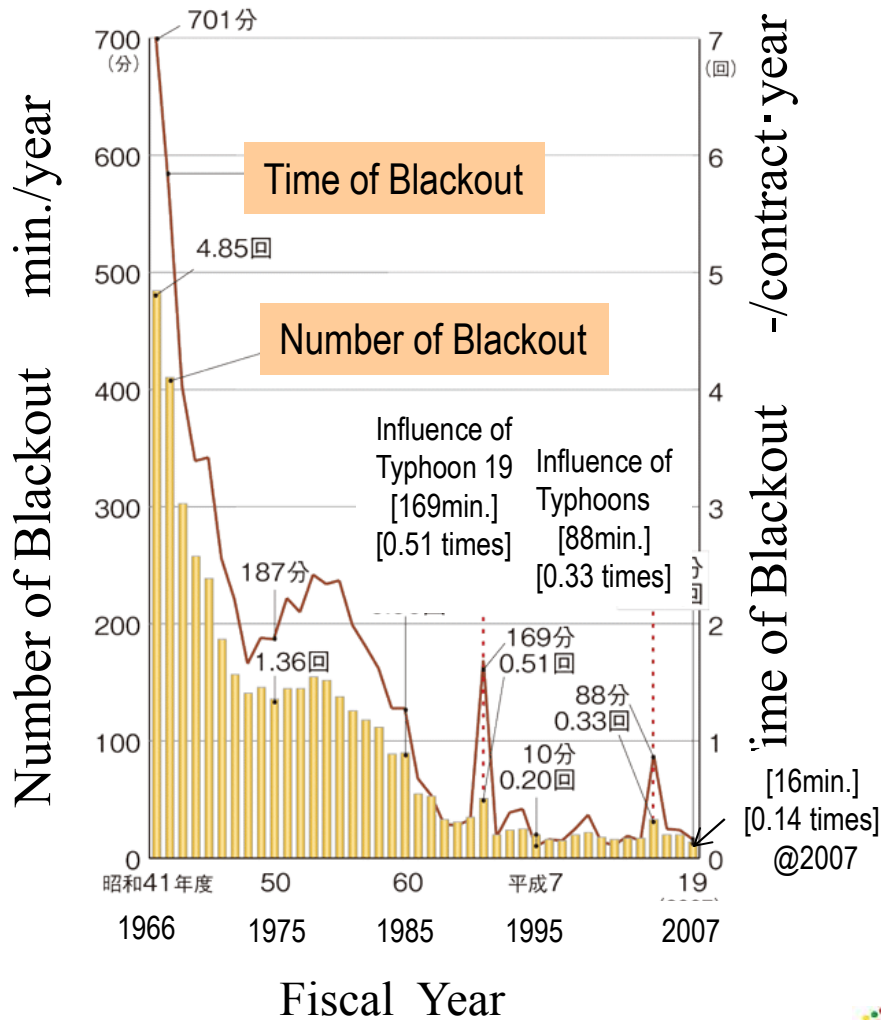
- More than 120,000 units were installed. (March 2015)
- Market expansion significantly reduced system price to below 2M yen which is 1/4 of its beginning.



(Source) Sales Number : Advanced Cogeneration and Energy Utilization Center JAPAN.  
 Sales Price : NEDO.



# Expanding market for ENE-FARM



Residential Use

(The current state of the electric business 2012  
:The Federation of Electric Power Companies of Japan)



# Expanding market for ENE-FARM

ENE-FARM to Europe!

ENE-FARM for Apartment housing



VIESSMANN  
/ Panasonic model

SenerTec  
/ Toshiba model





## 2.NEDO Projects on PEFC &SOFC

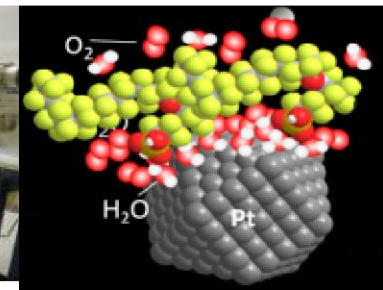
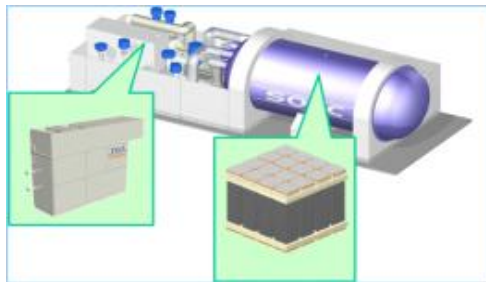


# NEDO projects of Hydrogen and Fuel Cells



~Budgets for H<sub>2</sub> & FC in 2015 ~

<b>PEFC</b>	<b>JPY</b>	<b>3 billion</b>
<b>SOFC</b>	<b>JPY</b>	<b>1 billion</b>
<b>H<sub>2</sub></b>	<b>JPY</b>	<b>8 billion</b>
<b>TOTAL</b>	<b>JPY</b>	<b>12 billion</b>





# PEFC development for FCEV



# NEDO's role in FCV development

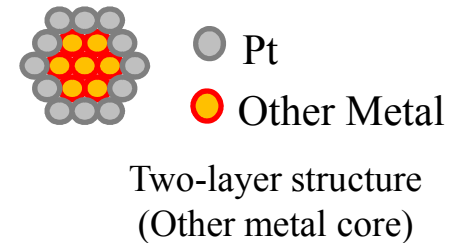
In Japan, Car manufacturers take initiative in development of fuel cell technologies for vehicle, while NEDO provide support in developing scientific knowledge and generic technologies.

- Catalyst research for reducing platinum use
- Developing common evaluation method for fuel cell
- Providing highest time and space resolutions in electrochemical reactions analysis



# Catalyst Research

- Improving Platinum Activity by using Core-Shell Structure (reduce Pt usage to 1/10)
- Improvement of Analysis Technology of Higher dispersion catalyst by using:
  - Developing common cell evaluation technique
  - Highest time and space resolutions in electrochemical reaction and mass transfer analysis of MEA materials.





## Next Five Years' Project

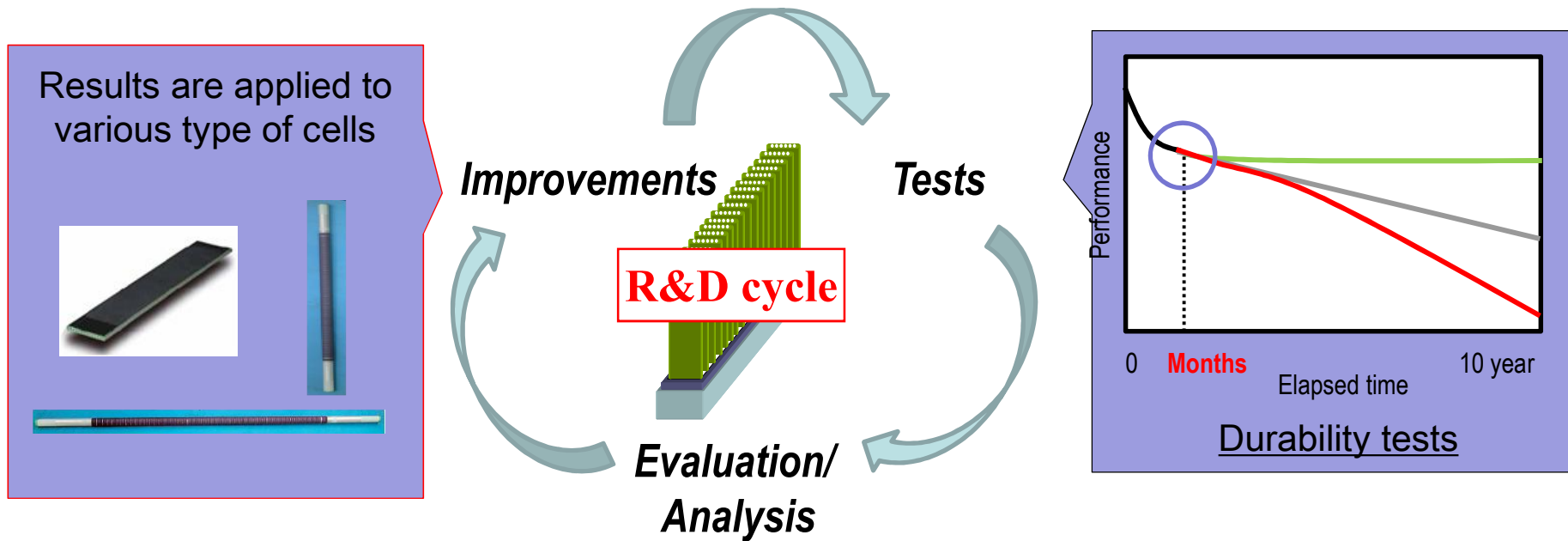
- Continue research of Catalyst for reducing platinum amount and increasing durability.
- New approach in evaluation: both output power density and the durability are considered.
- New target:
  - Cell Stack power density: 4kW/L
  - Durability: 50,000hrs and 600,000 cycle (for use in commercial vehicles)



# NEDO's program for SOFC



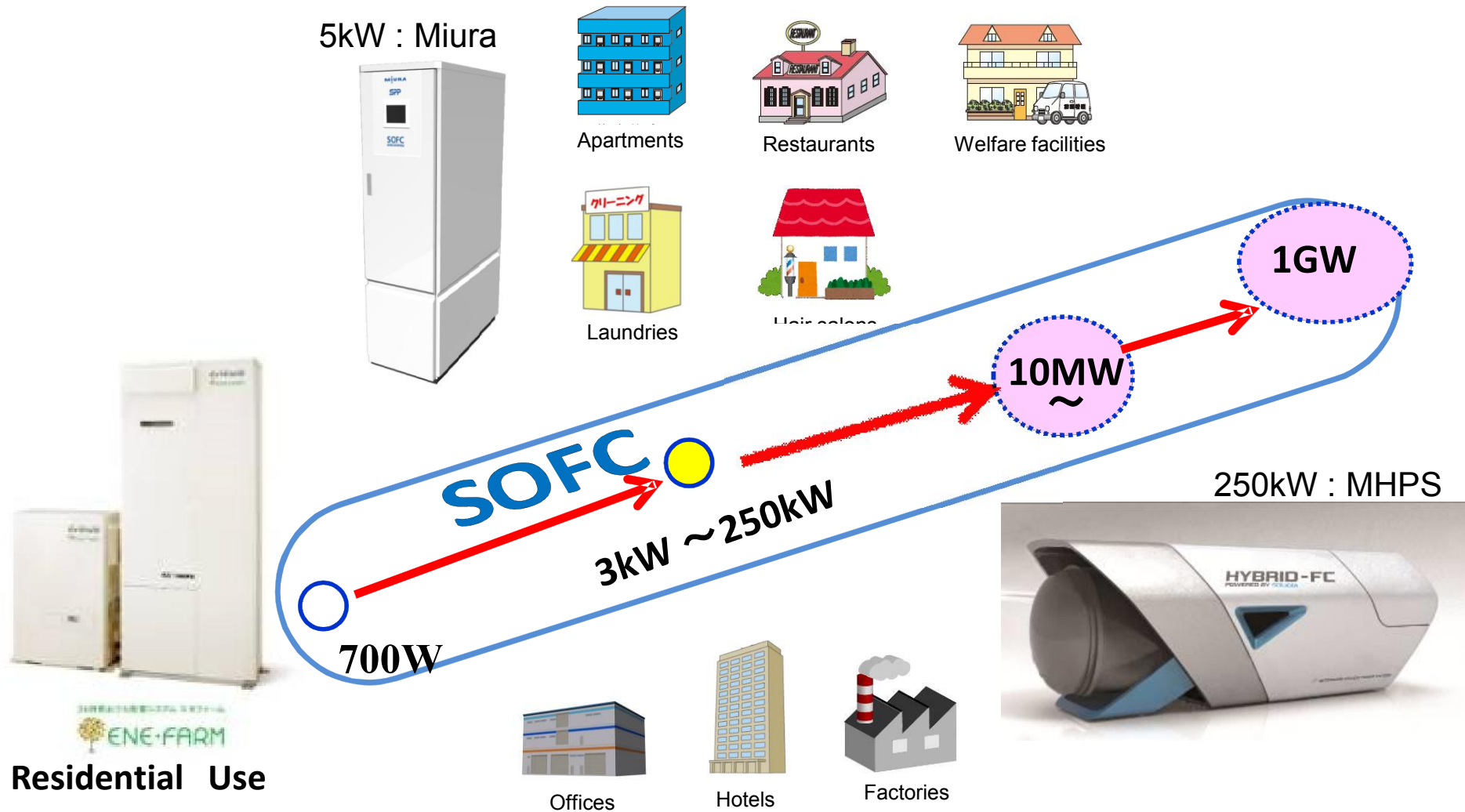
# Rapid Evaluation Method for SOFC Durability



Forecast 90,000 hour durability with short term data by using thermodynamics, chemical and mechanical analyses



# NEDO Development on SOFC





# Summary

- Japan has been successful in developing residential FC CHP system. Key of the success was cooperation among the equipment manufactures and energy suppliers in launching market.
- Continue developing fuel cells in order to expand the use of FCV and also stationary use of FC in power and heat supply.



**Thank you for your attention**

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