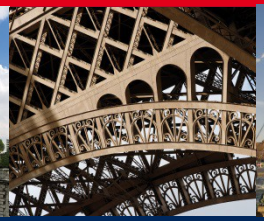
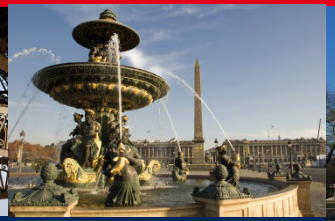
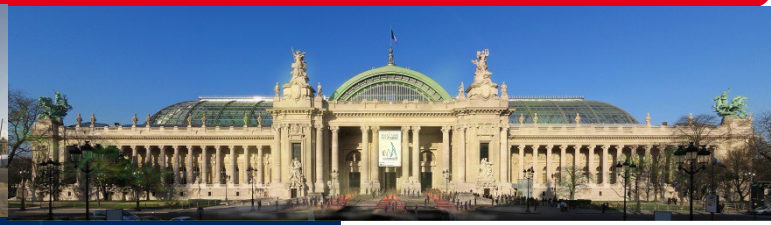
26th World Gas Conference

1 – 5 June 2015, Paris, France

Evolution of Residential Fuel Cell

Mr. Toshiki Shimizu
Smart Energy System Division
Panasonic Corporation

WGCPARIS2015
WORLD GAS CONFERENCE

Contents

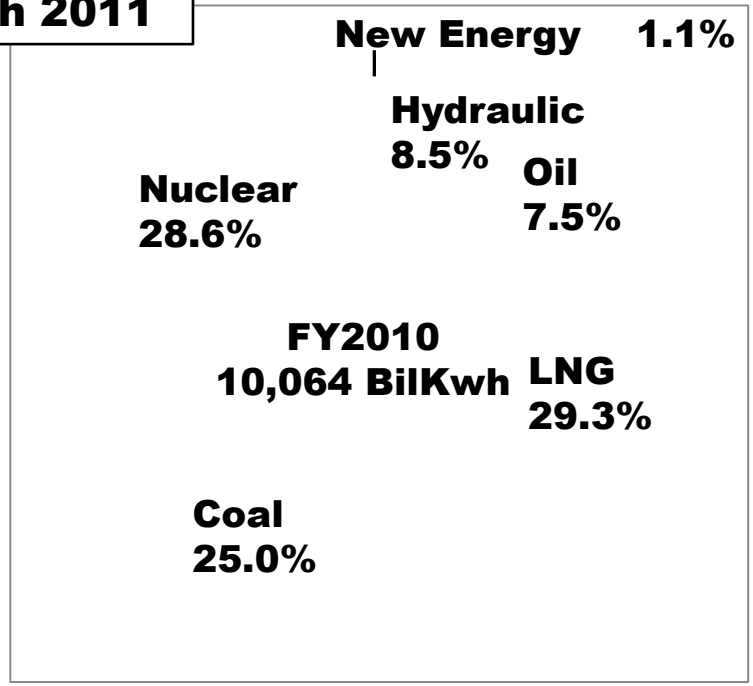
Contents Ⅰ

Ⅰ. Environment Surrounding Energy

Change of the Primary Energy

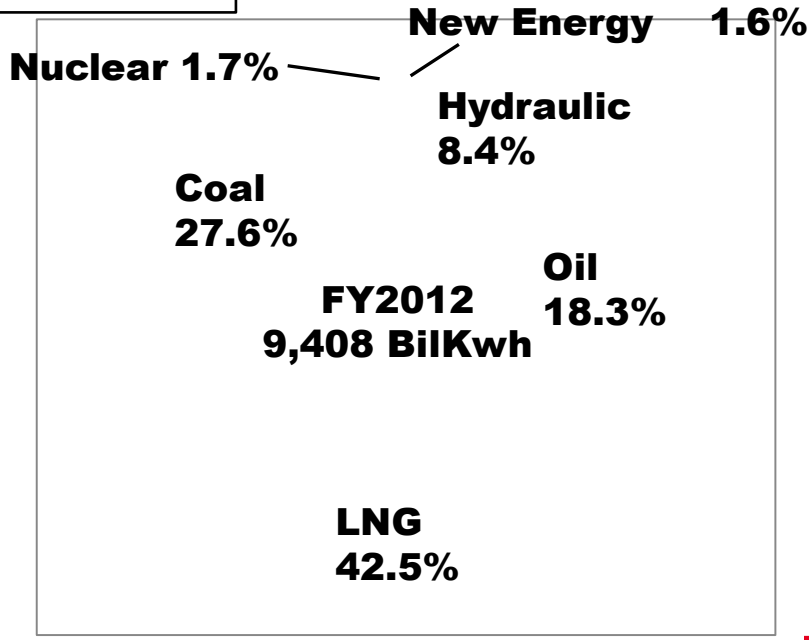
Before the Earthquake March 2011

OIL+LNG+COAL
６２％



After the Earthquake March 2011

OIL+LNG+COAL
８８％

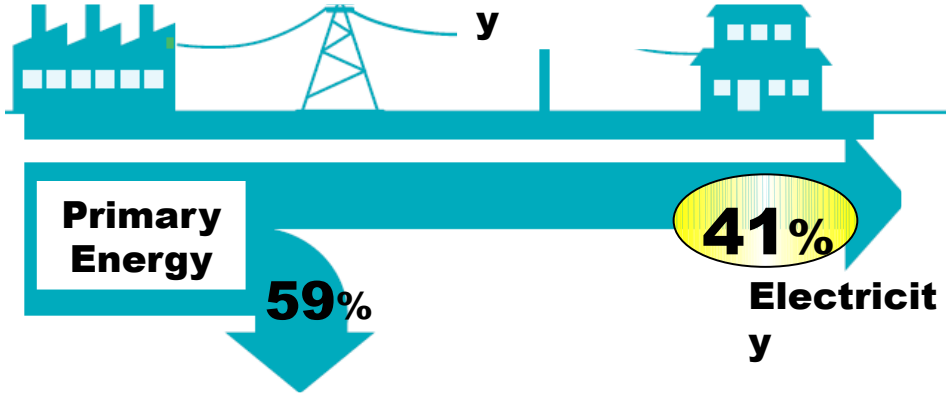


Source: Federation of Electric Power Companies 「Constitution of Power Generation amount by Power Source in the year of 2012」 Based on the released information in 17th, May 2013

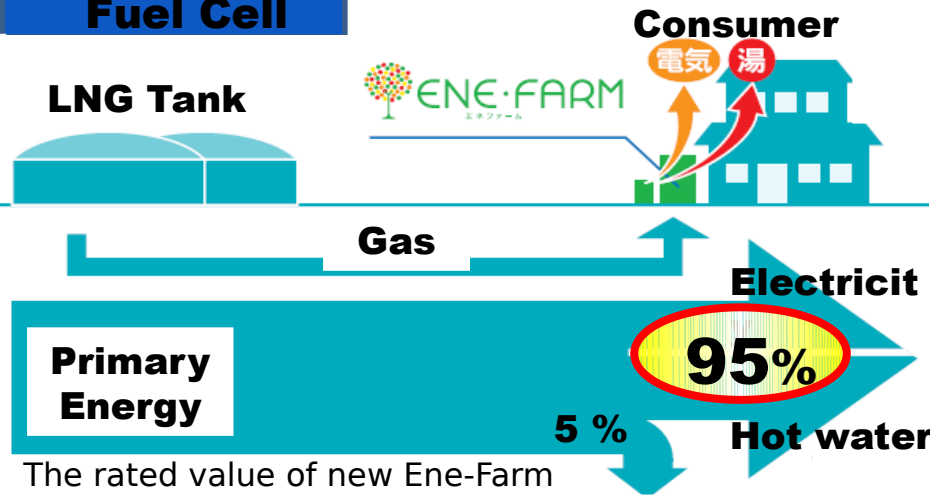
Advantage of Fuel Cell

◆High Energy Efficiency

Thermal Power Plant



Fuel Cell



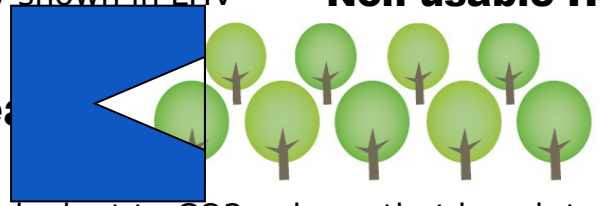
The rated value of new Ene-Farm

Efficiency shown in LHV

Based on regarding streamline of energy use

- **Reduction of CO2 emissions : 1.3t / ye**
- **Energy cost saving : 60,000 yen / year**

*Data from Panasonic



Equivalent to CO2 volume that beech tree forest of approx. 2,800 ㎡ in size absorb

Contents Ⅱ

Ⅱ．Panasonic’s Latest Development

Development History of Fuel Cell

1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015

Development

Basic technology → Practical use → Commercial i -zation → Large-scale field test

Commercial sales

Introduction → Enlarged Introduction → Penetration

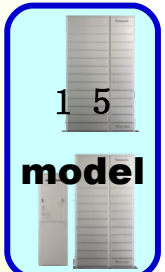
Installation at Prime Minister official residence

Opening of Kusatsu Factory

First shipping ceremony

model

model



model

Panasonic

NEDO Practical-use Experiments Penetration research → **NEDO** Strategically practical technology development

NEF Experimental field research → **NEF** Large-scale field test project

Government

(NEDO: New Energy and Industrial Technology Development Organization)
(NEF: New Energy Foundation)

FCCJ (Fuel Cell Commercialization Conference of Japan)

FCA (Fuel Cell Association)

ACEJ Advanced Cogeneration & Energy Utilization Center Japan

Industries

Promote initiatives with the government & related industries

The Features of 2015 Model

Hot water Storage tank Unit

Fuel Cell Unit

Remote controller

■Fuel Cell Unit

- Power Generation 700w – 200w
- Heat Generation 1000w
- Overall Efficiency 95.0%
  (Electricity39%+Heat56%)
- Durability 70,000 hours
- Dimension 1750(H) x 400(W) x 400(D)
- Weight 77kg

■Hot water Storage tank Unit

- Back up boiler output 41.9kw
- Water tank capacity 140L
- Dimension 1750(H) x 700(W) x 400(D)
- Weight 88kg(dry condition)

System Cost Reduction

■Simplified System (Fuel cell Unit)

・Parts numbers : Reduced approx. １５％（※）

・Weight : Reduced approx. １５％
(90⇒77kg）（※）

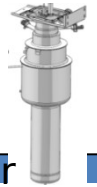
（※）against previous model

■Reduced Precious Metal

・Stack : Reduced Platinum

・Fuel processor : approx. 20%
Study for Catalyst material

Stack



Fuel Processor

◆RRP １．６ **million YEN**※（without TAX, Installation）

・・・Reduced **300K YEN**

(※) Case of Tokyo Gas (excluding the tax and installation)

(※) Available for without continuous power generation system

【Change of RRP】

Case of Tokyo Gas
(excluding the tax and installation)

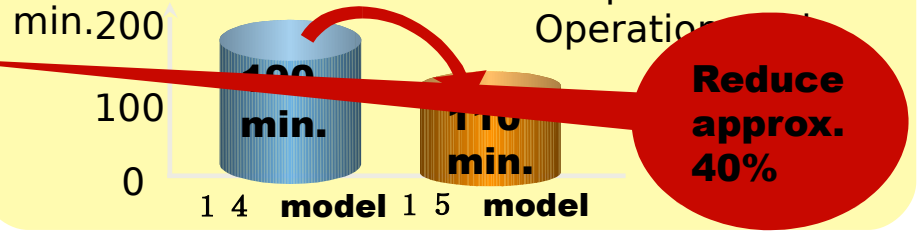
Reduction for Total Cost

Reduction of installation cost

-Reduction of the time for trial operation about 80min.

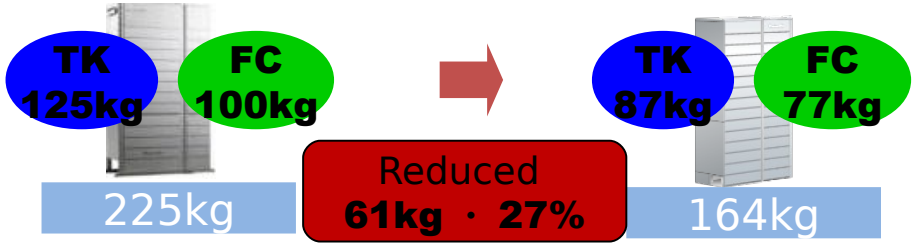
●Trial operation time

Simplified the start Operation



Improvement of installation

-Reduction of total weight about 61kg

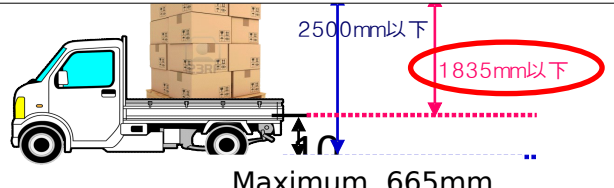


Reduction of transportation fee

-Total height should be under 1835mm

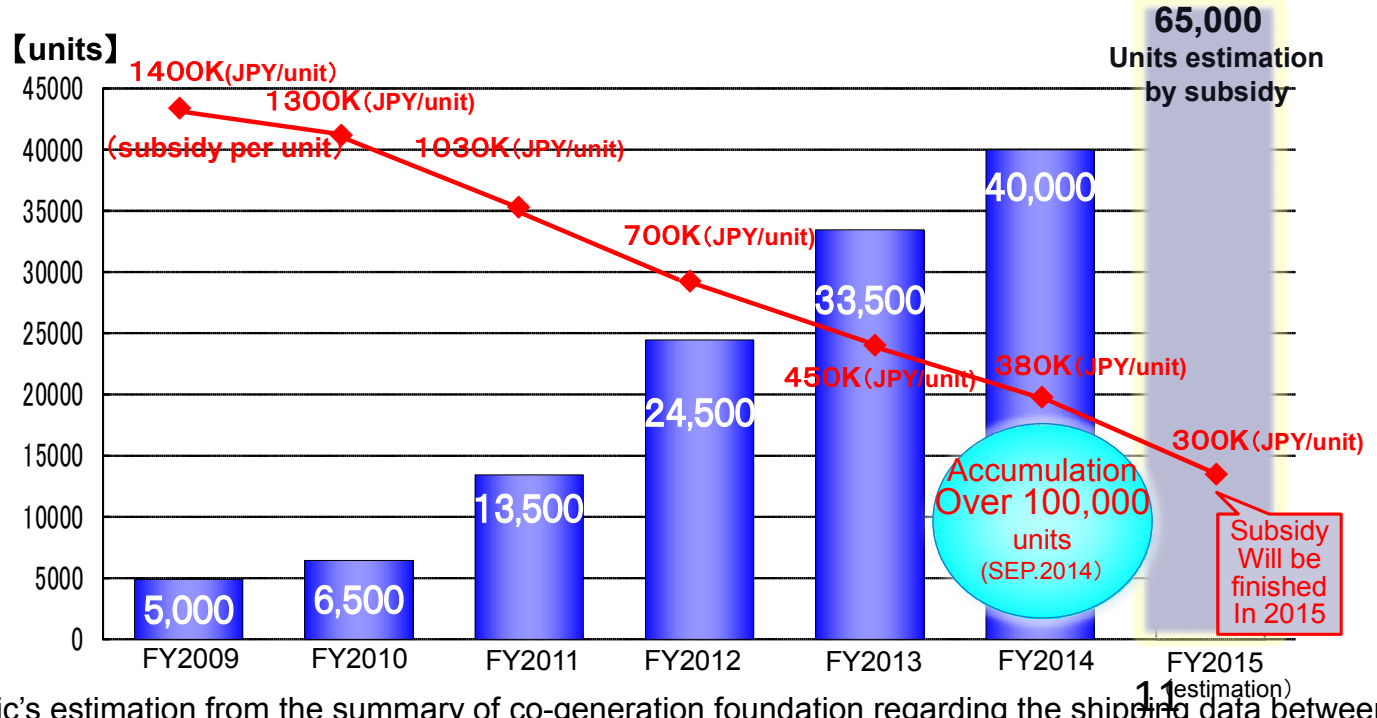
-Realized low cost transportation by small truck

(Reference) Japanese traffic regulation Maximum height is **2500mm**



Fuel cell Market Expansion in Japan

- Market is growing rapidly since 2009
- Accumulated quantity achieved 100,000 units in Sep. 2014
- Cost reduction should be needed because of decreasing the amount of subsidy



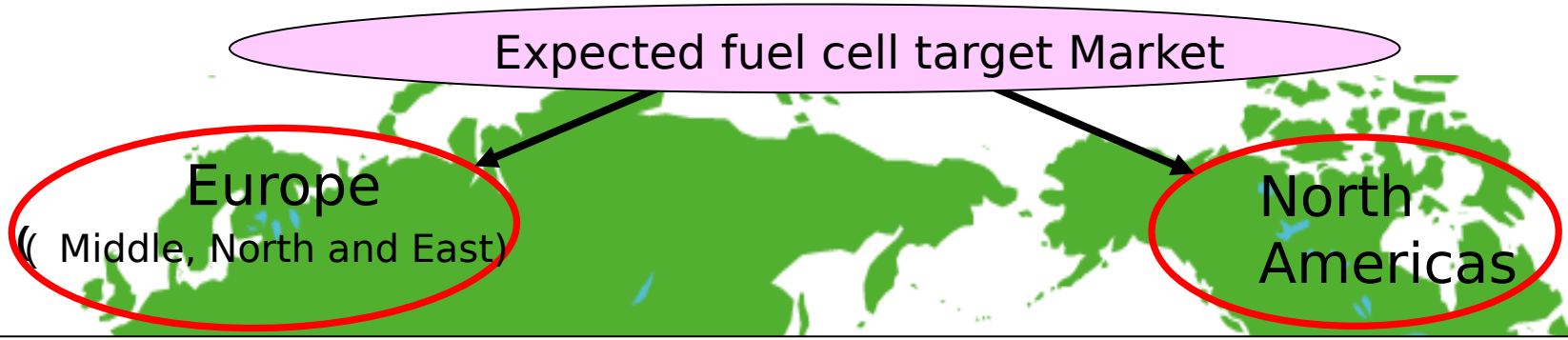
Source : Panasonic's estimation from the summary of co-generation foundation regarding the shipping data between 2009-2014

Contents III

Ⅲ. Activities for Global Expansion

The Global Market Potential of Fuel

◆The market expansion of Fuel Cell in EU and North Americas is expected from the view point of Gas infrastructure, comparison of Gas and Electricity bill and heat demand



- **High Heating demand**
- **Big price gap between Electricity and Gas**
- **Rich Gas infrastructure**

※ Research for Statistic of Natural Gas
(Japan Gas Association, Fuji-Keizai)

< Penetration of Natural Gas >

Country	Penetration of Natural Gas	Household numbers with Natural Gas
Germany	87 %	35 million
United Kingdom	81 %	22 million
Italy	84 %	21 million
Japan	49 %	24 million

Adaptation to European Environment

■Variety of Gas composition

Japan : Liquefied Natural Gas (LNG)

- Low contamination by liquefaction
- Imported by the tanker

Germany : Gas Pipe line Network

- Rich contamination (sulfur, nitrogen and others)
- Various gas composition at the each area
- Gas composition will be changed by the political reason and the cost factor.

Source : SYSTEM DEVELOPMENT MAP 2011
Gas Infrastructure Europe Web site

■Difference of Environment

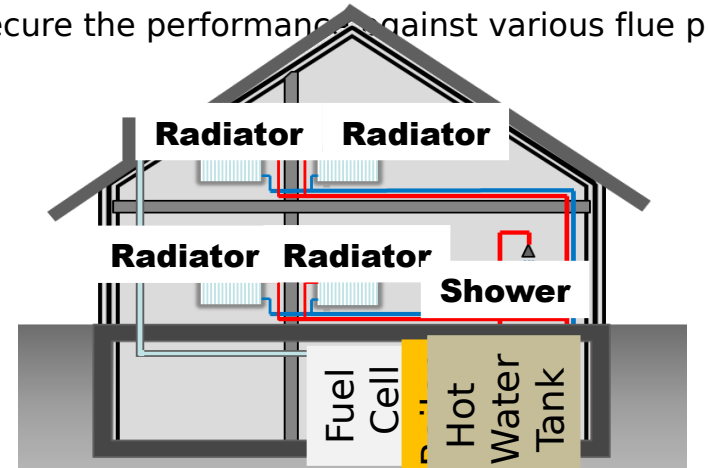
Japan : Outside installation

: Hot water for Kitchen and Bath

Germany : Inside installation

: Space heating demand

- Heating demand is approx. 4 times of Japan
- Adaptation of the local heating circuit system
- Secure the performance against various flue pipe



R&D Activities in EU

- Development of the suitable system for local operating condition and installing environment
- On site investigation with local gas composition

UK, Cardiff

Established in Sep, 2012

Germany, Langen

Established July, 2011

Developing matching product to the local usage condition for the early market introduction

1st European PEM Fuel Cell

1st European PEM Fuel Cell System※ launched in April, 2014

Vitovalor 300-P

◆**Features**

1. **High efficiency**
2. **Simple construction for utility room**
3. **Easy to Use by Mobile device**

◆**Specification**

【**Power Generation**】 **750 W** （**constant**）

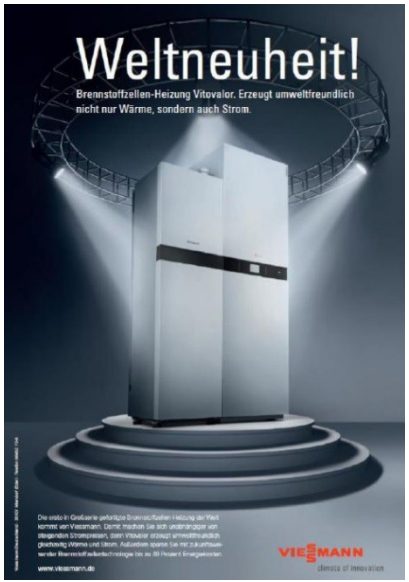
【**Heat Generation**】 **1000 W**

【**Overall Efficiency**】 **90%**（**LHV)**

(Electricity37%/heat53% ）

【**Durability**】 **60,000 hours** （**10 years**）

Start/Stop 4,000 times



Left ： Fuel cell

Right ： Hot water tank

+ VIESMANN boiler

※ As of 9th of SEP in 2013, residential PEFC type fuel cell system , Panasonic's estimation

Source: VIESMANN

Contents Ⅳ

Ⅳ . Trends for Spread

Smart House with Fuel Cell

Fujisawa SST(Sustainable Smart Town)

★ Fujisawa SST is offered by Panasonic

★ [redacted] have 1,000 houses (already completed 200 ho[redacted]

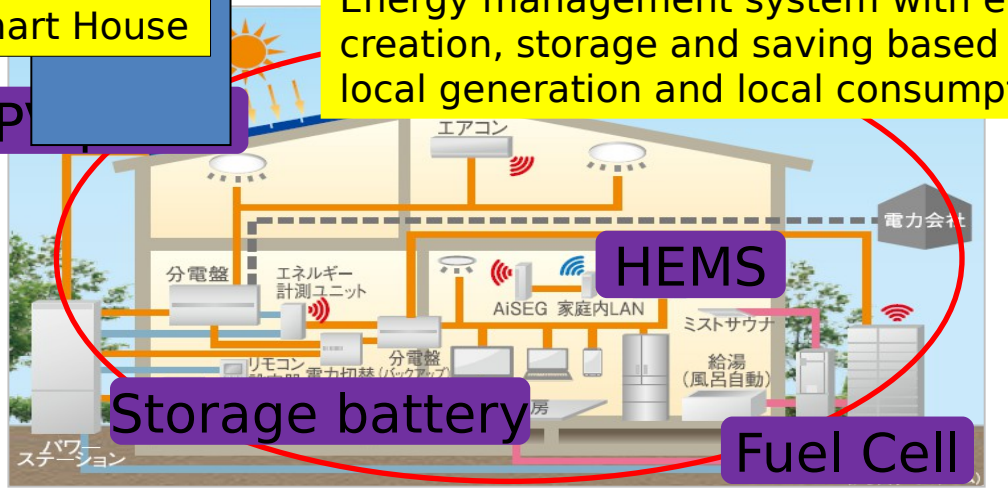
★ [redacted]ry and HEMS installed in all houses

★ [redacted]g to install Fuel Cell to most of houses

Target : CO_2 reduction 70% (vs. 1990) in whole Town

Smart House

Energy management system with energy creation, storage and saving based on local generation and local consumption



Installation sample

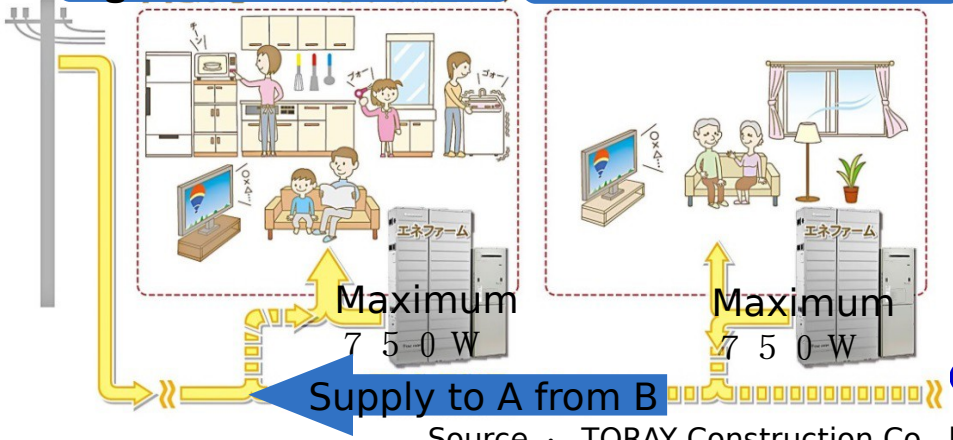
Application for Fuel Cell : T - Grid System(*

◆ **Maximize FC efficiency and Minimize buying electricity and CO2 emission**

- ◆ T-Grid is a energy management system
- ◆ FC ‘Ene-Farm’ will be installed to all 190 rooms
- ◆ All FCs are connected network and managed by T-Grid
- ◆ FC at low electric demand room supply to high demand room

Room A:
High electric demand

Room B:
Low electric demand



New building with T-grid system Feb.2017

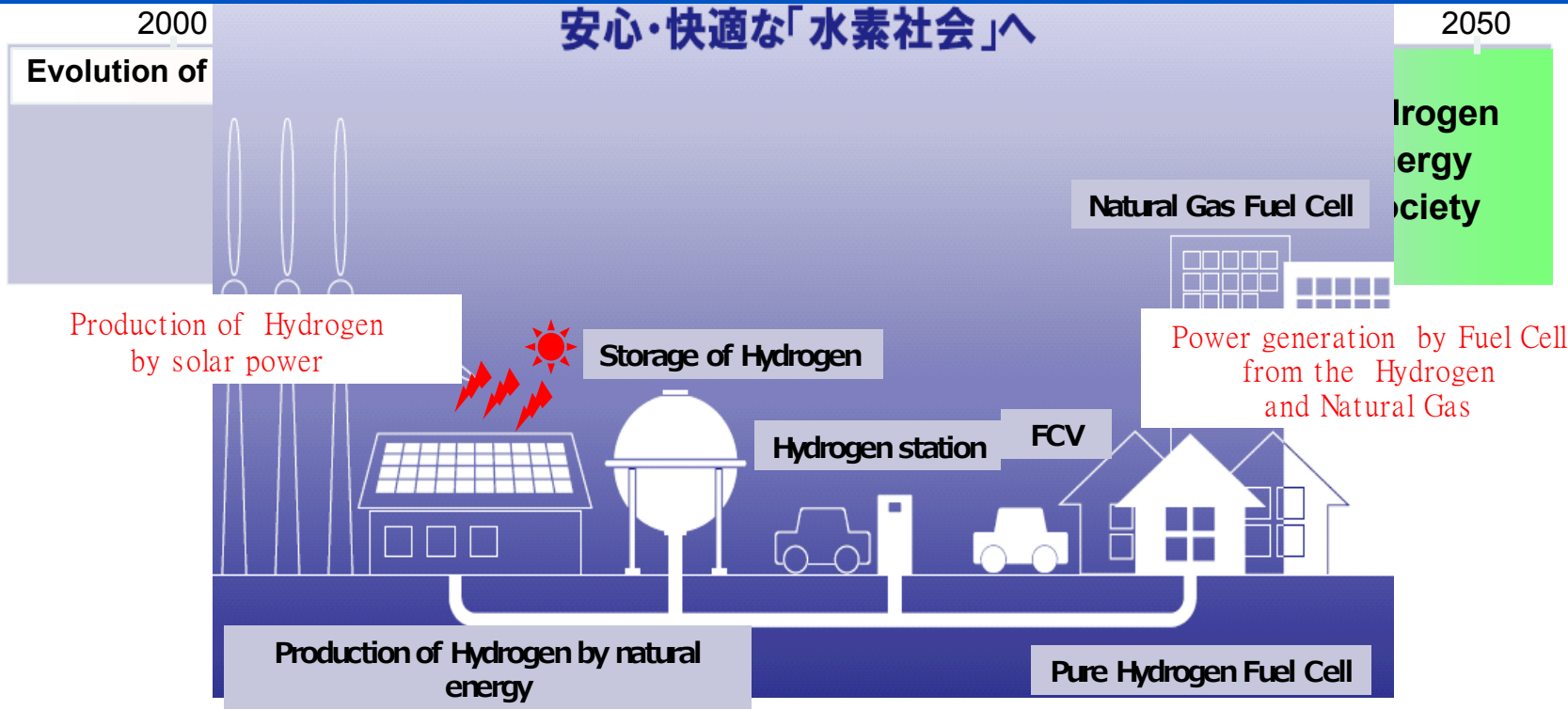
Source ： TORAY Construction Co., ltd, SHIZUOKA Gas Company

(*1) T-Grid is the town based local grid system

Establishment of the Hydrogen Energy Society

Toward the Ultimate clean "Hydrogen Energy Society"

based on evolution of Fuel Cell and Carbon-free Hydrogen



A Better Life,
A Better World

Panasonic will contribute comfortable life
for the customer and the global environment
by the spread and expansion of Fuel Cell