Hydrogen & Fuel Cell

IPHE Education & Outreach Working Group April 26 2017

Overview of FCH Developments in Japan

Current Status of RD & D in JAPAN

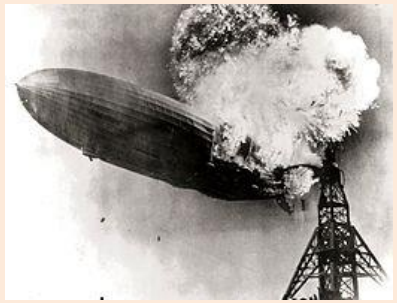
New Energy and Industrial Technology Development Organization

(NEDO)

Masataka KADOWAKI

Feeling for Hydrogen in Japan

Hindenburg Disaster



(1937 U.S.A.)

The sparks from static electricity ignited in the iron oxide and the aluminum mixture paints.

The cause was not hydrogen!

Fuel Cell Vehicle (Since 2014)

MIRAI (2014.12)

H_2-burning experiment

Hydrogen in test tube

Easy to extinguish.
But a scary memory.

Hydrogen Water (2015 Renewed)

Contents

1. Motivation

2. Current Activities (Phase 1)
   - Development of Fuel Cells
   - Deployment of Hydrogen Energy Society

3. Next Stage (For Phase 2 & 3)
   - New Activities

Motivation：Prime Minister's Leadership

Prime Minister Shinzo Abe delivered a policy speech.
(193rd of Diet, Jan. 20, 2017)

Hydrogen energy is the trump card for;
- Energy security
- Measures to address global warming

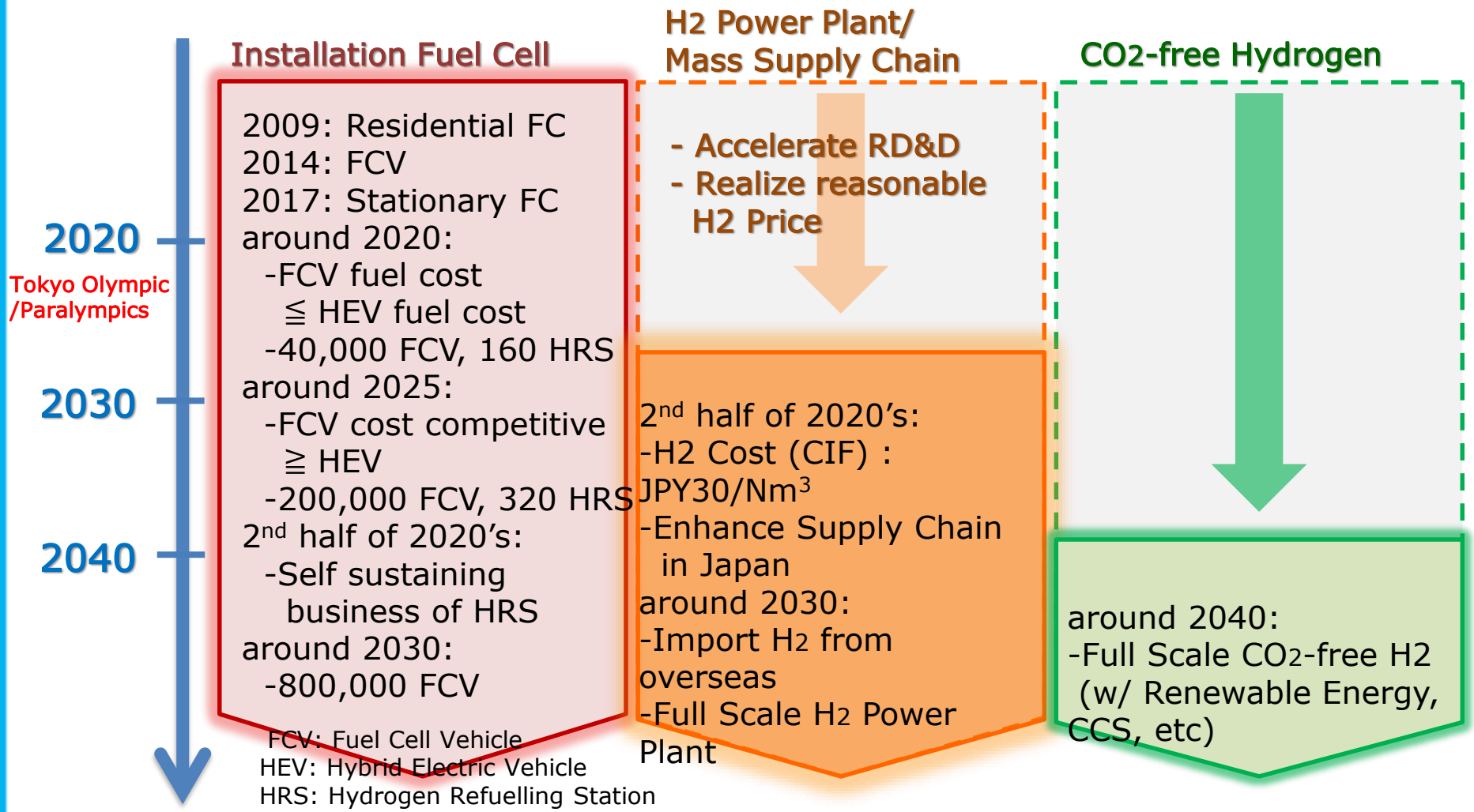
20 Jan. 2017: Policy Speech by Prime Minister Shinzo Abe to the 193rd Session of the Diet

Prime Minister Shinzo Abe attended the first meeting, the Ministerial Council on Renewable Energy, Hydrogen, etc. (April 11, 2017)

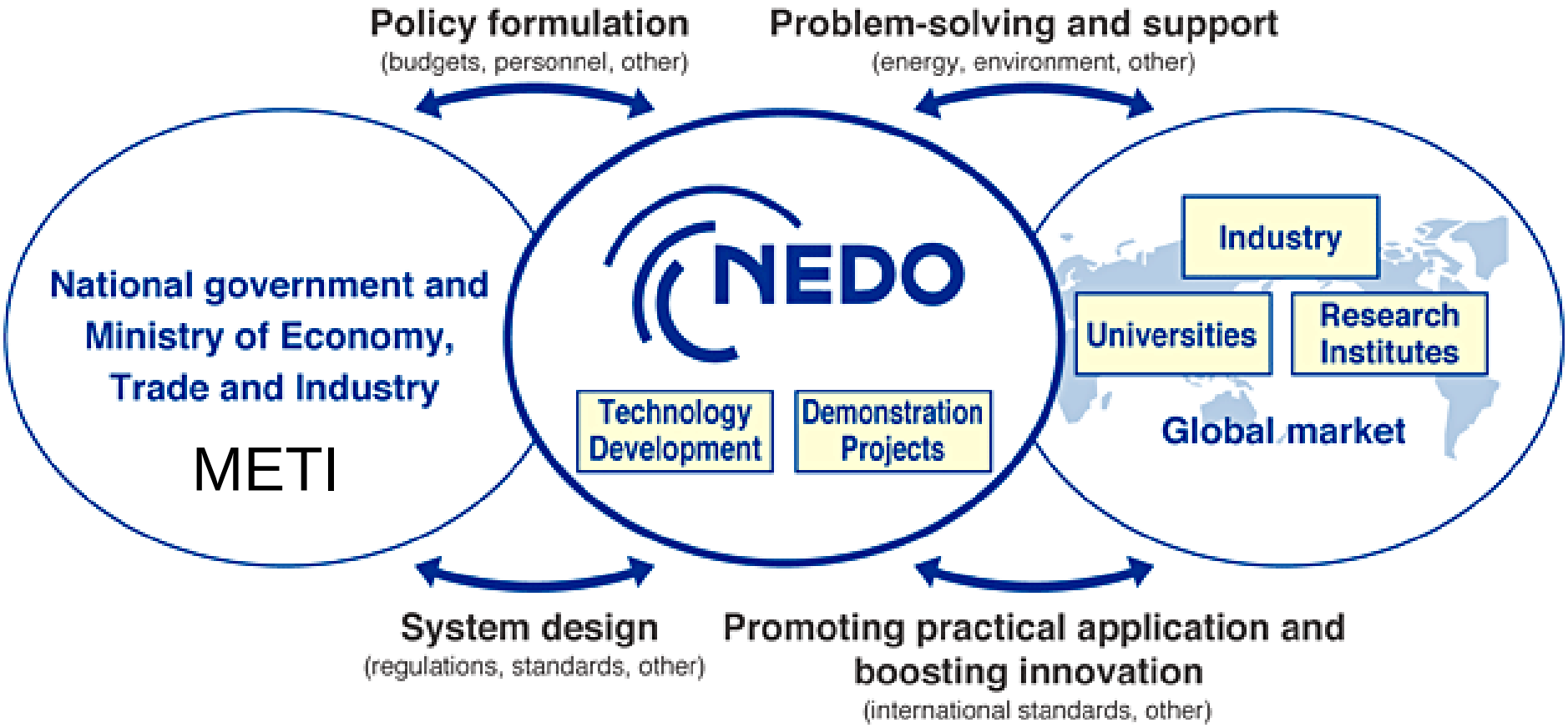
"Japan will be the first in the world to realize a hydrogen-based society."

Strategic Road Map for Hydrogen and Fuel Cells

Step by Step approach to realize Hydrogen Society



New Energy and Industrial Technology Development Organization



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Applications of Fuel Cells in JAPAN

Micro CHP Fuel Cell System for Residential Use (Since 2009)

ENE・FARM
エネファーム

Fuel Cell Vehicle (Since 2014)

MIRAI
（2014.12）

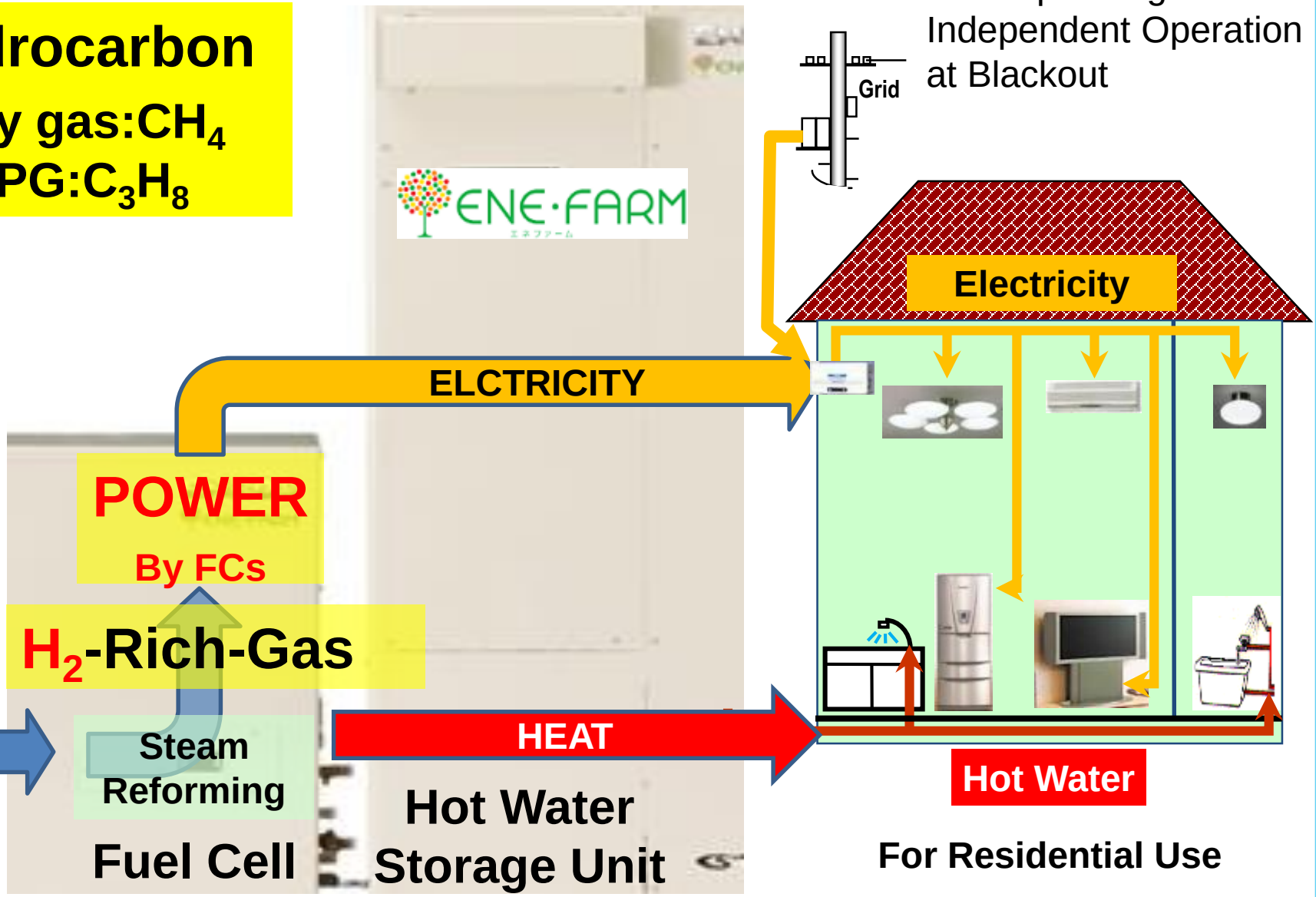
CLARITY FUEL CELL
（2016.3）

ENE-FARM

Hydrocarbon

City gas:CH_4
LPG:C_3H_8

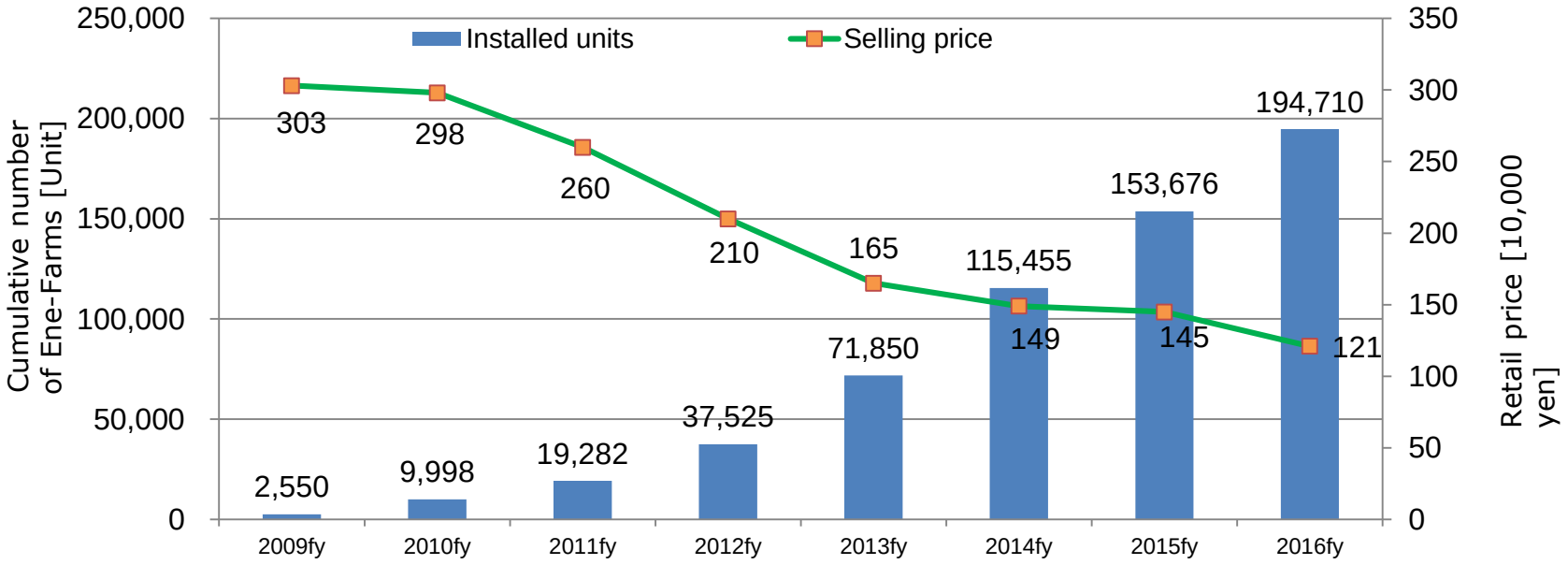
Corresponding to Grid Independent Operation at Blackout



Current Status: micro-CHP for household

- Total units installed: 194,710 (as of March 2017)
- Target: 1.4million units by 2020, 5.3million units by 2030
- Price: Currently dropped to less than half of 2009

Changes in the diffusion number and retail price



* Based on determination subsidization base

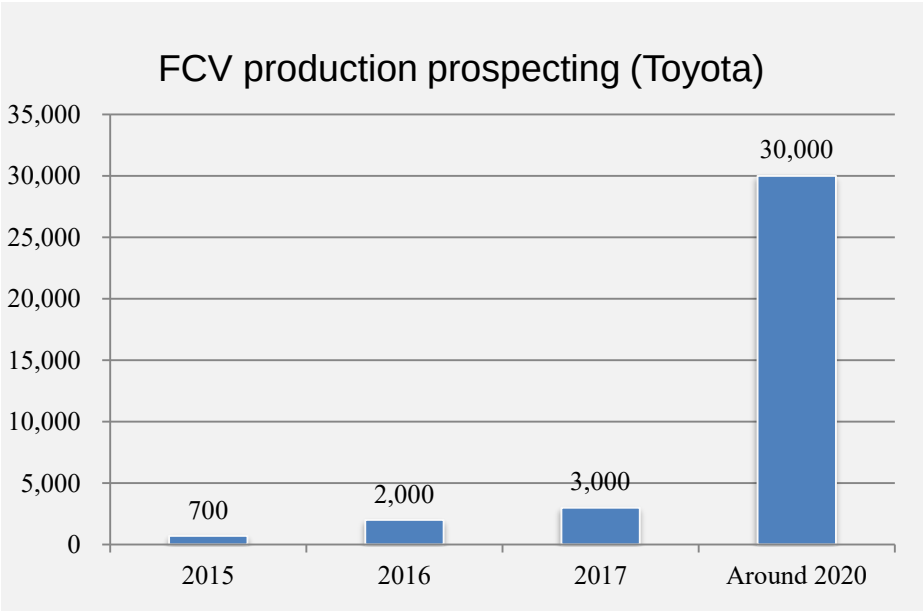
(As of the end of March 2017)

Current Status: FCV & FC Bus

TOYOTA

<December 2014>
- Released “MIRAI” at a price of 7.23 million yen

<October 2015>
- Announced its FCV sales plan of 30,000 in global market around 2020 or later.



HONDA

< March 2016>
- Released “CLARITY FUEL CELL” at a price of 7.66 million yen

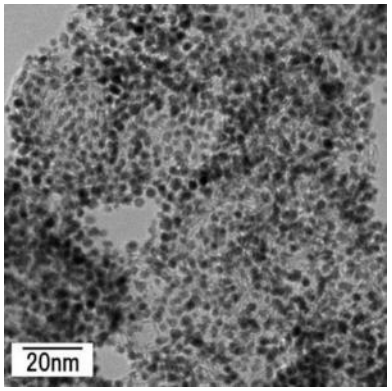
TOYOTA

<March 2017>
- Operating two fuel cell buses on metropolitan bus routes
- 100 FC-Bus in 2020 for Tokyo Olympic / Paralympic Games.

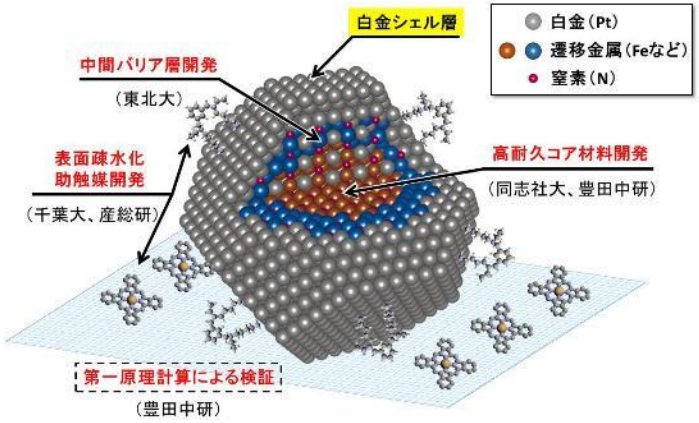
R & D of PEFC

Focusing on Basic Research

New Material Design Concept

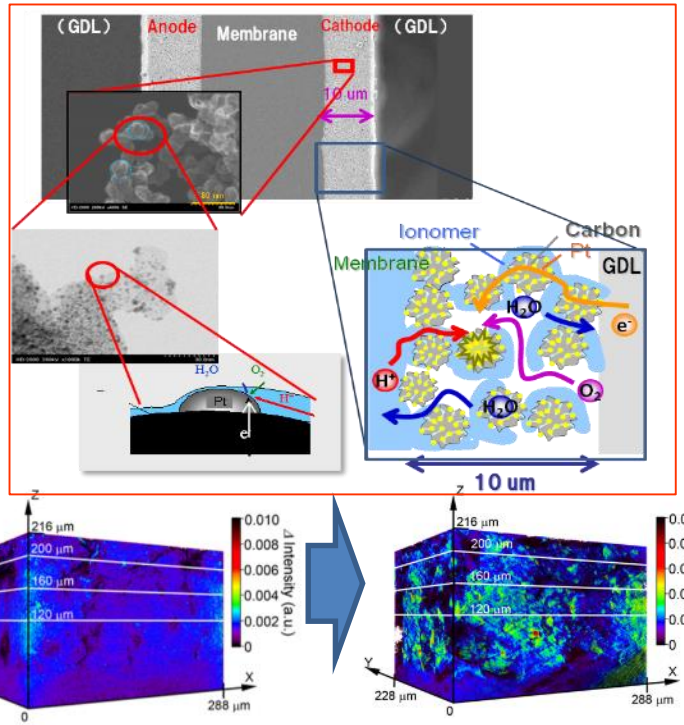


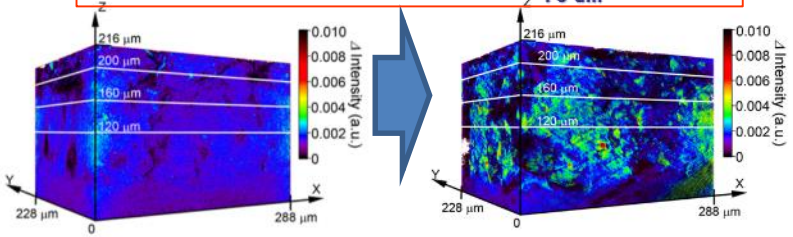
Prospect:
0.1 g-Pt / kW



University initiative (with private sector)

Analysis Technology



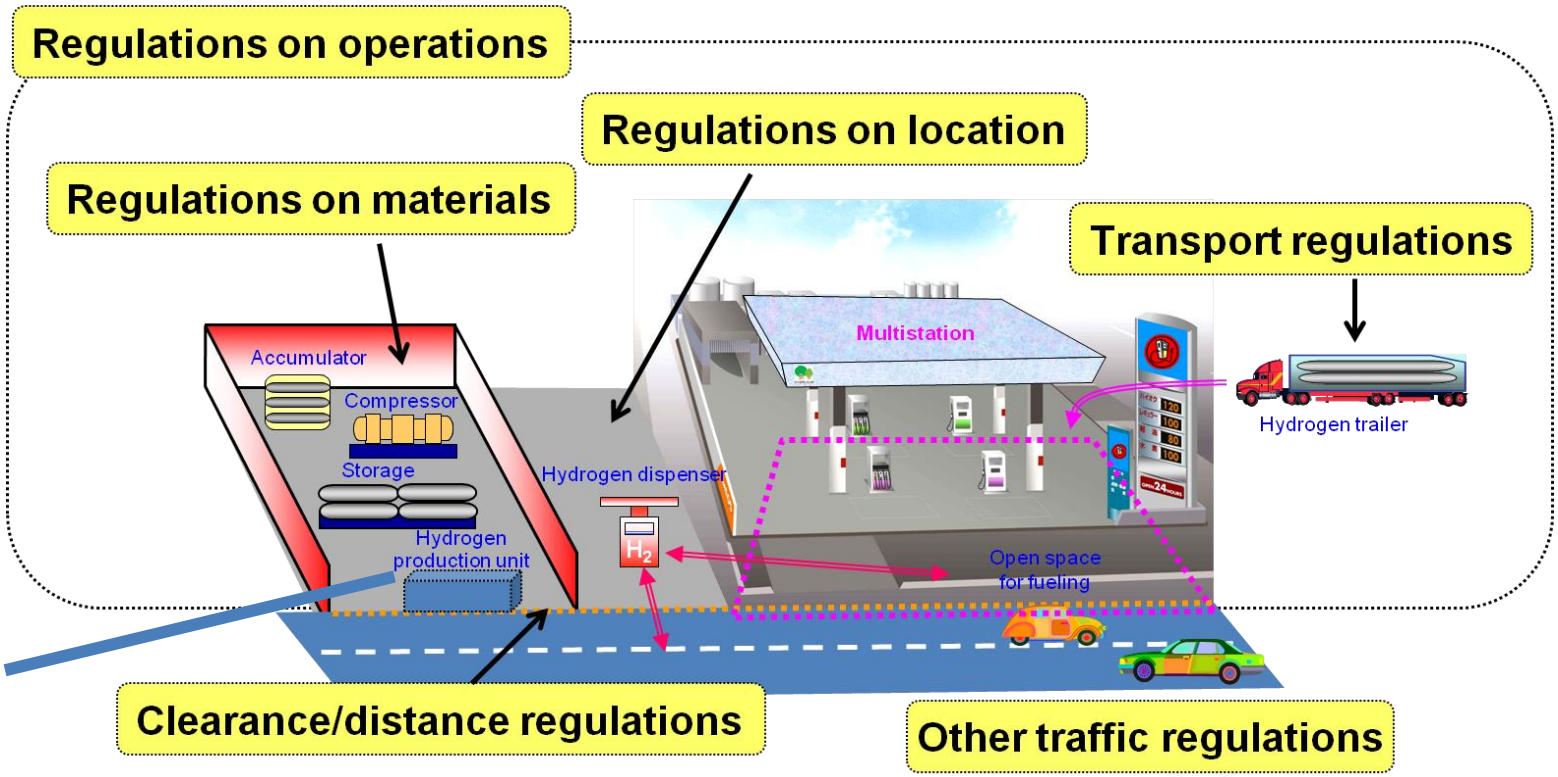


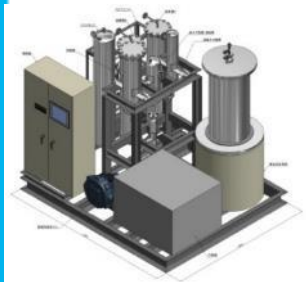
- ✓ Break down reaction process, deterioration mechanism
- ✓ Observe mass transfer (heat, oxygen, water, H^+)
- ✓ Durability testing (50,000 hrs.)

Research Consortium

HRS Infrastructure

Streamlining Regulation





R&D for Cost Reduction of Equipment

※ HRS: Hydrogen Refueling Station

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Large Scale H_2 Energy Utilization Project

Just Started Large Scale Hydrogen Energy Utilization Project: Enhancing Hydrogen Utilization

H_2 resources in Overseas

- Brown coal
- By-product
- Associated gas

Convert to Hydrogen Carrier

Liquid H_2

Organic Chemical Hydride

Convert to Hydrogen

H_2 Utilization In Japan

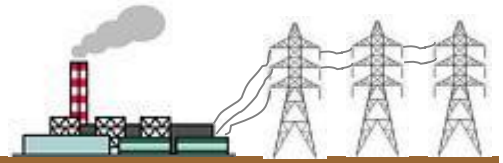
- Large Scale Power Generation
- Small Scale GT / Heat and Power

CCS Tech.

Production

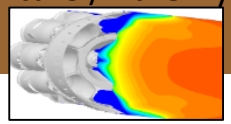
Storage

Storage



Utilization

Hydrogen Gas Turbine
(NG mixture / Pure Hydrogen)



Overseas

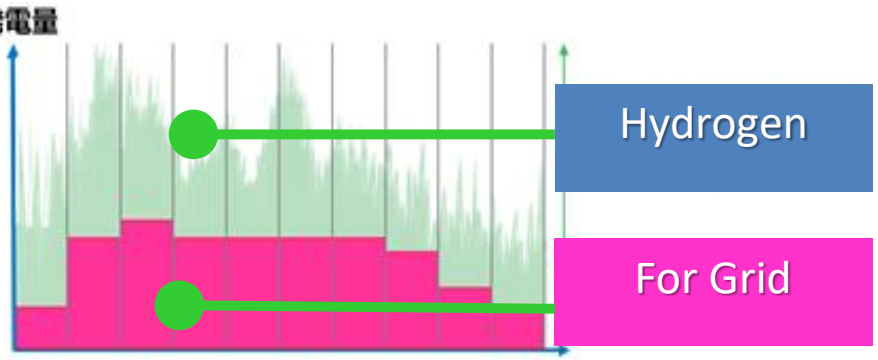
Japan

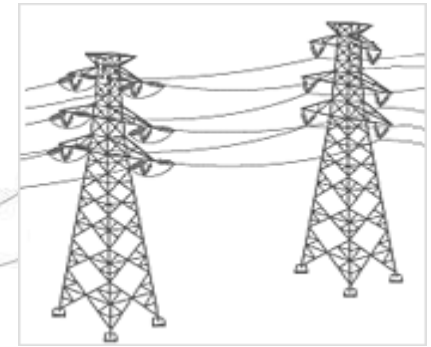
Mass & Long Distance Transportation

Power to Power

Enhancing Renewable Energy Potential with Hydrogen

Electrolysis → H_2 → POWER



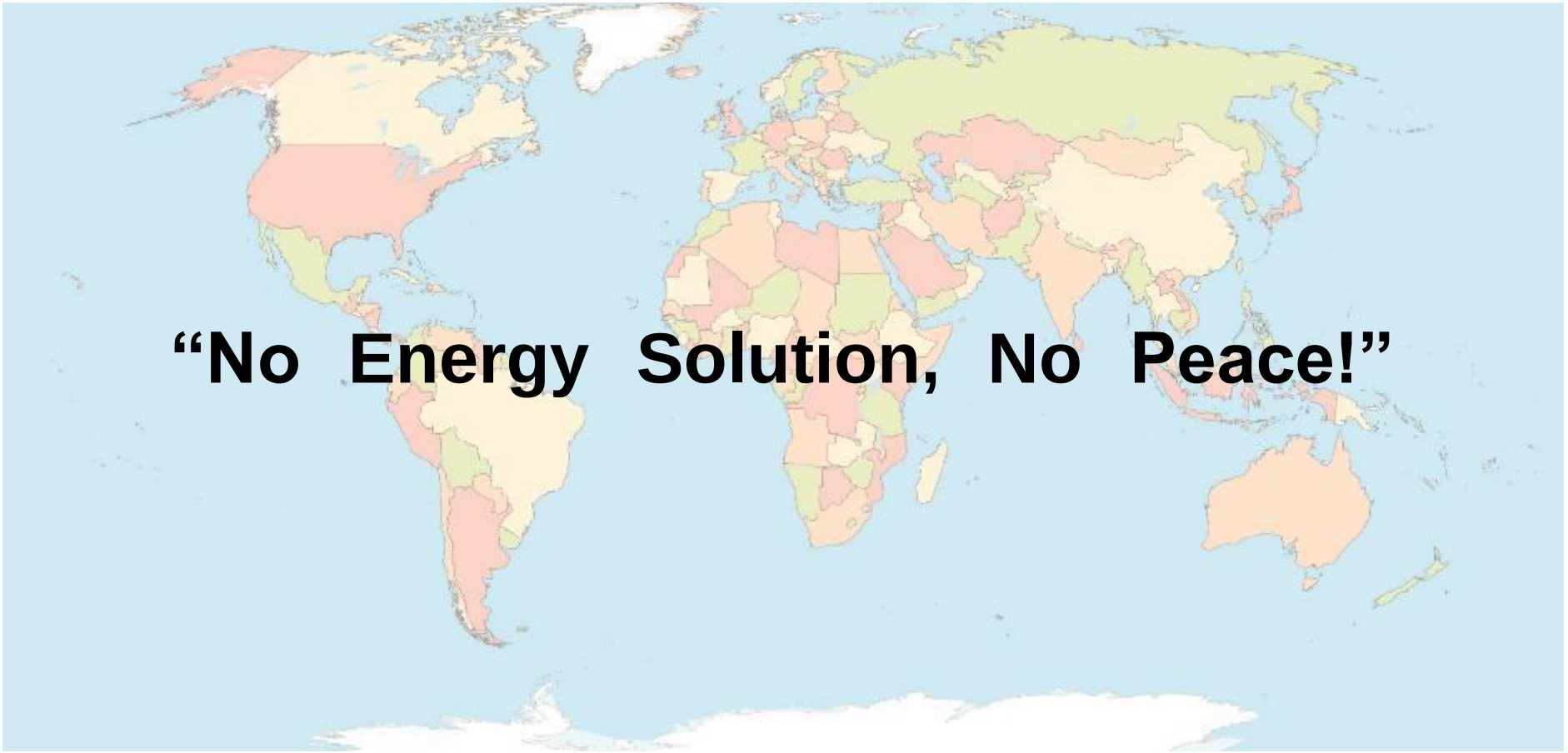


Time Shifting With Hydrogen

Real Time Use

Mutual Understanding

Geopolitical and Cultural Issues



Hydrogen is One of the Energy Solutions.

No Energy Solution, No Peace!

For the Up-Coming Hydrogen-based Society!!

with

www.nedo.go.jp