# Country Update

# JAPAN

## December 2nd, 2014

## 22nd IPHE SC Meeting

## Rome, Italy

# Japan's Policy on Hydrogen Energy

## Action to realize "Hydrogen Society"; at Strategic Energy Plan *(updated by Cabinet on April 11th ,2014)*

(1) Promote of Stationary FC

(2) Create of preferable market conditions for FCVs commercialization

(3) Develop new application toward wider H2 utilization (H2gas-based power generation, etc)

(4) Develop large-scale hydrogen supply chain (production/storage/delivery)

(5) Develop H2/FC Roadmap toward "Hydrogen Society"

# Strategic Road Map for Hydrogen and Fuel Cells

## 3 Phases toward "Hydrogen Society"

**Phase 1: Expand utilization of fuel cell (Present - )**

- Acceleration of dissemination micro-CHP (ENE･FARM)
- Market introduction of fuel cell for commercial / industry use
- FCV: Price equivalent to the hybrid vehicle
  (Hydrogen price: around 2020 / Vehicle price: around 2025)

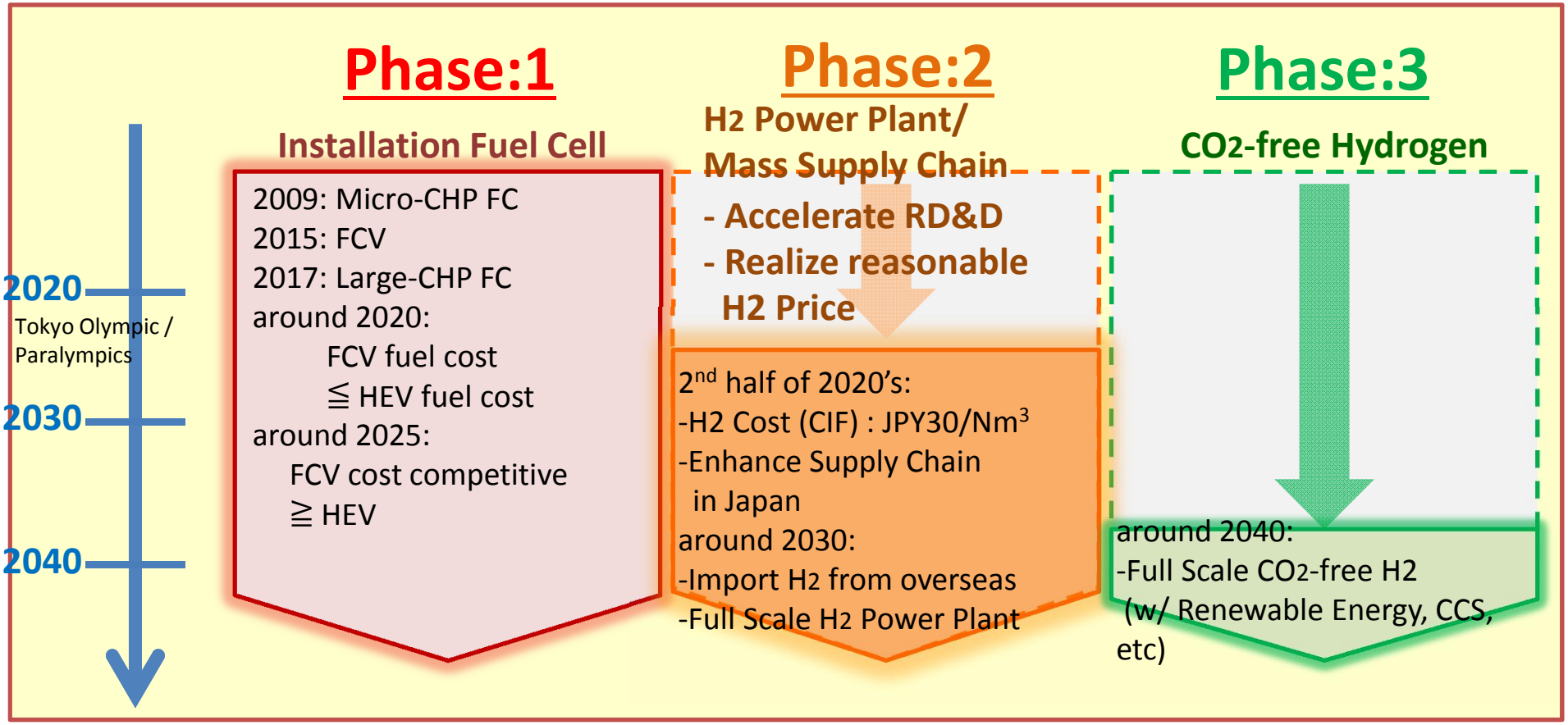
**Phase 2: Establish hydrogen supply chain with unused energy from overseas (second half of 2020's -)**

- Develop efficient transport / storage technology with chemical hydride, liquid hydrogen
- Market introduction on hydrogen power plant (2030)

**Phase 3: Establish CO2-free hydrogen supply chain (2040 -)**

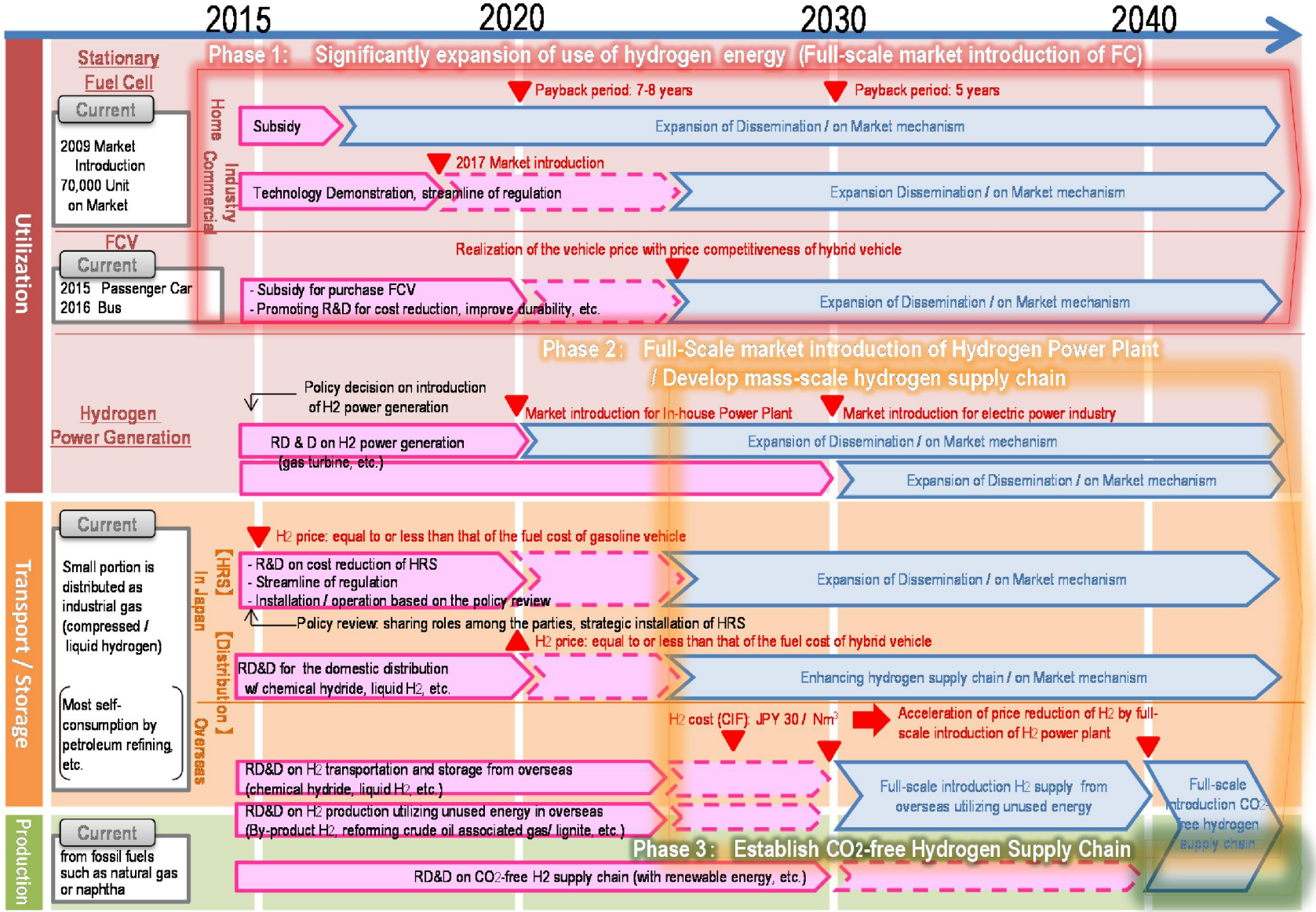
- Develop hydrogen production technology with renewable energy, CCS

# Step by Step approach to realize Hydrogen Society




## Create New Market on Hydrogen / Fuel Cell (Japan)

US$ 10 billion (2030) ⇒ US$ 80 billion (2050)


2015
2020
2030
2040
Utilization
Stationary Fuel Cell
Current
2009 Market Introduction 70,000 Unit on Market
Home Commercial Industry
Phase 1: Significantly expansion of use of hydrogen energy (Full-scale market introduction of FC)
Payback period: 7-8 years
Payback period: 5 years
Subsidy
Expansion of Dissemination / on Market mechanism
2017 Market introduction
Technology Demonstration, streamline of regulation
Expansion Dissemination / on Market mechanism
FCV
Current
2015 Passenger Car
2016 Bus
Realization of the vehicle price with price competitiveness of hybrid vehicle
- Subsidy for purchase FCV
- Promoting R&D for cost reduction, improve durability, etc.
Expansion of Dissemination / on Market mechanism
Phase 2: Full-Scale market introduction of Hydrogen Power Plant / Develop mass-scale hydrogen supply chain
Hydrogen Power Generation
Policy decision on introduction of H2 power generation
Market introduction for In-house Power Plant
Market introduction for electric power industry
RD & D on H2 power generation (gas turbine, etc.)
Expansion of Dissemination / on Market mechanism
Expansion of Dissemination / on Market mechanism
Transport / Storage
Current
Small portion is distributed as industrial gas (compressed / liquid hydrogen)
Most self-consumption by petroleum refining, etc.
H2 price: equal to or less than that of the fuel cost of gasoline vehicle
【HRS】 In Japan
- R&D on cost reduction of HRS
- Streamline of regulation
- Installation / operation based on the policy review
Expansion of Dissemination / on Market mechanism
Policy review: sharing roles among the parties, strategic installation of HRS
H2 price: equal to or less than that of the fuel cost of hybrid vehicle
【Distribution】 Overseas
RD&D for the domestic distribution w/ chemical hydride, liquid H2, etc.
Enhancing hydrogen supply chain / on Market mechanism
H2 cost (CIF): JPY 30 / Nm3
Acceleration of price reduction of H2 by full-scale introduction of H2 power plant
RD&D on H2 transportation and storage from overseas (chemical hydride, liquid H2, etc.)
Full-scale introduction H2 supply from overseas utilizing unused energy
Full-scale introduction CO2-free hydrogen supply chain
RD&D on H2 production utilizing unused energy in overseas (By-product H2, reforming crude oil associated gas/ lignite, etc.)
Phase 3: Establish CO2-free Hydrogen Supply Chain
Production
Current
from fossil fuels such as natural gas or naphtha
RD&D on CO2-free H2 supply chain (with renewable energy, etc.)
Proactive involvement of government
Proactive efforts of the private sector

# Budget volumes ( in FY 2015 budget request)

**Phase 1** — Dramatic expansion of hydrogen utilization (Full-scale installation of FCs in society)
Focus on implementation from the present

**Phase 2** — Establishment of a system for supplying hydrogen derived from untapped overseas energy resources
Realization in the late 2020s

**Phase 3** — Establishment of a system for supplying CO2-free hydrogen
Realization in 2040s

## Dissemination of stationary FCs

Subsidies for supporting introduction of micro-CHP (ENE-FARMs) [15 billion yen]

Promote the accelerated introduction of ENE-FARMs. Promote lower cost through mass production.


## Dissemination of FC vehicles

Subsidies for building HRS [11 billion yen]

Support the building of hydrogen fueling stations. Partially subsidize activities for creating new demand, etc.

Support for introducing FCV [Included in 30 billion yen]

## Building a hydrogen supply chain

Demonstrations for building a supply chain of hydrogen imported from untapped overseas energy resources [3.8 billion yen]

Demonstrate how hydrogen can be produced from untapped overseas energy resources, e.g., by-product hydrogen, brown coal, etc., transported in the form of liquefied hydrogen or organic hydride, and used to generate power.

## R&D of fuel cells, etc.

Technology development and demonstration of FCs [4.0 billion yen]

Conduct R&D to enhance performance and lower costs of FCs, and demonstrate commercial applications of FCs.

FCs for commercial application

Technology development for hydrogen fueling stations, etc. [4.5 billion yen]

Develop technologies to lower costs of hydrogen fueling stations, enhance safety and security and collect data so as to review regulations.

## Construction of a hydrogen energy network

Construction of a hydrogen energy network [Included in 3.0 billion yen]

Build a network that effectively connects multiple hydrogen applications in the region.

## Development of hydrogen production, transport and storage technologies

Development of technologies for producing, transporting and storing hydrogen derived from renewable energy sources [1.75 billion yen]

Develop technologies of high efficiency water electrolysis units, tanks for storing liquefied hydrogen, etc. with the use of renewable energy sources in mind

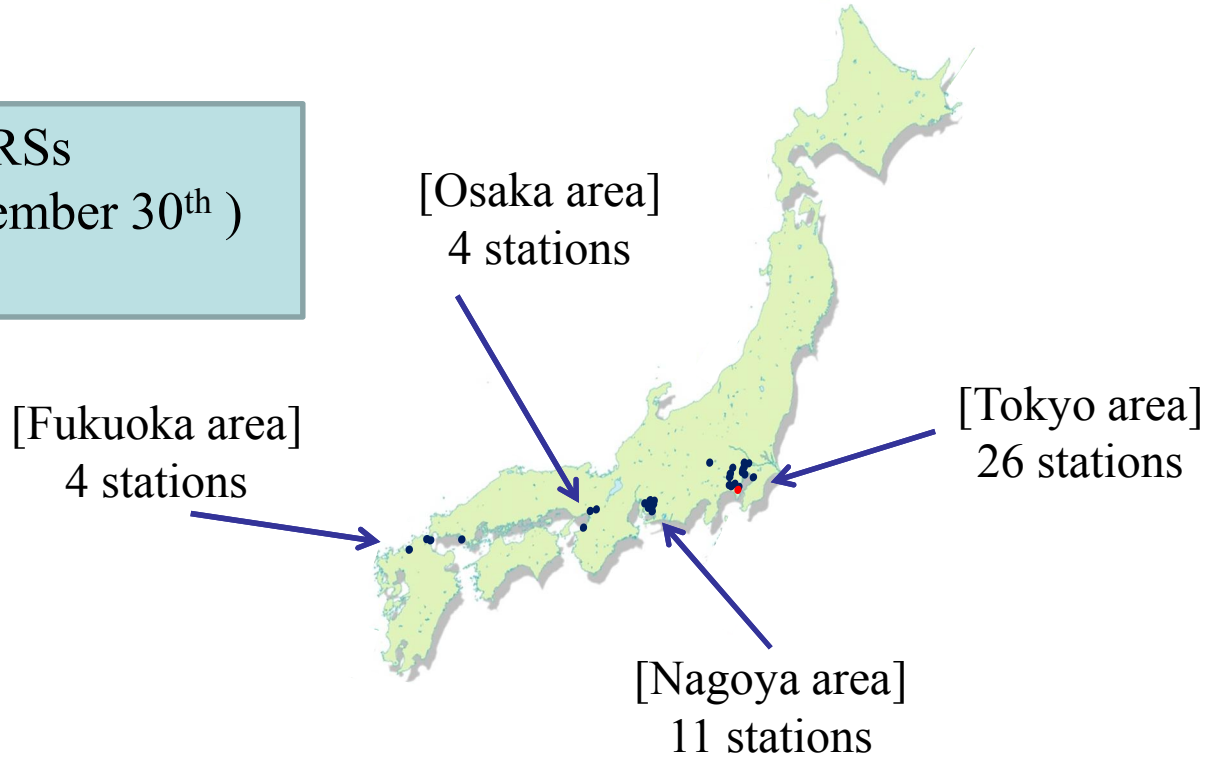
# FCV and HRS are on start line of Commercial

| FCV | HRS |
|---|---|
| ■ **TOYOTA**<br>Toyota Motor Corporation will launch its new FCV, "Mirai" in Japan on December 15th , 2014.<br>  <br>■ **HONDA**<br>Honda has unveiled its new FCV CONCEPT. (launch within FY2015)<br>  | ■ **Iwatani**<br>Japan's first commercial HRS has opened in Amagasaki on July 14th , 2014, and second one has opened in Kitakyushu on October 22nd , 2014.<br>  <br>■ **JX Nippon Oil & Energy**<br>JX's First commercial HRS is going to open in December, 2014 and total 11 HRSs will open by the end of March, 2015.<br>  |

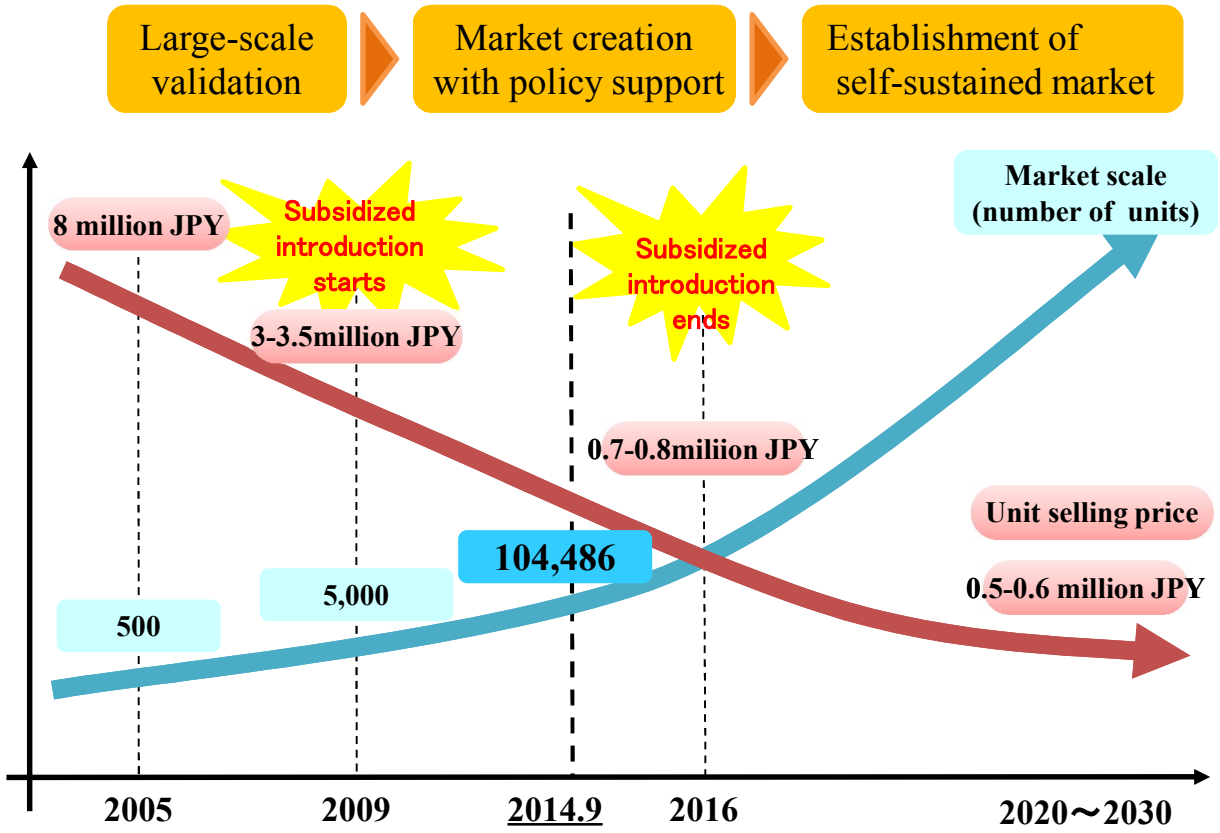
# Promotion of HRS Installation

- Prior to market introduction of FCVs, 100 HRSs will be installed in four major metropolitan areas.
- METI subsidizes about 50 % of HRS installation cost (63 million USD in FY2014)

Status of HRSs
(as of November 30th )
45 stations



# Residential FCs ("ENE-FARM")




- **Total units installed: 104,486 (as of 2014.9)**
- **Target: 1.4million units by 2020 5.3million units by 2030**

ENE·FARM

# Action by Tokyo Metropolitan Government

- Conveying to the world the information on the technologies of hydrogen by taking advantage of the 2020 Summer Olympic Games in Tokyo.

## (1) HRS Installation

35 stations in 2020, 80 stations in 2025

## (2) Promote of FCV, FC Bus

FCV: 6,000 in 2020, 100,000 in 2025

FC Bus: over 50 by 2020

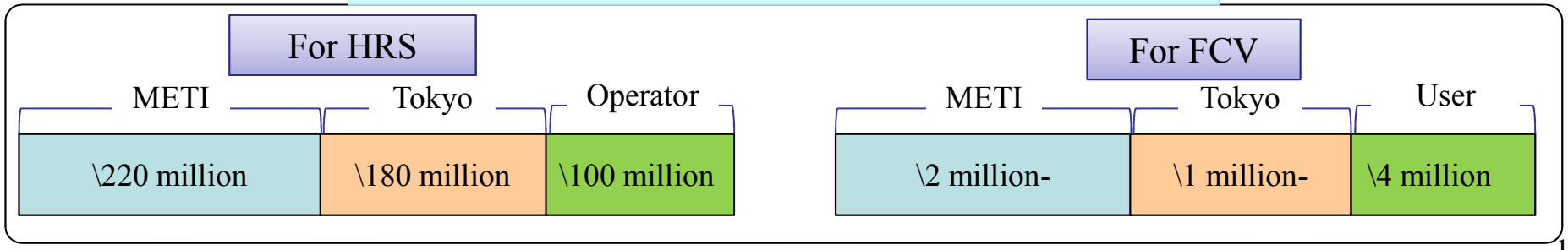
## (3) Promote of micro-CHP and large-CHP

micro-CHP: 0.15 million units in 2020, 1 million units in 2030

large-CHP: market introduction in 2017

## (4) Stable Hydrogen Supply / Improve of Social Acceptance

Example of Subsidies (standard model case)



# NEDO's Program for Hydrogen Infrastructure

## Item 1: Streamlining Regulations

"Regulation Reform Plan" (Cabinet approved in June 2013) etc.
- 25 items were identified as priority
  (e.g. Location, Distance, Materials, Transport)

## Item 2: R&D on low cost equipment for HRS

e.g. Accumulator, Compressor, Pre-cooler, Reformer

## Item 3: Code and Standard

e.g. Quality, Metering, Fueling, Inspection

## Item 4: Safety

e.g. HRS reliability Database, Social acceptance

# NEDO's Program for Fuel Cell

## Item 1: Basic technology

e.g. Analysis to enhance MEA performance, Accelerating durability test method ,
Low precious metal catalyst

## Item 2: Basic Production technology

e.g. Technology for mass production, Quality management technology,
Demonstration for commercial applications

## Item 3: Next generation technology

e.g. High performance Fuel Cell components and materials for next generation

**What have been the most valuable aspects or outcomes of IPHE ?**

*The IPHE has been the mechanism for information sharing on hydrogen and fuel cell.*

**What is your greatest need that can be addressed through IPHE?**

*IPHE can promote the harmonization of infrastructures and education on hydrogen and FC.*

**List top 3 actions/next steps to be undertaken through IPHE.**

- *Increase IPHE's function of policy forum by ensuring government officials' representation, as well as by inviting new members.*
- *Enhance the activities on publications and outreach.*
- *Enhance collaborations by IPHE mechanism such as workshops.*

**List at least one specific action you would be willing to support.**

*Promote HRS reliability database with other countries.*