

# Introduction of NEDO's Activities for Hydrogen and Fuel Cell Technology.

**26 February 2019**

**New Energy and Industrial Technology Development Organization (NEDO)**

# Agenda

1. NEDO's role in Japan
2. Basic Hydrogen Strategy
3. Current Status of Fuel Cell Application
4. NEDO's programs

## **New Energy and Industrial Technology Development Organization (NEDO)**

**Foundation** Originally established on October 1, 1980;  
reorganized as an incorporated administrative agency on October 1, 2003

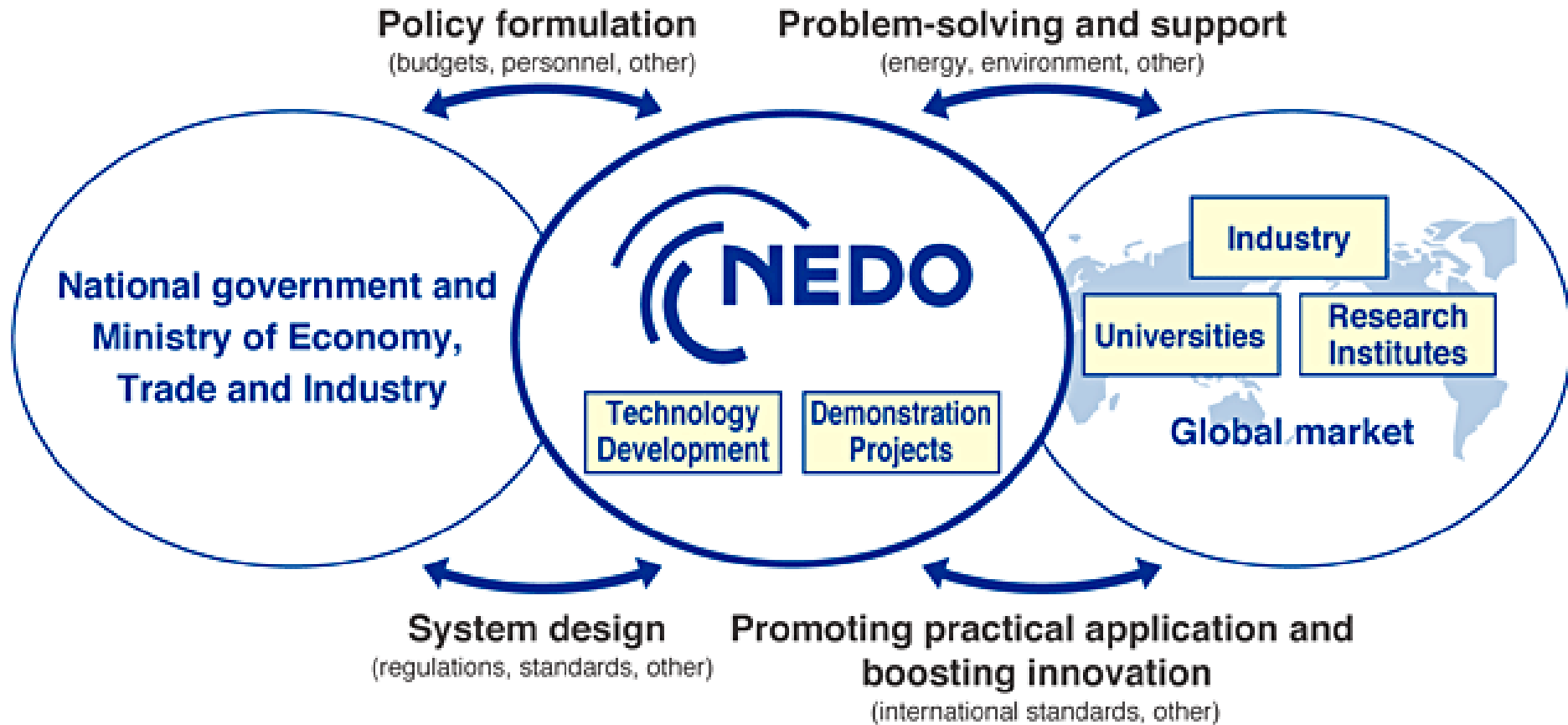
**Minister in Charge** Minister of Economy, Trade and Industry (METI)

**Personnel** 926 (as of 1<sup>st</sup> April, 2018)

**Chairman** Mr. Hiroaki ISHIZUKA

**Budget: 160 billion JPY (1.45 billion USD) in 2018**

# Who we are...



- ✓ Addressing energy and global environmental problems
  - Development of new energy and energy conservation technologies.
  - Stable energy supply and the resolution of global environmental problems.
  
- ✓ Enhancing industrial technology
  - Pursue R&D of advanced and practical technology.

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## ● Points to be considered;

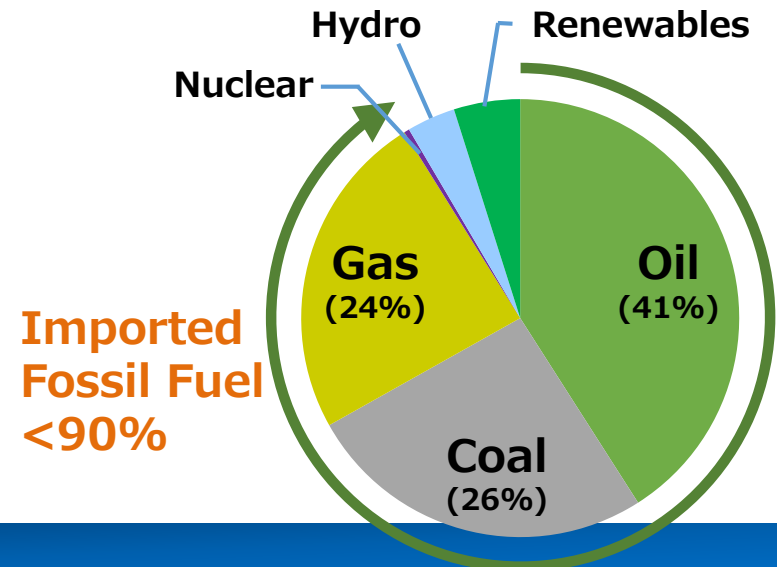
- ✓ Contribute **decarbonization**  
(**E**nvironment)
  - ✓ Mitigate **dependence on specific countries**  
(**E**nergy security)
  - ✓ Enable to utilize **low cost feedstock**  
(**E**conomic affordability)
- + **Japan's edge in technology** since 1970s

3" E" + Safety

## ● Measures;

- ✓ Energy saving
- ✓ Renewable energy
- ✓ Nuclear energy
- ✓ CCS + Thermal power
- ✓ **Hydrogen**

Japan's Primary Energy (2015)



## 1<sup>st</sup> Ministerial Council on Renewable Energy, Hydrogen and Related Issues (11<sup>th</sup> April 2017)

Prime Minister Shinzo Abe stated "***Japan will be the first in the world to realize a hydrogen-based society. I request relevant ministers to formulate the basic strategy within this year.***"

*In particular, he requested relevant ministers to*

- *accelerate the establishment of hydrogen refuelling stations & streamline regulations*
- *formulate a common scenario toward the building of supply chains and the full-scale introduction of hydrogen power generation*





## ➤ 2050 Vision:

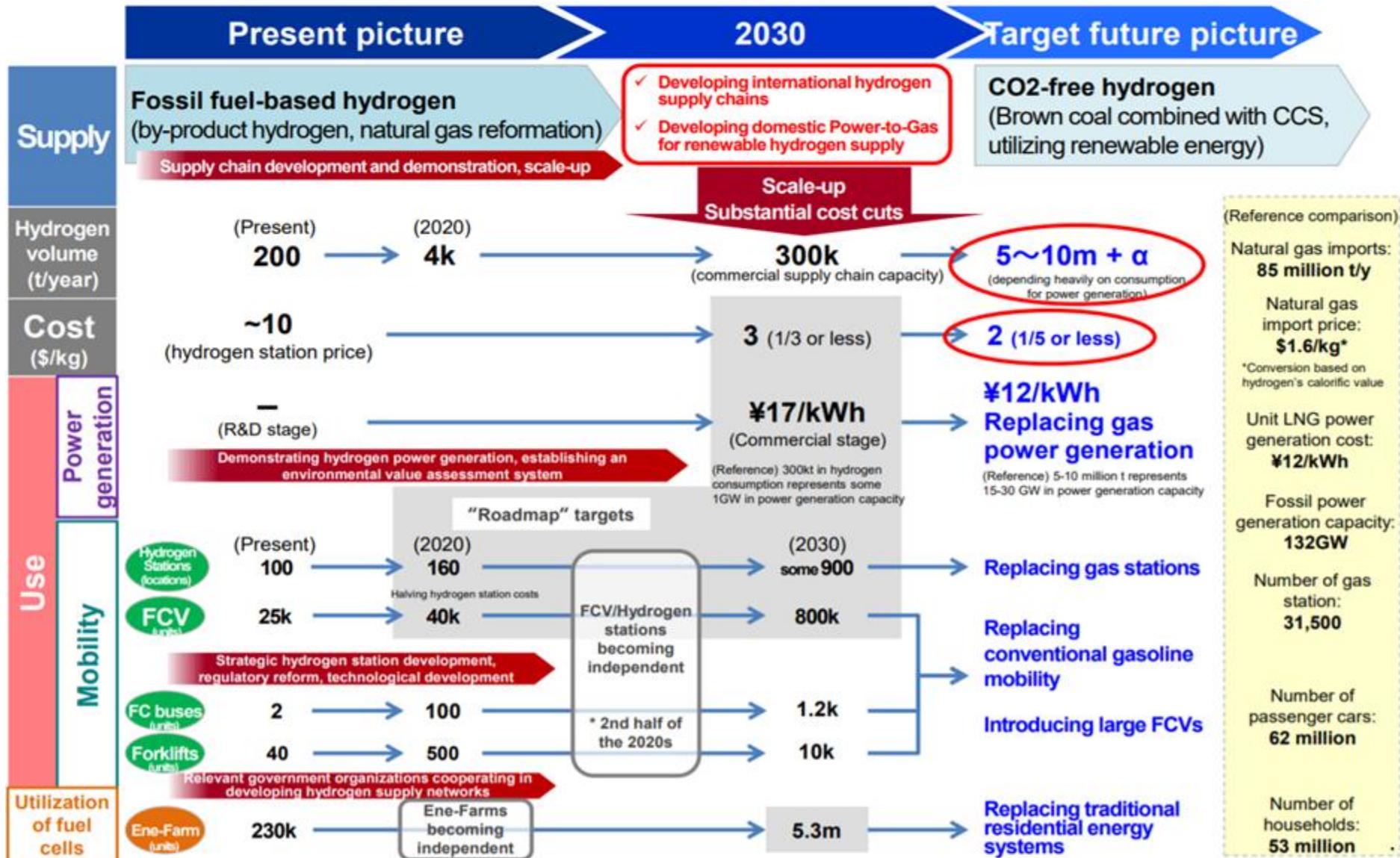
**Position H<sub>2</sub> as a new energy option**  
(following Renewables)

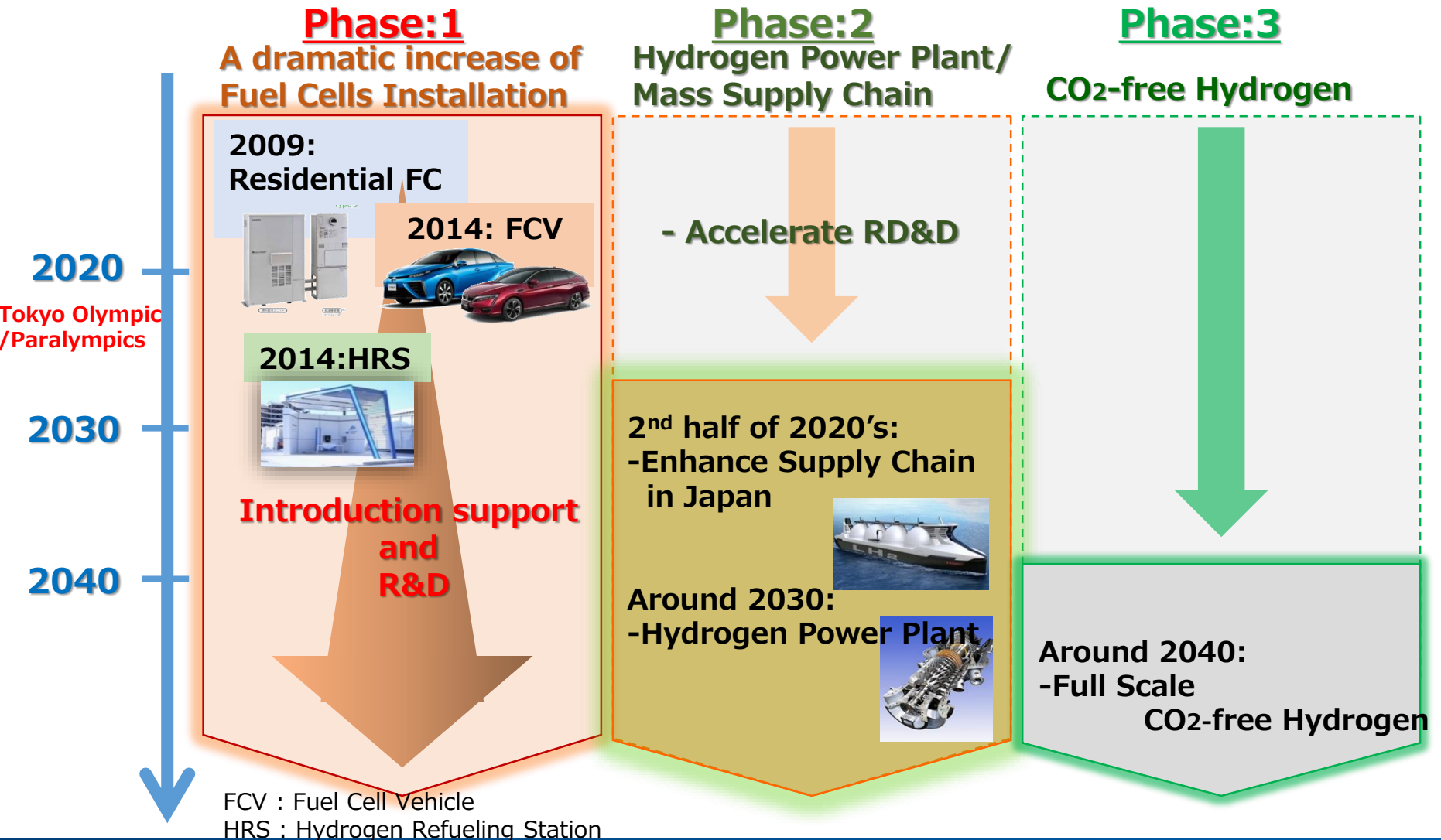
## ➤ Target:

**H<sub>2</sub> Cost** : \$3/kg by 2030 ⇒ \$2/kg

**H<sub>2</sub> Volume** : 300k t/y by 2030 ⇒ 5~10m t/y

# Scenario





# Agenda

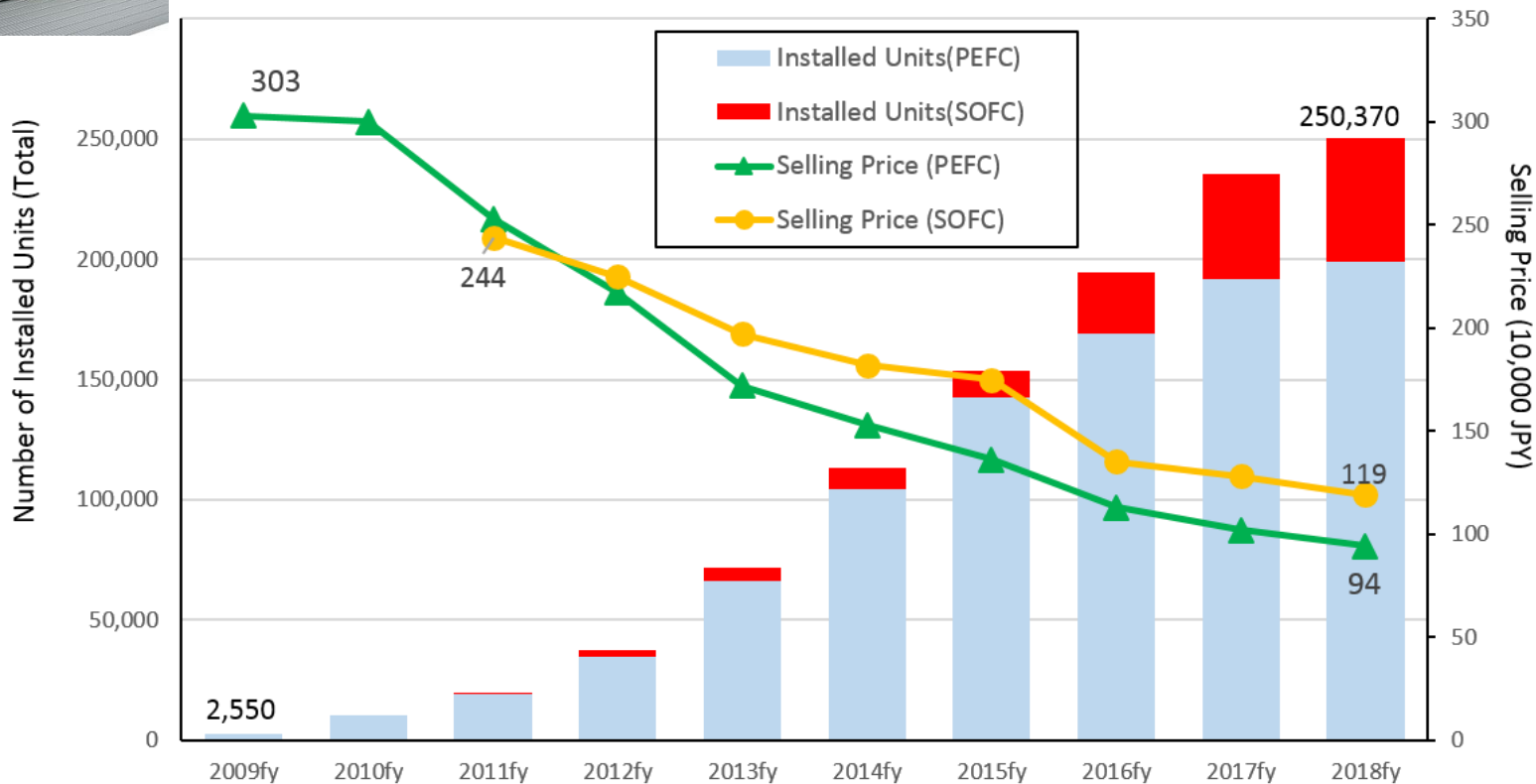
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# Current status of residential fuel cell "Ene-Farm"

Selling Price of Ene-Farm is getting lower with increasing the number of installed unit.



274,000 units (Jan.2019) = 192MW



# SOFC unit for commercial / industrial use



(3kW: Kyocera)  
Total efficiency: > 80%



(4.2kW: Miura)  
Total efficiency: 90%



(250kW: MHPs)  
Total efficiency: > 73% (hot water)  
65% (Steam)



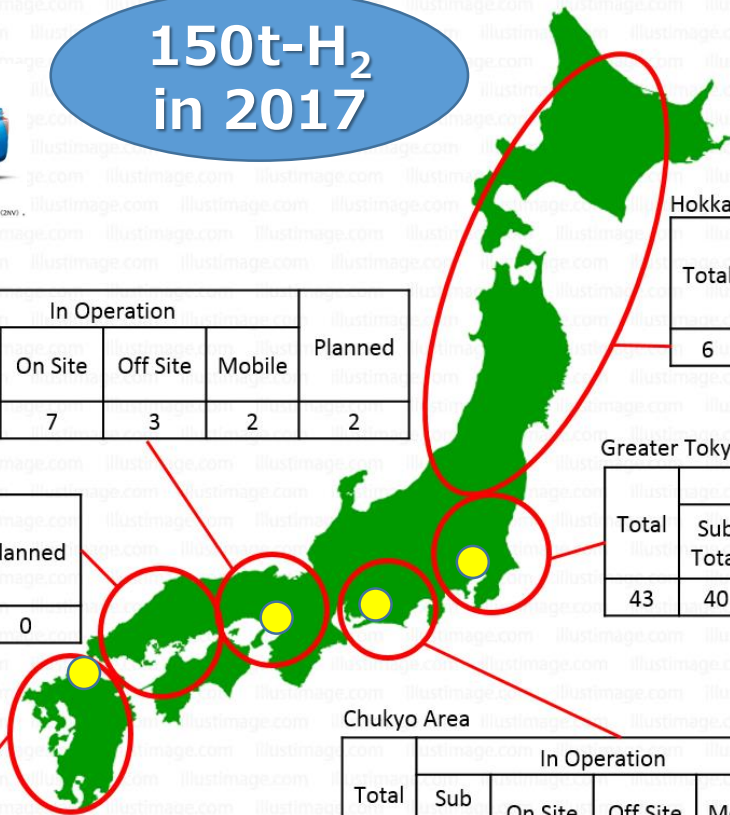
# Current status of FCV and HRS

**FCV: 2,700 on road**

**HRS: 100 in operation + 11 planned**



150t-H<sub>2</sub>  
in 2017



**Kinki Area**

Total	In Operation				Planned
	Sub Total	On Site	Off Site	Mobile	
14	12	7	3	2	2

**Hokkaido / Tohoku Area**

Total	In Operation				Planned
	Sub Total	On Site	Off Site	Mobile	
6	4	1	0	3	2

**Chugoku / Shikoku Area**

Total	In Operation				Planned
	Sub Total	On Site	Off Site	Mobile	
8	8	2	0	6	0

**Greater Tokyo Area**

Total	In Operation				Planned
	Sub Total	On Site	Off Site	Mobile	
43	40	24	1	15	3

**Kyushu Area**

Total	In Operation				Planned
	Sub Total	On Site	Off Site	Mobile	
11	11	5	4	2	0

**Chukyo Area**

Total	In Operation				Planned
	Sub Total	On Site	Off Site	Mobile	
29	25	8	6	11	4

● Initial installation in 4-major-populated areas



TOYOTA FC-Bus "SORA"  
photo: Tokyo Metropolitan Government



TOYOTA FC-Forklift  
photo: Toyota Industries Corporation



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# Current Direction of NEDO's Program

## 1. Fuel Cells:

### (1) PEFC: for mobility

- Target: 0.03-0.1 g-PGM/kW (depend on durability), 50,000 hrs. life time (commercial vehicle), Power Density:> 4kW/L

### (2) SOFC: for stationary use

- Complete co-generation model (> 50%) by 2017
- New target: >65% efficiency for mono-generation

## 2. Hydrogen Refueling Station:

Reducing CAPEX / OPEX

- To address regulatory reform on FCV/HRS in Japan  
ex. Unmanned operation with remote monitoring, Risk assessment on HRS, etc.
- Developing low cost equipment (incl. polymer materials, Electro-chemical compressor, etc.)

## 3. Hydrogen Supply Chain / Gas Turbine:

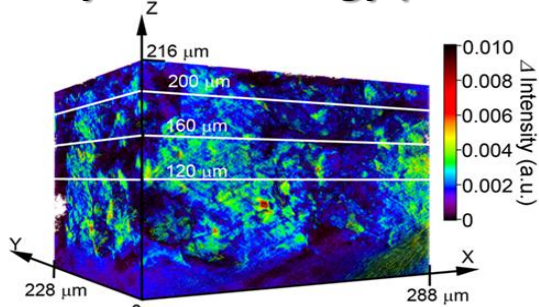
- Developing combustor for Hydrogen Gas Turbine  
Control of combustion for low NOx, back fire, etc.
- Realizing large scale hydrogen supply chain  
Hydrogen carriers for long distance transportation

## 4. Power to Gas:

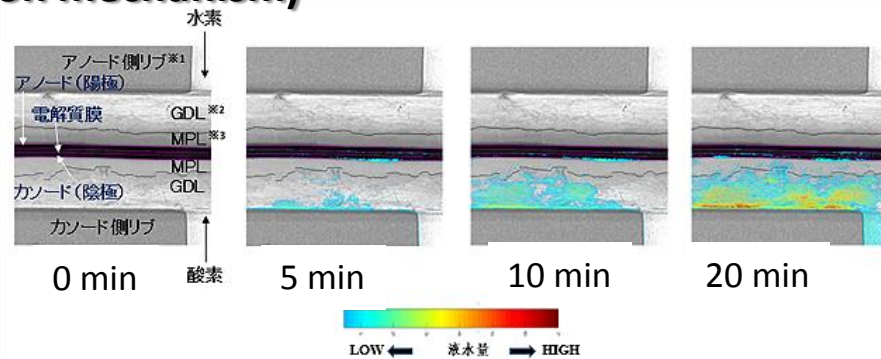
- Developing System Technology  
System Operation, Energy management, Demand response
- Improving electrolysis technology  
Analyzing reaction mechanism, develop lifetime evaluation, etc.  
(Alkaline, PEM, SOEC)

## NEDO focused on basic research.

### Analysis Technology (PEFC reaction mechanism)



3D visualization of PEFC anode catalyst degradation



Water distribution in PEFC

### PEFC performance evaluation



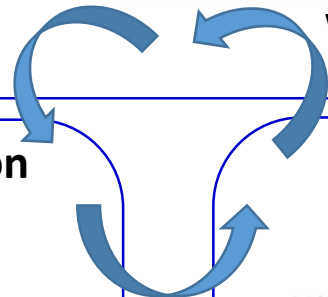
### Material Design Concept



Catalyst



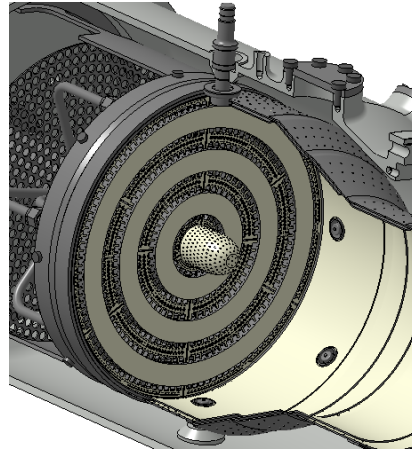
Membrane



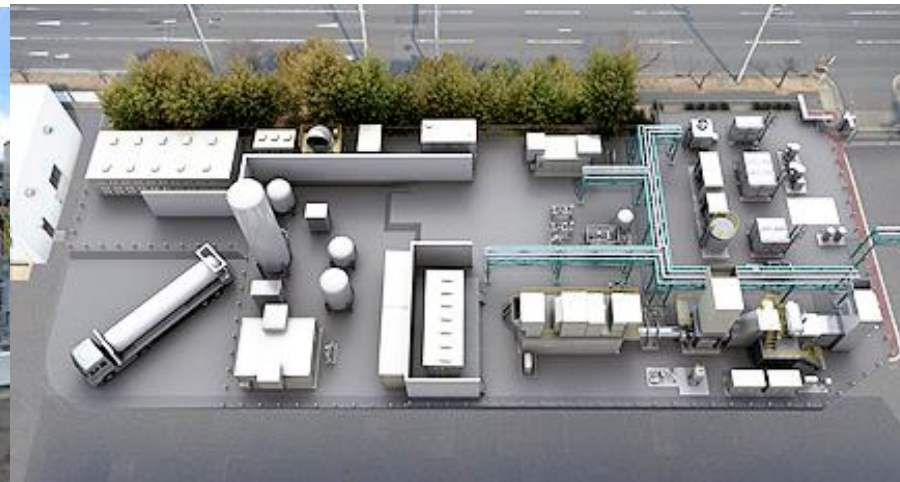


# Highlight of NEDO's Program (H<sub>2</sub>GT)

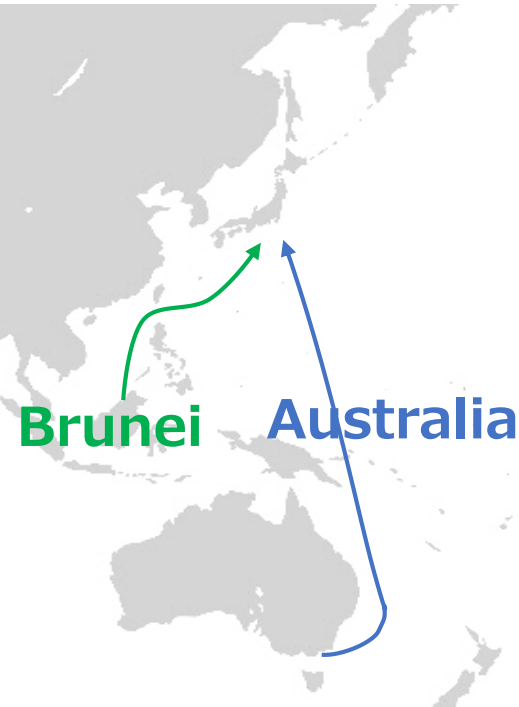
## Developing combustor for H<sub>2</sub> gas turbine



## Demonstration project / H<sub>2</sub> gas turbine



## Japan-Australia H<sub>2</sub> Supply Chain Project



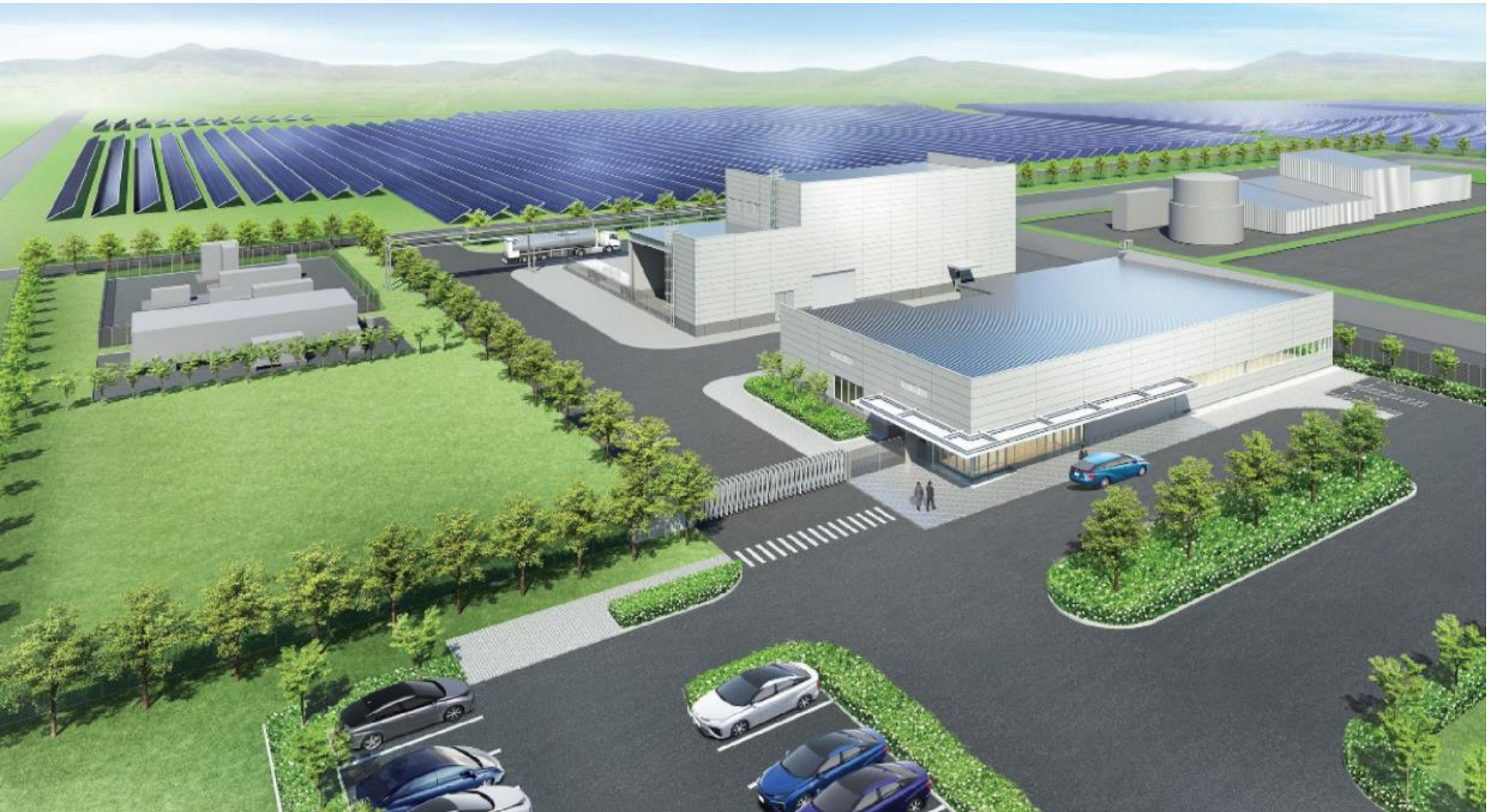
## Japan-Brunei H<sub>2</sub> Supply Chain Project





# Highlight of NEDO's Program (Power to Gas)

@ Fukushima Pref. 10MW electrolysis / provide H<sub>2</sub> to Tokyo 2020



## Olympic Village with Hydrogen



Image: Tokyo Metropolitan Government

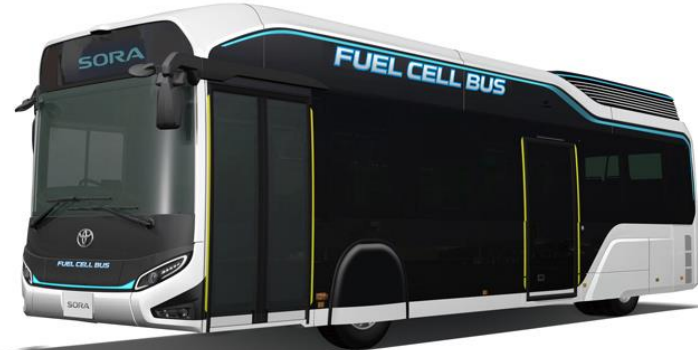


Image: Toyota Motor Cooperation



Image: Tokyo Metropolitan Government



- *Japanese Government strongly promoting*
  - *with Prime Minister's leadership*
  
- *Just started market penetration*
  - *need to enhance hydrogen energy application*
  - *continue to improve technology*
  
- *Utilizing hydrogen in energy system*
  - *enhancing hydrogen demand & role*
  - *demonstration at Tokyo 2020*



**Thank you!**