Toward Realizing Hydrogen Based Society

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NEDO

Today's Topic

1. Introduction of NEDO
2. Current status of Fuel Cell application
3. NEDO's Activity
4. Conclusion

1.Introduction of NEDO

Outline of NEDO

New Energy and Industrial Technology Development Organization (NEDO)

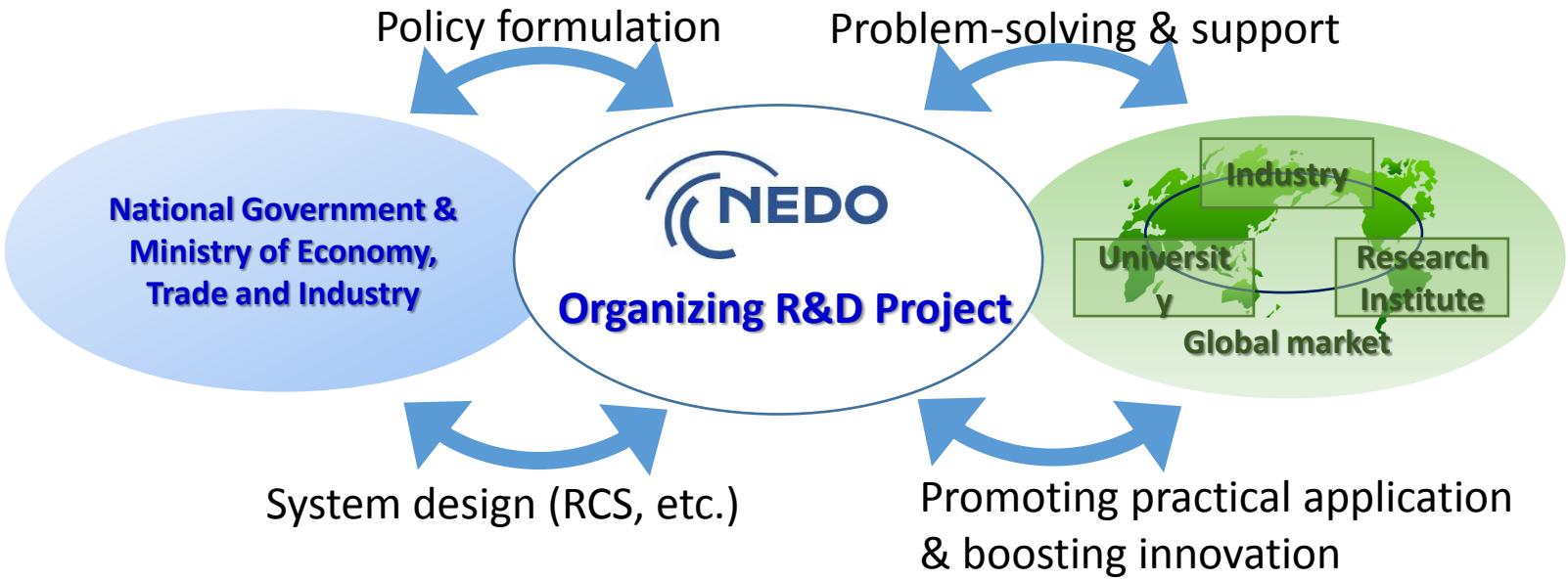
Organization: *Established in 1980;*
under the Ministry of Economy, Trade and Industry of Japan

Mission:

- Enhancing industrial technology
- Addressing energy and global environmental problems

Number of Employees: 926 (as of 1 April, 2018)

Budget in FY 2018: JPY 160 billion (= 1.2 billion euro)



NEDO's Technology Development Fields

NEDO covers a wide range of technology development fields, and it promotes the development of technologies necessary for the future.

NEDO's Technology Development Fields

To address energy and global environmental problems, NEDO promotes and carries out new energy, energy conservation, and other technology development and demonstration projects. NEDO is committed to developing a broad range of technologies from innovative materials to IoT and robot technologies to enhance the level of industrial technology.

Addressing energy and global environmental problems

Energy Conservation

Superconducting cable system demonstration using actual grid

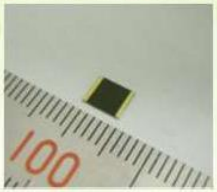
- Energy conversion and supply
- Industrial sector
- Residential and commercial sectors
- Transport sector
- Cross-sector

Rechargeable batteries & energy systems

World's most advanced battery analysis facility (RISING2 synchrotron radiation beamline)

New Energy

- Solar power
- Wind power
- Fuel cells and hydrogen
- Biomass
- Geothermal energy
- Ocean energy

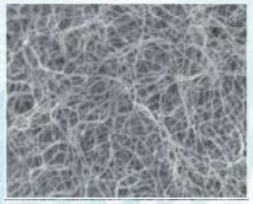


Ultrahigh efficiency solar cells

Demonstration research on offshore wind power generation

Materials & Nanotechnology

- Inedible biomass
- Carbon fiber
- Smart cells



Cellulose nanofiber

New Manufacturing Technology

- Laser
- 3D printer

Excitation semiconductor laser

Crossover & Peripherical fields

- Sensor system

Infrared array sensor equipped with solar panel

Environmental and Resource Conservation

- Water recycling
- 3R technology
- Environmental chemistry
- Fluorinated gas control measures

Global Warming Mitigation

- Global Warming Mitigation Technology Promotion Project

Energy-saving membrane bioreactor pilot test plant

Support for International Expansion

- Smart communities
- International projects for increasing the efficient use of energy

Demonstration of smart grid technologies using electric vehicles (Maui Island, State of Hawaii, USA)

Clean Coal Technology

- Low-carbon coal-fired power plant
- Utilization of low-rank coal
- Low-carbon steel industry

Demonstration facilities for oxygen-blown IGCC power generation (Osaki CoolGen Project)

Electronics, Information & Telecommunications

- IoT (Internet of Things)
- Computing
- Memory
- Power semiconductors
- Printed electronics
- Optoelectronics

World's smallest optical transceiver (optical I/O core)

Robot Technology

- Industrial robots
- Service robots
- Infrastructure maintenance
- Disaster response robots
- Next-generation robot elemental technology
- Artificial intelligence

Robot arm

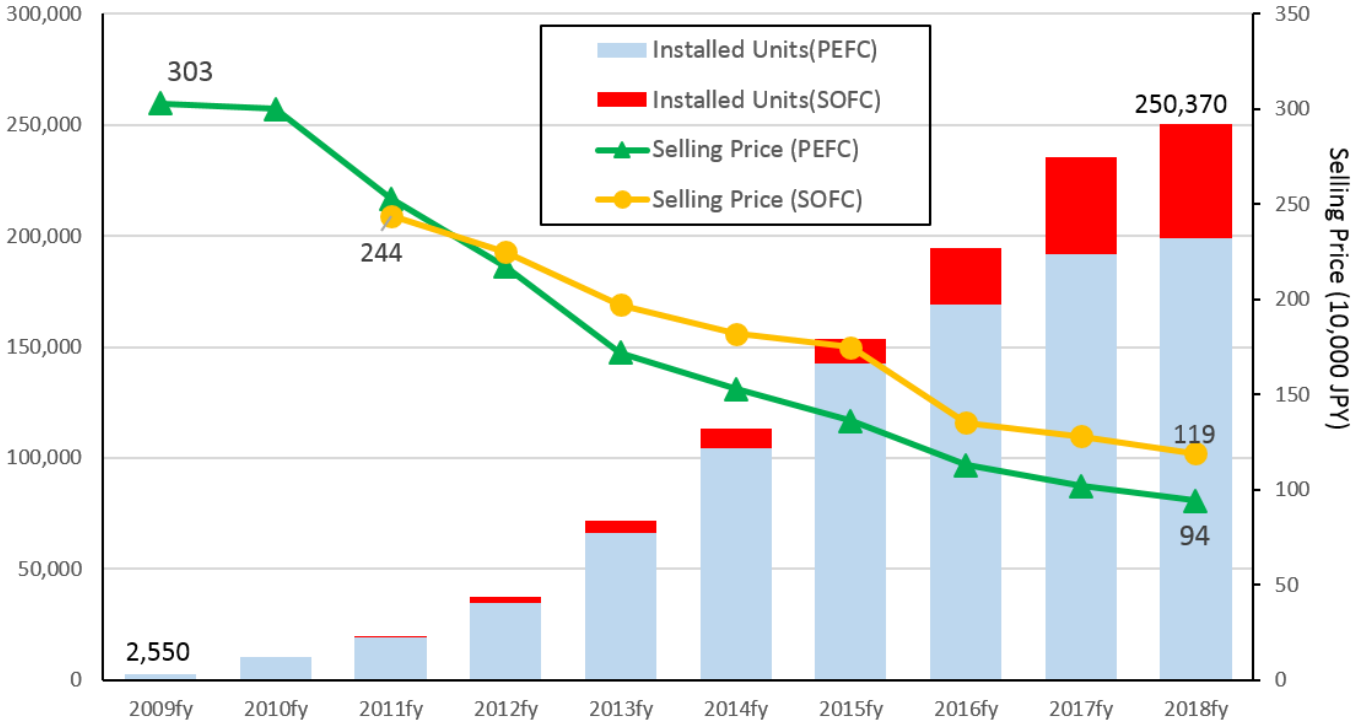
Disaster response drone

Enhancing industrial technology

2.Current status of Fuel Cell application in Japan

Residential Fuel Cell “Ene-Farm”

250,000 unit = 175MW



Fuel Cell Vehicles & Hydrogen Refueling Stations

FCV: 2,500 on road

150t-H_2 in 2017

Hokkaido / Tohoku Area

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

Kinki Area

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

Chukyo Area

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

Kyushu Area

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

HRS: 100 in operation + 11 planned

Japan-wide initiative to spread out HRS

JAPAN H₂ MOBILITY

JHyM

Established in February 2018

TOYOTA NISSAN HONDA JXTG Nippon Oil & Energy

IDEMITSU Iwatani TOKYO GAS TOHO GAS

Air Liquide creative oxygen TOYOTA TSUSHO DBJ 日本政策投資銀行 JA MITSUI LEASING

Sompo Japan Nipponkoa SMFL Sumitomo Mitsui Finance and Leasing NEC NEC Capital Solutions Limited SPARX Group Co., Ltd.

Strategic deployment of hydrogen stations

Cost down for hydrogen stations

Improvement of convenience for FCV customers

3.NEDO’s activity

R&D Program / PEFC for Mobility

Full fledged dissemination around 2030

FC Stack Power Density: >4 kW/L
Durability: > 5,000hrs (Passenger Vehicle) / > 50,000hrs (Commercial Vehicle)
PGM amount of use: < 0.1 – 0.03 g/kW (depend on durability)
Productivity: > 10 time w/current level

OEM's Activities to Achieve the Target

Collaboration

Improving Analyzing Tech.

- Analysis of morphology, electrochemical reaction and mass transfer in MEA
- Cell evaluative analysis

Develop Material Concept

- Less PGM (Core-Shell, CNT, etc.)
- Non-PGM

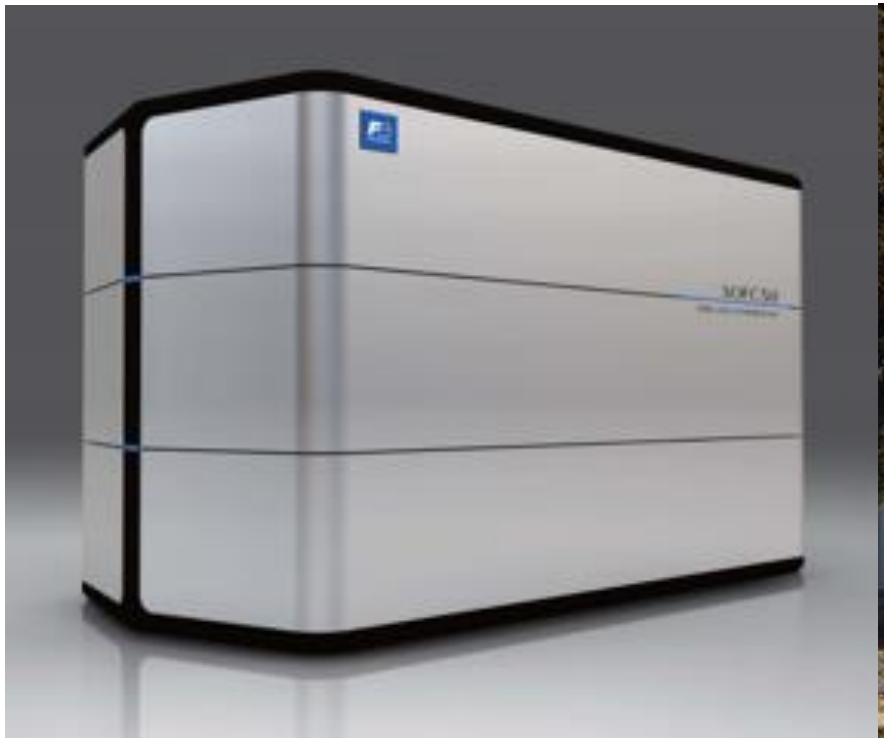
NEDO's Program Activities

Develop Process Tech.

- Less tact time
  - MEA, Catalyst, Membrane, Separator,

R&D Program / SOFC: for stationary use

Demonstration SOFC(Solid Oxide Fuel Cell) application for stationary use / 20-50 kW model

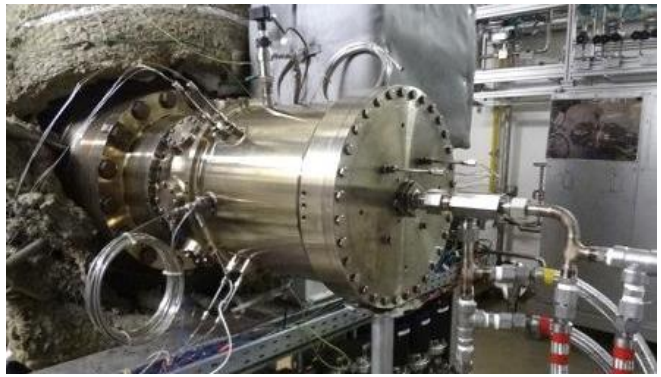


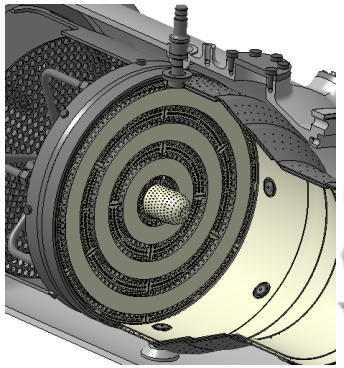
- Complete co-generation model (> 50%) by 2017
- New target: >60% efficiency (mono-generation)

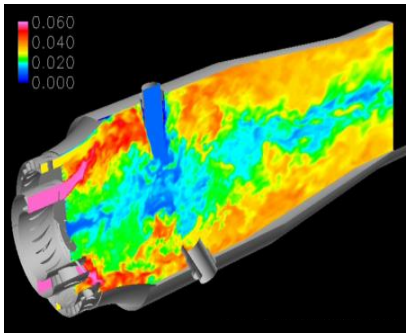
R&D activity / H_2 Gas Turbine

Developing combustor for H_2 gas turbine

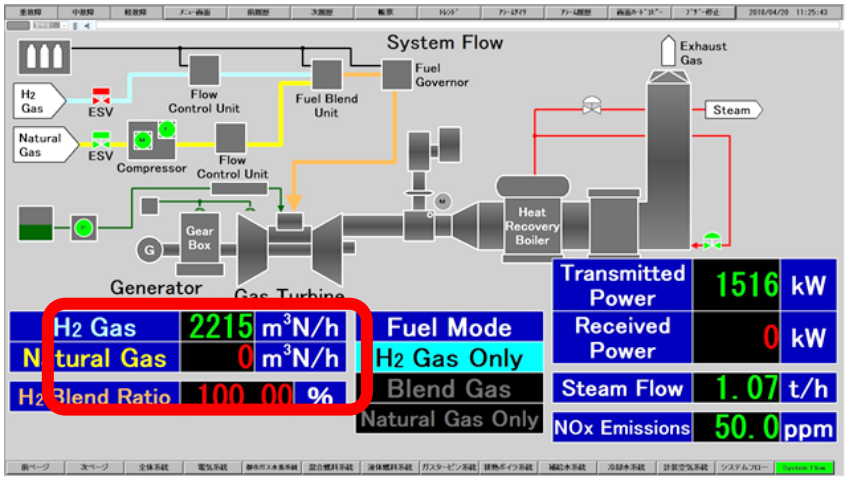
- Control of combustion for low NOx, back fire, etc.







Demonstration project / H_2 gas turbine providing heat & power



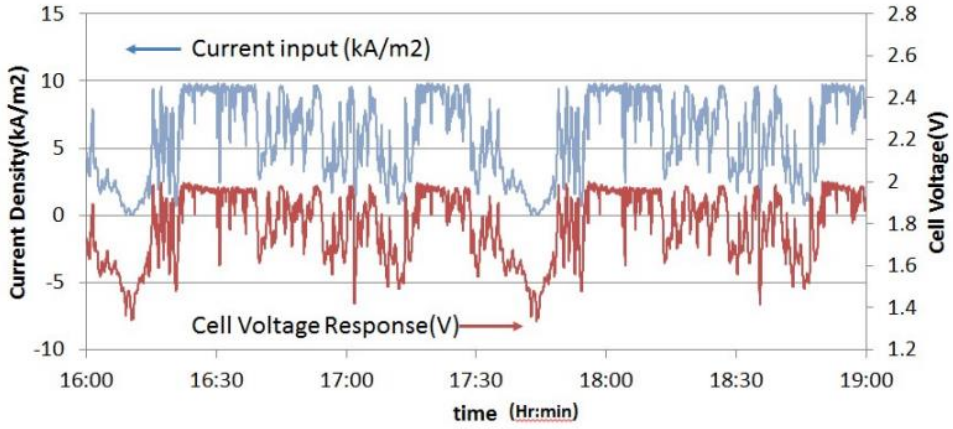
Demonstration project/Hydrogen Supply Chain

Developing large scale H_2 supply chain
-Hydrogen carriers for long distance transportation

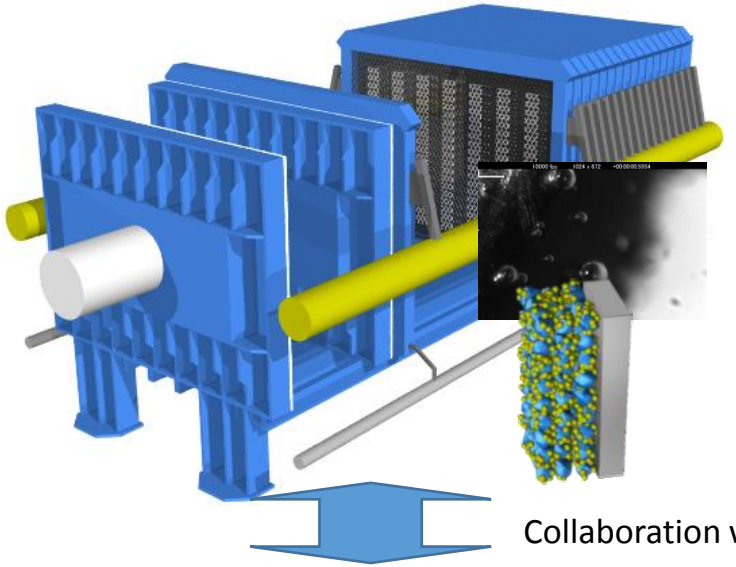
Japan-Australia H_2 Supply Chain Project

Japan-Brunei H_2 Supply Chain Project

R&D activity/Electroysis



Developing analysis technology for electrolysis



Collaboration with

Technology Collaboration Programme on
Advanced Fuel Cells

ANNEX30:
Forschungszentrum Jülich , DLR Stuttgart, Fraunhofer ISE, Siemens, Hydrogenics, ThyssenKrupp, Greenerity, and other industry join the program (ANNEX)

R&D activity/Power to Gas

Power to Gas / integration with renewable energy source

10MW electrolysis / provide H_2 to Tokyo 2020
- Producing “Green Hydrogen” plus Grid Stability

4.Conclusion

Conclusion

- *Japanese Government strongly promoting hydrogen*
  - *Key for sustainable society*
  - *with Prime minister's leadership*
- *Just started market penetration*
  - *need to enhance hydrogen energy application*
  - *how to use hydrogen in energy system*
- *Need technology development and international cooperation*

Thank you!