Japan's action toward realizing hydrogen-based society

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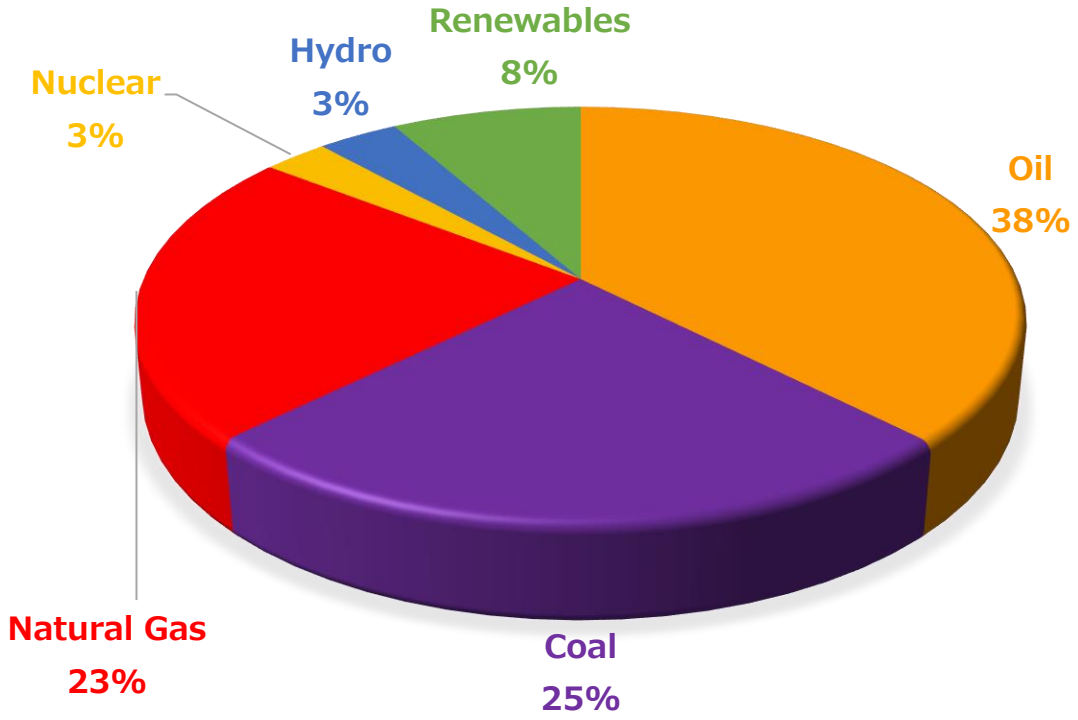
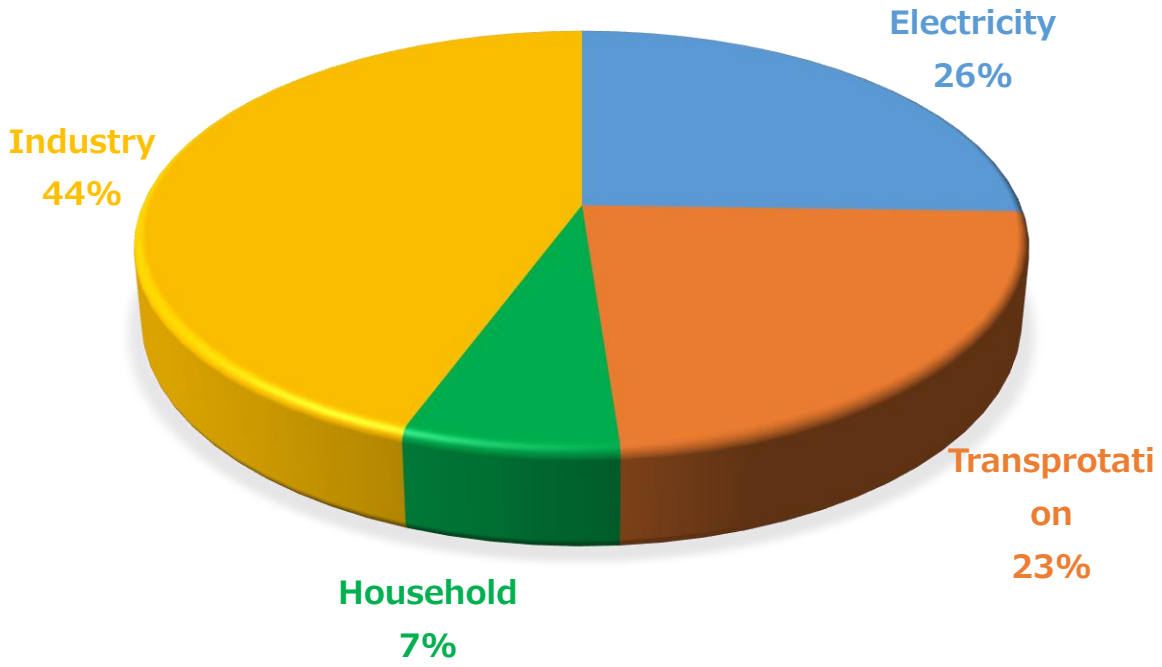
Background: Japan's Energy Situation

Primary Energy (2018)
total: 19,728PJ



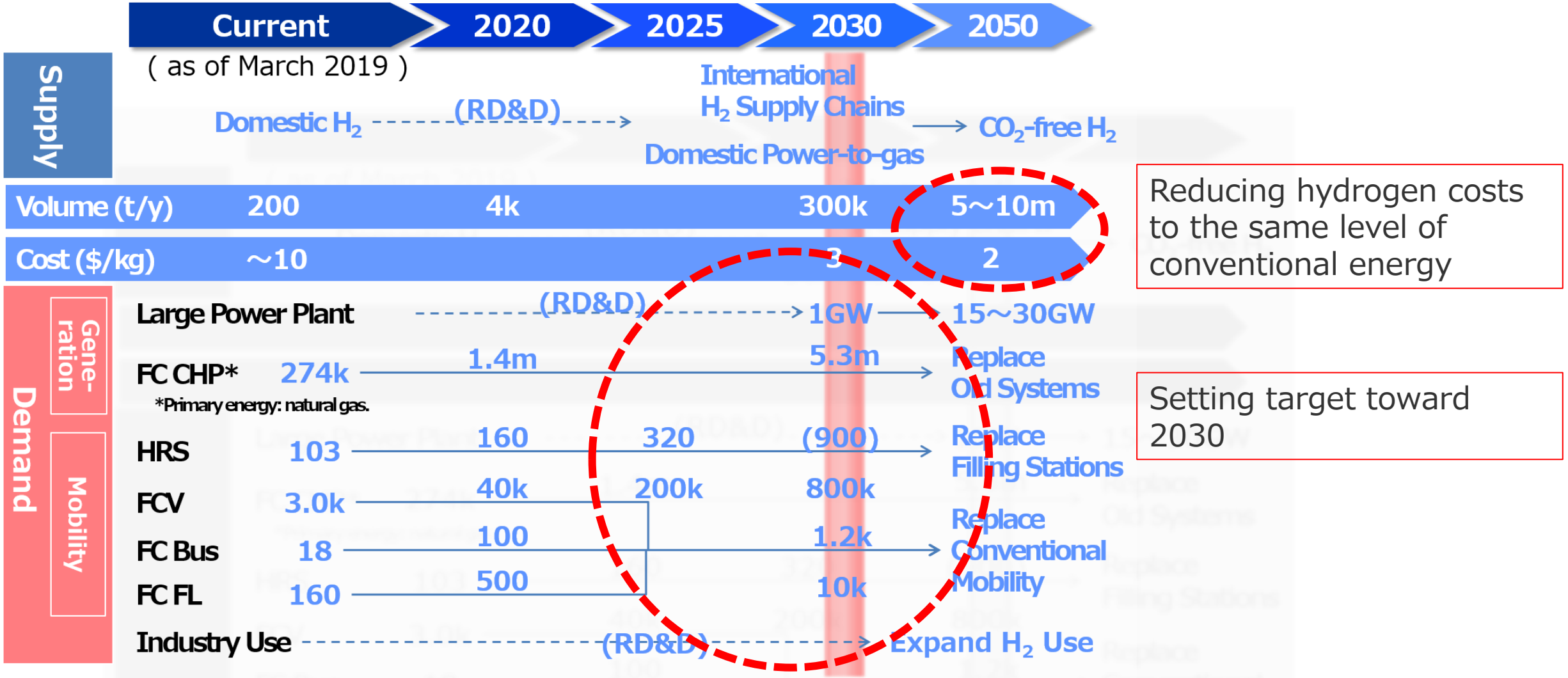
Final Energy Consumption(2018)
total: 13,124PJ



- **Japan's target**;
  - ✓ Reducing GHGs: ▲26% in 2030 / ▲80% in 2050
  - ✓ Increasing self-sufficiency rate around 40% (in 2030)

“Basic Hydrogen Strategy”

Clarify the future direction, with the consensus of stakeholders.



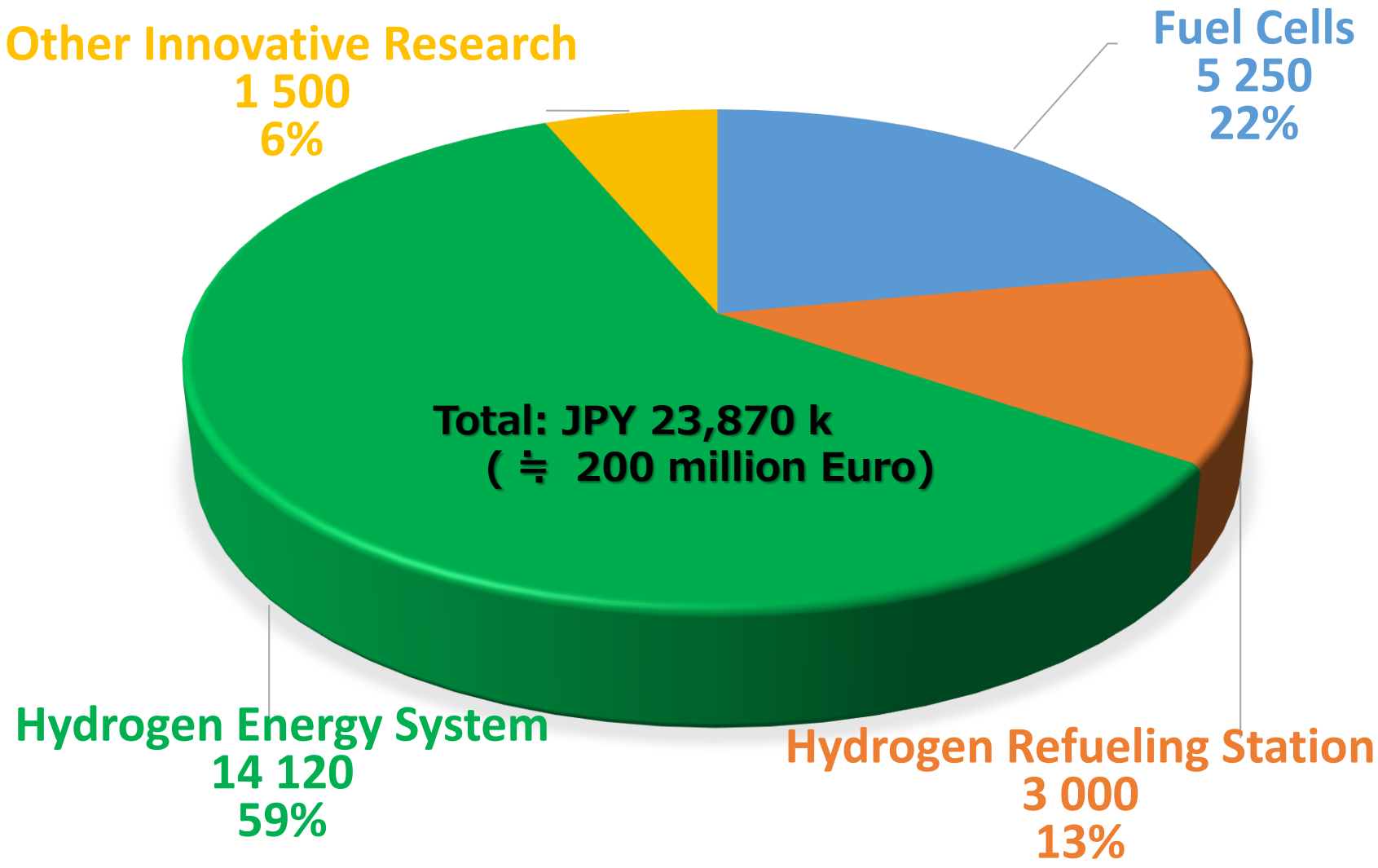
Reducing hydrogen costs to the same level of conventional energy

Setting target toward 2030

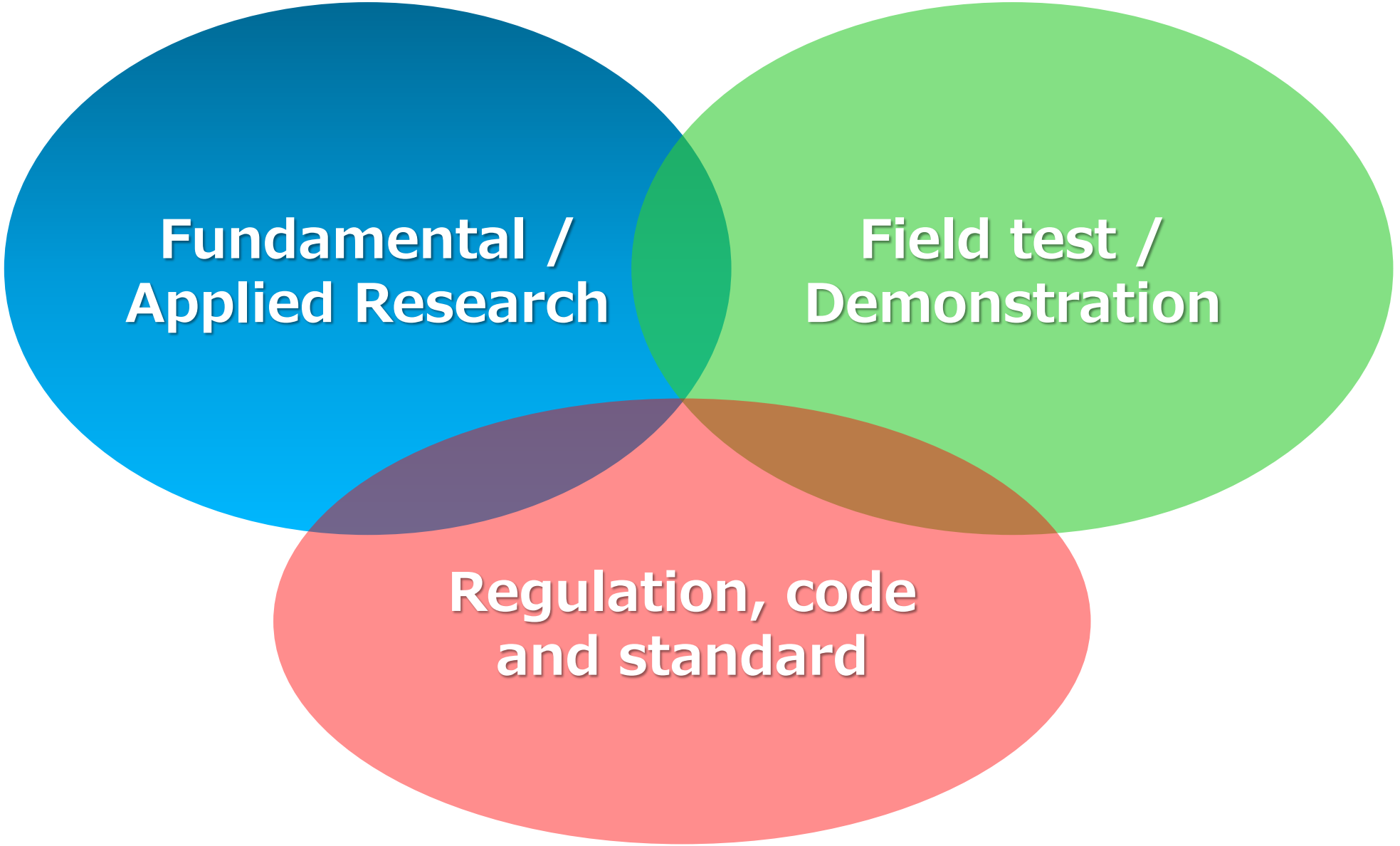
Current status: Hydrogen Applications

Items	Japan's Target (Year)	Current status (as of Mar-2020)
Residencial Fuel Cell		
Instration number	5.3 million (2030)	Applox. 350,000
Pay back period (price)	5 years (2030)	PEFC: 7.9 years (JPY 900k / EUR 7.5k) SOFC: 9.5 years (JPY 1,110k / EUR 9.3k)
Mobility		
Nubmer of Passenger Vehicle	800k (2030)	3,757
Nubmer of Fuel Cell Bus	1.2k (2030)	57 (mainly in regular operation)
Hydrogen Refueling Station		
Nubmer of Station	900 (2030)	117 (public stations)
Installation cost (in JPY)	200 million (2025)	310 million (EUR 2.6 million)
Operation cost (in JPY)	15 million (2025)	31 million (EUR 260k)


NEDO's Budget for Hydrogen Energy in 2020



Comprehensive approach



Current Direction of NEDO's Program

First Step: Promoting fuel cell application

Fuel Cells:

(1) PEFC: for mobility

Challenging Target:

	2030	2040
Power Density	6kW/L	9kW/L
Max Voltage	> 0.6V	0.85V
Max Temperature	< 100℃	120℃
Cruse range	800 km	> 1,000 km
System Cost	< US$40 / kW	US$20 / kW

- Developing Analysis / Evaluation Platform to accelerate material / MEA development
- Improving productivity (Catalyst, MEA, other materials, Tank, etc.)

New applications (Ship, Heavy/Middle duty Vehicle, Drone, etc.)

(2) SOFC: for stationary use

Efficiency > 65% (mono-generation) , Durability > 130,000 hrs.

- New technology such as Proton-Conducting SOFC

Current Direction of NEDO's Program

First Step: Promoting fuel cell application

Hydrogen Refueling Station:

Reducing CAPEX / OPEX: make it half by 2025

- 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. Electro-chemical compressor, polymers, etc.)

Preparing for Heavy Duty Vehicles

- Developing refueling protocol, hydrogen metering, etc.

Current Direction of NEDO's Program

Second Step: Develp H2 demand & Integrate w/ energy system

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

Power to Gas:

- Developing System Technology
  System Operation, Energy management, Demand response
- Improving electrolysis technology
  Analyzing reaction mechanism, developing lifetime evaluation, etc.
  Scaling-up, durability, dynamic operation

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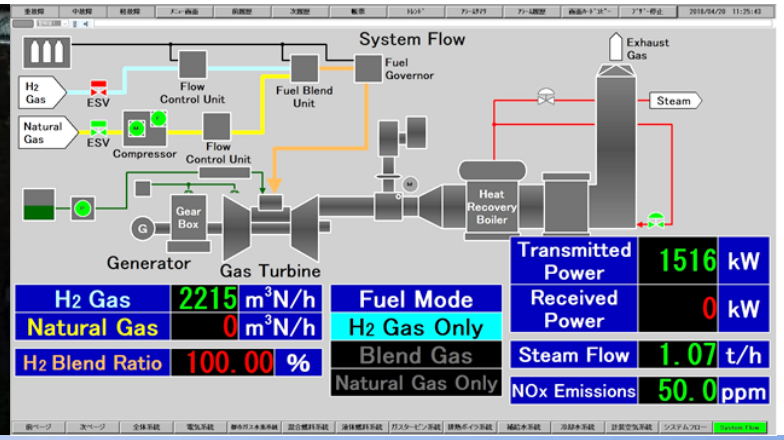
Recent topic from NEDO program

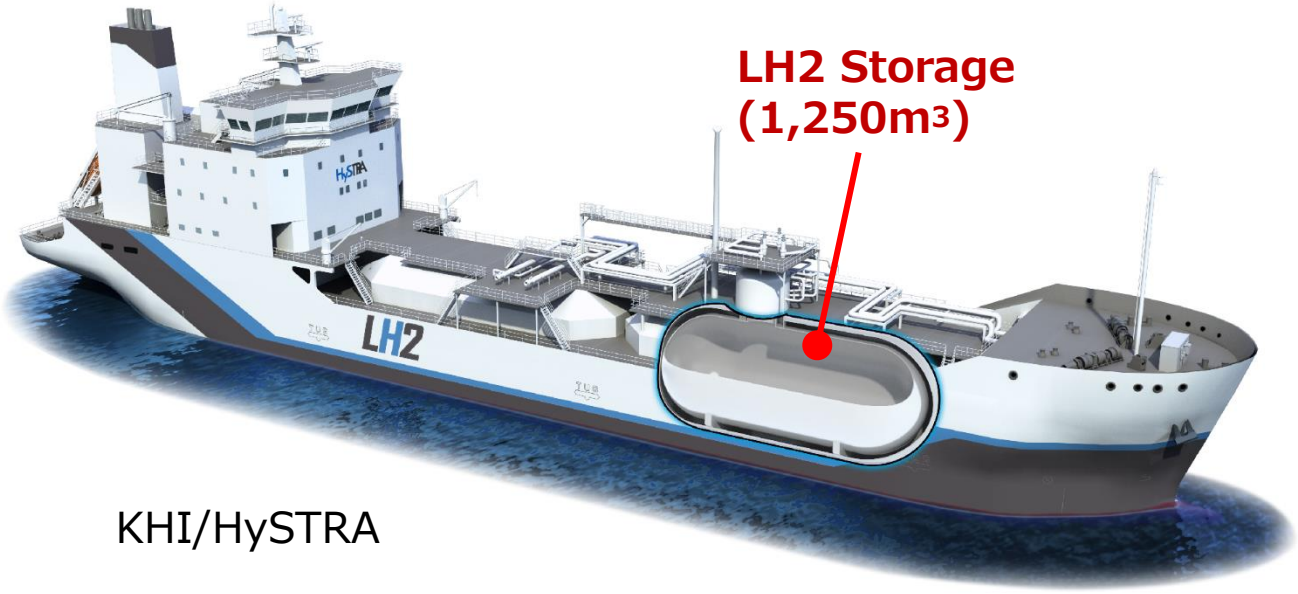
1MW Hydrogen/Natural Gas dual fuel gas turbine system



Recent topic from NEDO program

Demonstration with world 1st hydrogen tanker

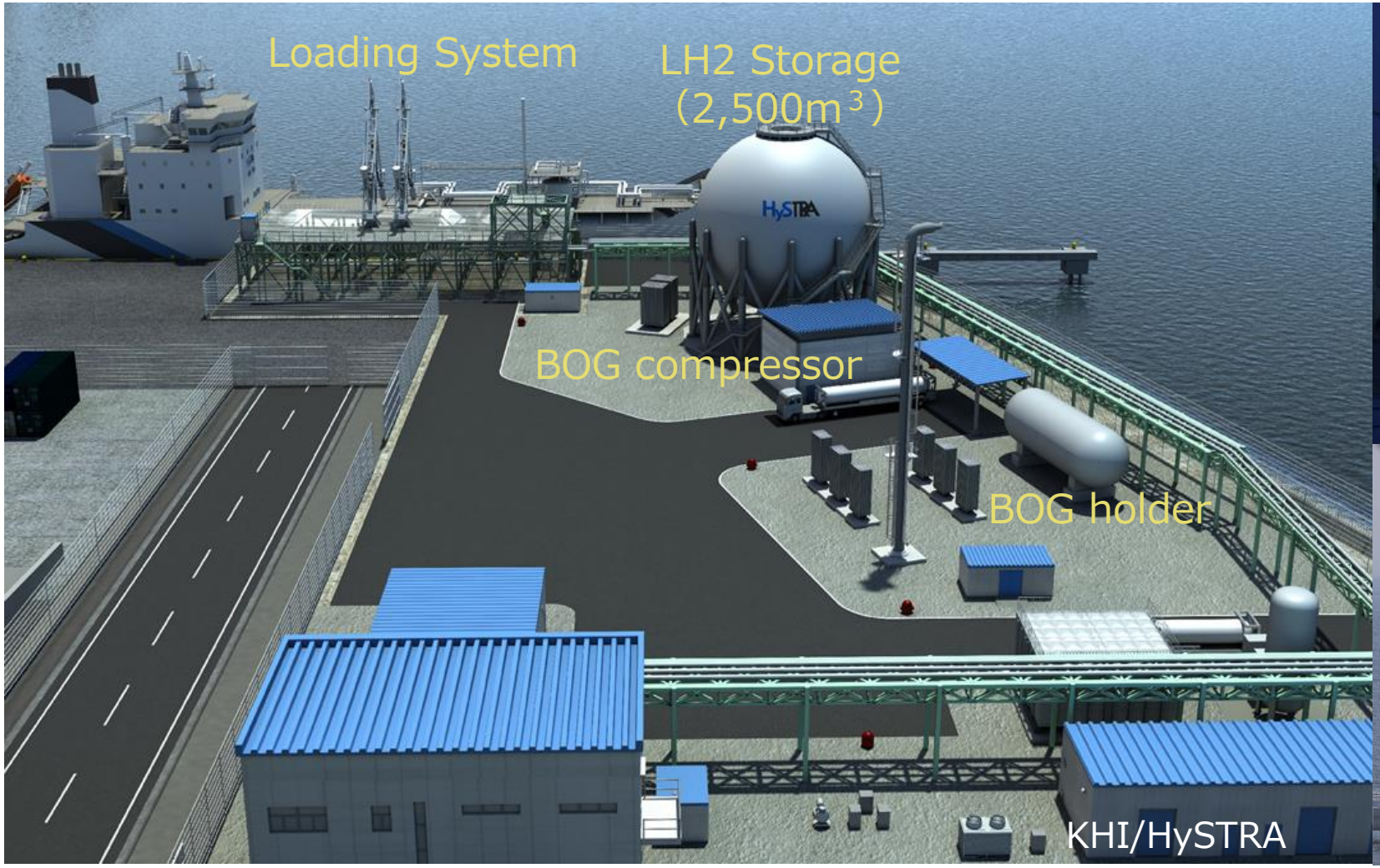
Length	116m
Width	19m
Propulsion	Motor
Cruising range	11,300 n. m.
Cruising Speed	13 knot



KHI/HySTRA

Recent topic from NEDO program

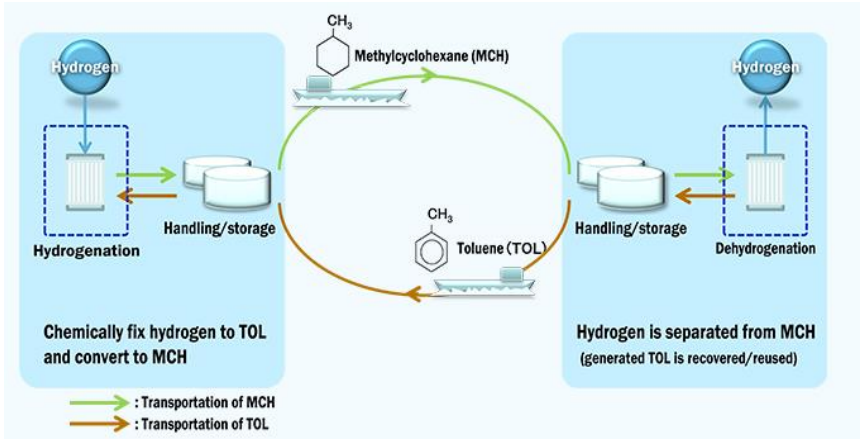
Demonstration with world 1st hydrogen tanker (LH2 Base @Kobe)



Recent topic from NEDO program

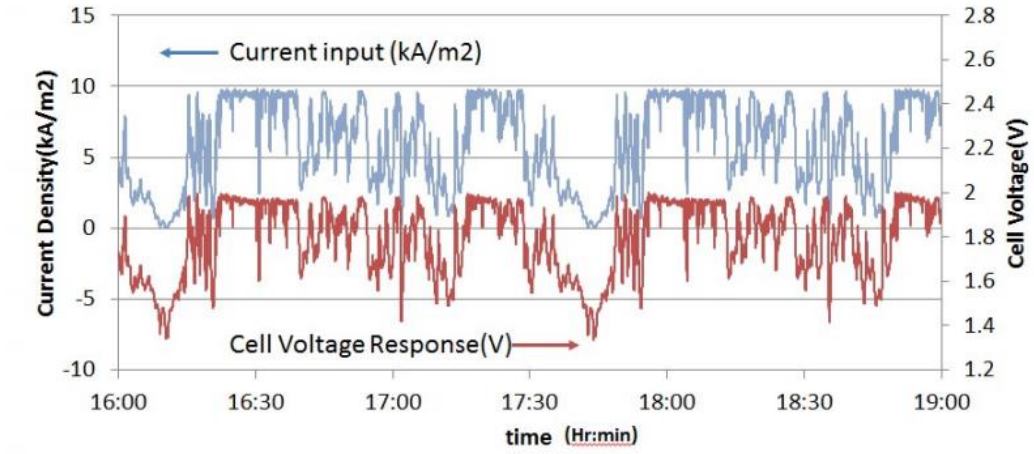
Developing Hydrogen Supply Chain (OCH)

World 1st international hydrogen transport demonstration (start on Nov. 2019)



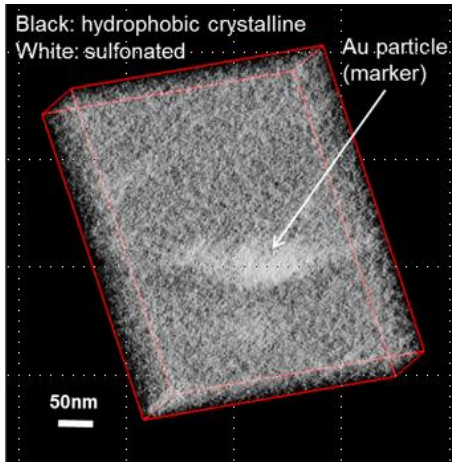
Recent topic from NEDO program

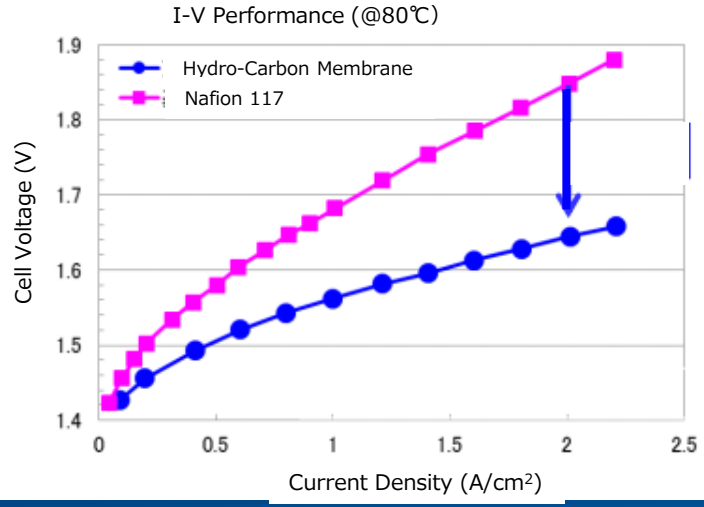
Asahi Kasei: Large scale Alkaline Electrolysis (3m²/cell)



Scaling up

Toray: Hydro-Carbon Membrane for PEM Electrolysis





Recent topic from NEDO program

Conclusion

- *Japanese Government strongly promoting hydrogen*
  - *clarify future vision and direction*
  - *importance of international collaboration*

- *Just started market penetration*
  - *information from market, feedback to R&D activity*
  - *need to enhance application, improve technology*

- *Our goal: Developing low-carbon energy system*
  - *scaling-up / integration with other energy system*

Thank you!