Japan's activity on hydrogen energy
日本的氢能源措施

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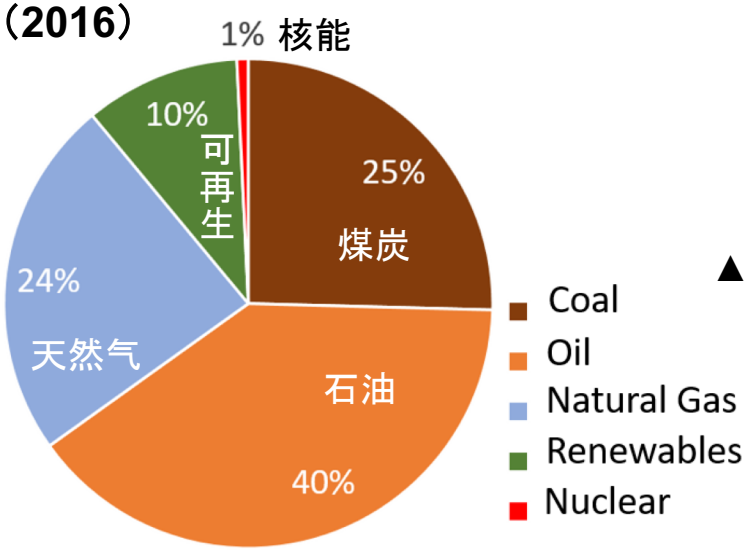
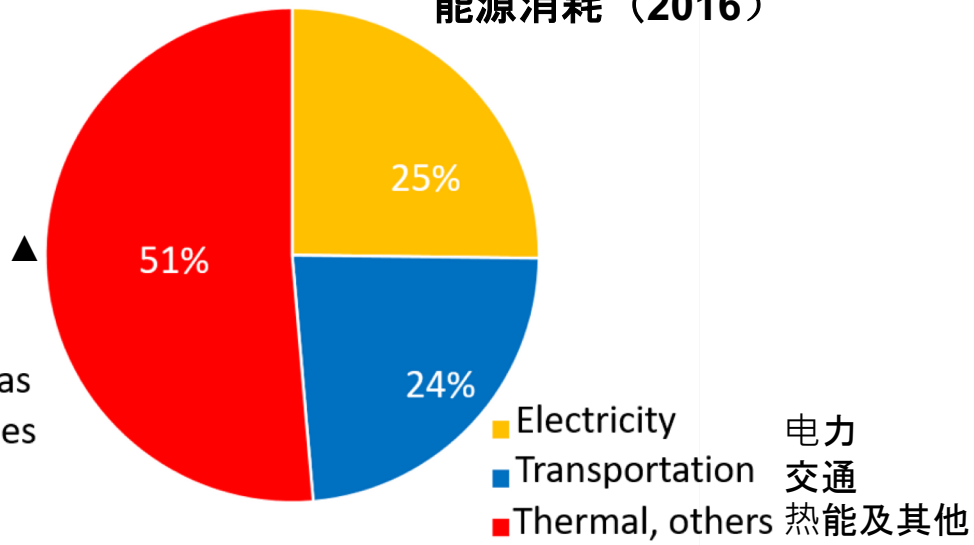
Background: Japan's Energy Situation
背景：日本的能源形势

Primary Energy (2016)
一次能源（2016）



Energy Consumption (2016)
能源消耗（2016）



- **Target** 目标；

  Reducing GHGs 减少温室气体排放

  ▲26% in 2030 / ▲80% in 2050

  2030年减少26% / 2050年减少80%

  Increasing self-sufficiency rate around 40% (in 2030)

  提高自给率约40%（2030年）

- **Measures** 措施；

  Energy saving 节能

  Renewable energy 可再生能源

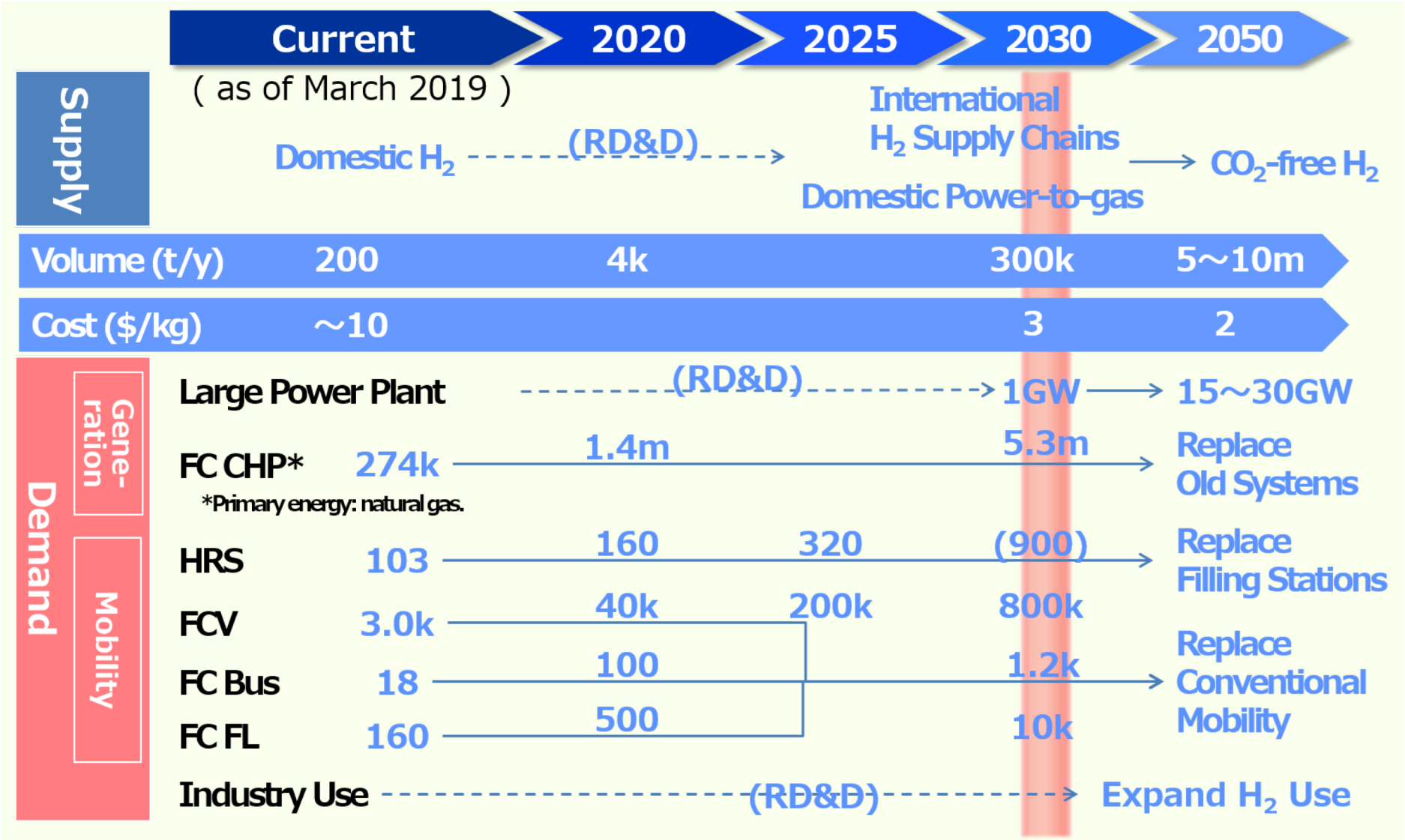
  Nuclear energy核能

  CCS + Thermal power

  碳捕获与封存 +火力发电

  Hydrogen 氢能源

Policy: “Basic Hydrogen Strategy”
政策：“氢战略”



Action Plan: “Strategic Roadmap for HFC”
行动计划：“HFC的战略路线图”

		Goals in the Basic Hydrogen Strategy		Set of targets to achieve	Approach to achieving target
Use	Mobility	FCV 200k by 2025 800k by 2030	2025	● **Price difference between FCV and HV** (¥3m → ¥0.7m) ● **Cost of main FCV system** (FC ¥20k/kW → ¥5k/kW; Hydrogen Storage ¥0.7m → ¥0.3m)	• Regulatory reform and developing technology
		HRS 320 by 2025 900 by 2030	2025	● **Construction and operating costs** (Construction cost ¥350m → ¥200m; Operating cost ¥34m → ¥15m) ● **Costs of components for HRS** (Compressor ¥90m → ¥50m; Accumulator ¥50m → ¥10m)	• Consideration for creating nation wide network of HRS • Extending hours of operation
		Bus 1,200 by 2030	Early 2020s	● Vehicle cost of FC bus (¥105m → ¥52.5m) ※In addition, promote development of guidelines and technology development for expansion of hydrogen use in the field of FC trucks, ships and trains.	• Increasing HRS for FC bus
	Power	Commercialize by 2030	2020	● Efficiency of hydrogen power generation (26%→27%) ※1MW scale	• Developing of high efficiency combustor etc.
	FC	Early realization of grid parity	2025	● Realization of grid parity in commercial and industrial use	• Developing FC cell/stack technology
Supply	Fossil Fuel +CCS	Hydrogen Cost ¥30/Nm3 by 2030 ¥20/Nm3 in future	Early 2020s	● Production: Production cost from brown coal gasification (¥several hundred/Nm3→ ¥12/Nm3) ● Storage/Transport : Scale-up of Liquefied hydrogen tank (thousands m³→50,000m³) Higher efficiency of Liquefaction (13.6kWh/kg→6kWh/kg)	• Scaling-up and improving efficiency of brown coal gasifier • Scaling-up and improving thermal insulation properties
	Green H2	System cost of water electrolysis ¥50,000/kW in future	2030	● Cost of electrolyzer (¥200,000m/kW→¥50,000/kW) ● Efficiency of water electrolysis (5kWh/Nm3→4.3kWh/Nm3)	• Designated regions for public deployment demonstration tests utilizing the outcomes of the demonstration test in Namie, Fukushima • Development of electrolyzer with higher efficiency and durability

Current status of Fuel Cell application
燃料电池应用的现状

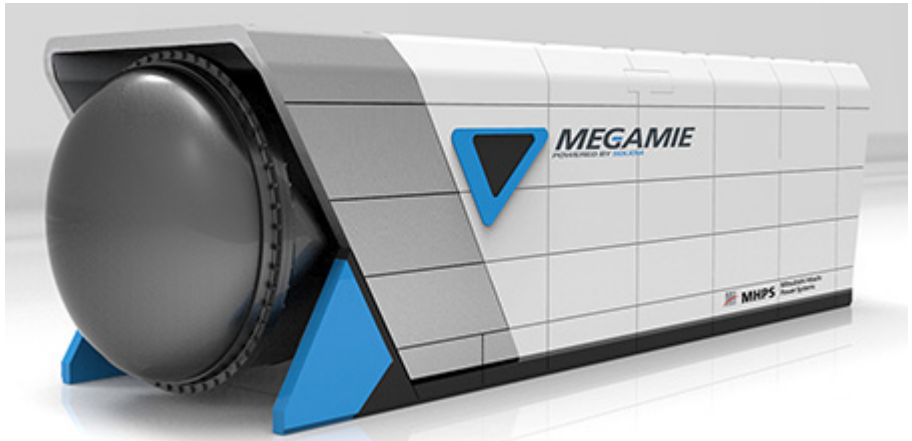
Residential Fuel Cell “Ene-Farm” (Launched in 2009)
家用燃料电池Ene-Farm（2009年推出）

0.7kW Power + Hot water: 700瓦功率+热水：
total efficiency > 90% 总效率 > 90%

314k unit = 220 MW as of June 2019
截至2019年6月，31.4万户= 220兆瓦

for Commercial Use (Launched in 2017)商业用途（2017年推出）

Kyocera: 3kW SOFC
Kyocera：3千瓦 SOFC



MHPS “MEGAMIE”: 250 kW
MHPS“MEGAMIE”：250千瓦

Current status of Fuel Cell application
燃料电池应用的现状

Policy Measures for introducing New Technology
引进新技术的政策措施

Research, Development & Demonstration
研究、开发和示范

Develop Market Environment
(Regulation, Code & Standard)
发展市场环境（法规，规范和标准）

Financial Support
(Subsidy, Tax Exemption)
财政支持（补贴，免税）

Current METI/NEDO budget related hydrogen
目前与氢有关的METI / NEDO预算

Subsidy: operated by METI 补贴：由METI运营

(1) Stationary fuel cell: JPY 5.2 billion (US$ 48 million)
（1）固定式燃料电池：52亿日元（4800万美元）
(2) Hydrogen Refueling Station: JPY 10 billion (US$ 92 million)
（2）加氢站：100亿日元（9200万美元）
(3) Clean Energy Vehicle: JPY 16 billion (US$ 148 million)
- for BEV, PHEV, Clean Diesel, FCV
（3）清洁能源汽车：160亿日元（1.48亿美元）
- 适用于BEV，PHEV，清洁柴油，燃料电池汽车

R&D, D: operated by NEDO 研发：由NEDO运营

(1) Fuel Cell: 3.8 billion (US$ 35 million)
（1）燃料电池：38亿（3500万美元）
(2) Hydrogen Refueling Station: JPY 3 billion (US$ 28 million)
（2）加氢站：30亿日元（2800万美元）
(3) Hydrogen Energy System: 17.7 billion (US$ 163 million)
- Hydrogen Gas Turbine, Hydrogen Transport, Electrolysis, Power to Gas, etc.
（3）氢能源系统：177亿（1.63亿美元）
- 氢气涡轮机，氢气输送，电解，电转气等

Current Direction of NEDO's Program
NEDO项目当前方向

First Step: Promoting fuel cell application
第一步：促进燃料电池的应用

Fuel Cells: 燃料电池：

(1) PEFC: for mobility（1）固体高分子型燃料电池(PEFC）：移动装置使用

- Target: 0.03-0.1 g-PGM/kW (depend on durability), 50,000 hrs. life time (commercial vehicle), Power Density:> 4kW/L (in 2030)
- Focusing on basic research to accelerate material / MEA development
- Improving productivity

(2) SOFC: for stationary use（2）固体氧化物型燃料电池(SOFC)：固定装置使用

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

Hydrogen Refueling Station: 加氢站：

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. Electro-chemical compressor, polymers, etc.)

Current Direction of NEDO's Program
NEDO项目当前方向

Second Step:　Develp H2 demand & Integrate w/ energy system
第二步：开发氢气需求并与能源系统集成

Hydrogen Supply Chain / Gas Turbine: 氢供应链/燃气轮机：

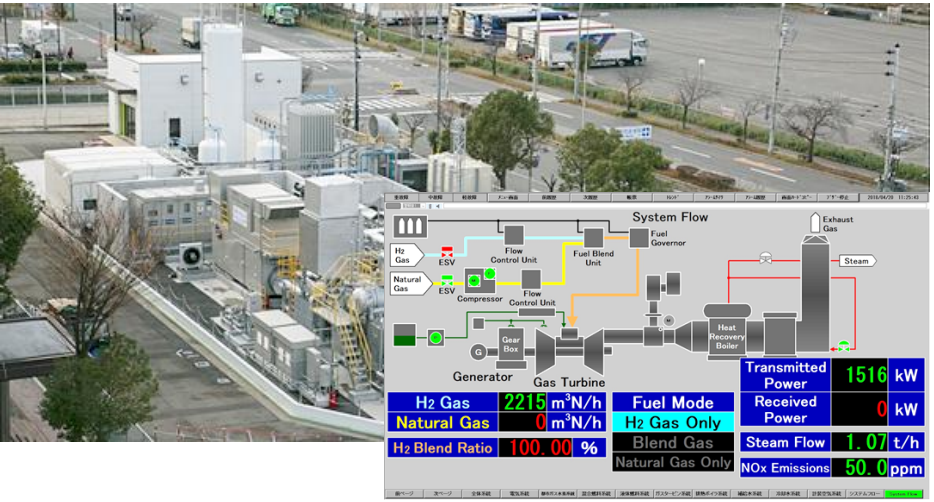
- Developing combustor for Hydrogen Gas Turbine
  Control of combustion for low NOx, back fire, etc.
- 开发氢燃气轮机燃烧室
- Realizing large scale hydrogen supply chain
  Hydrogen carriers for long distance transportation
- 实现大规模的氢供应链

Power to Gas: 电转气：

- Developing System Technology
  System Operation, Energy management, Demand response
- 开发系统技术
- Improving electrolysis technology
  Analyzing reaction mechanism, develop lifetime evaluation, etc.
- 提高电解技术

RD&D: Scaling-up 研发与示范：推广

1MW H_2 Gas-Turbine Demo Plant



Japan-Australia H_2 Supply Chain Project

FH2R FUKUSHIMA HYDROGEN ENERGY RESEARCH FIELD

10MW Electrolysis PtG Demo

Thank you! 谢谢！