

# Japan's Policy and NEDO's Activities in Hydrogen field

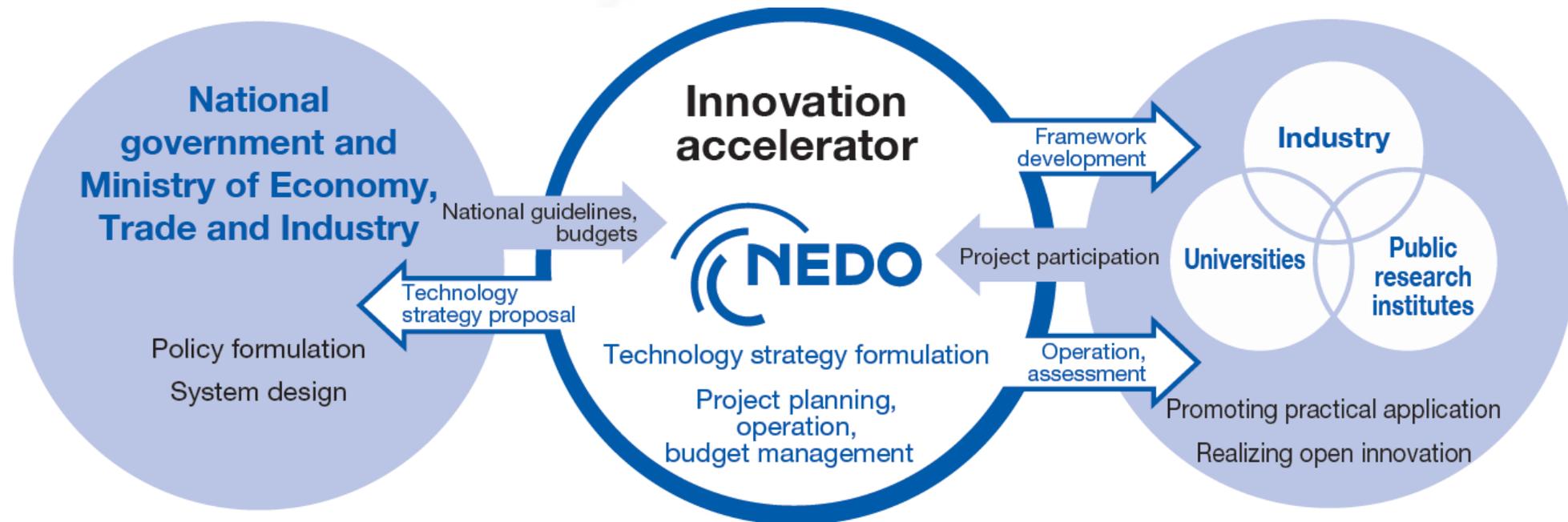
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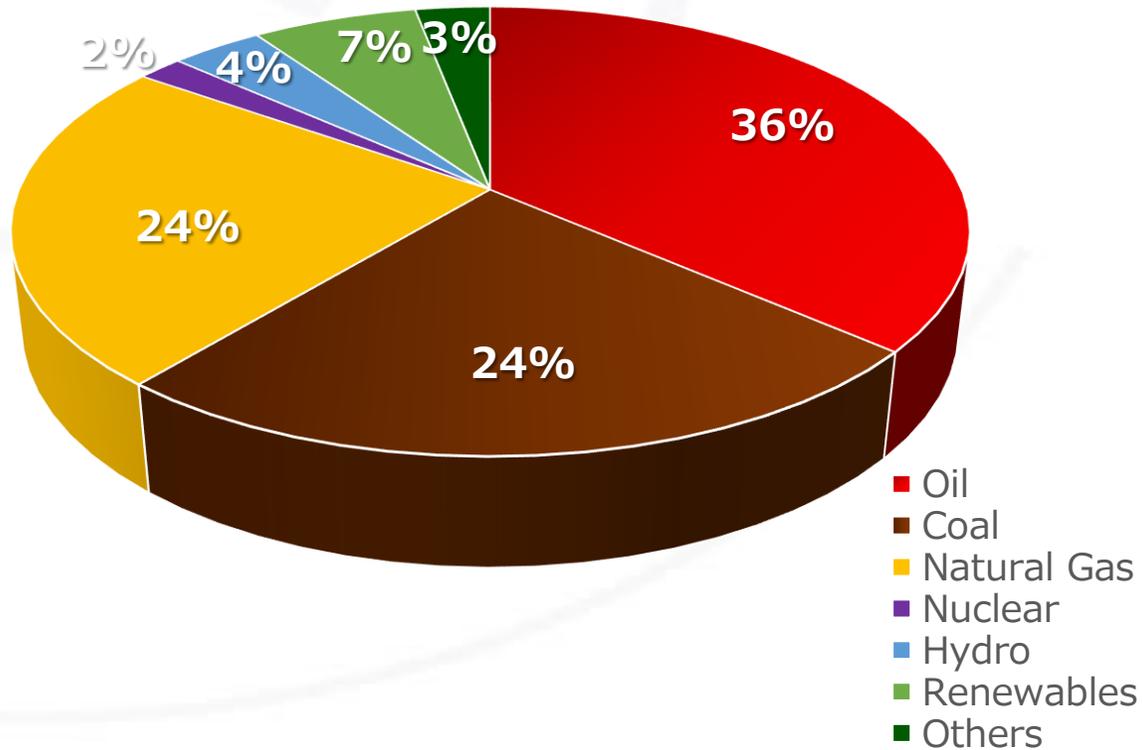
## Positioning of NEDO (New Energy and Industrial Technology Development Organization)

- In its role as an **innovation accelerator**, NEDO formulates project plans and establishes project implementation frameworks by combining the capabilities of industry, academia, and government, including public solicitations of project participants.
- NEDO carries out research and development projects and set targets based on changes in social conditions in order to realize maximum results.

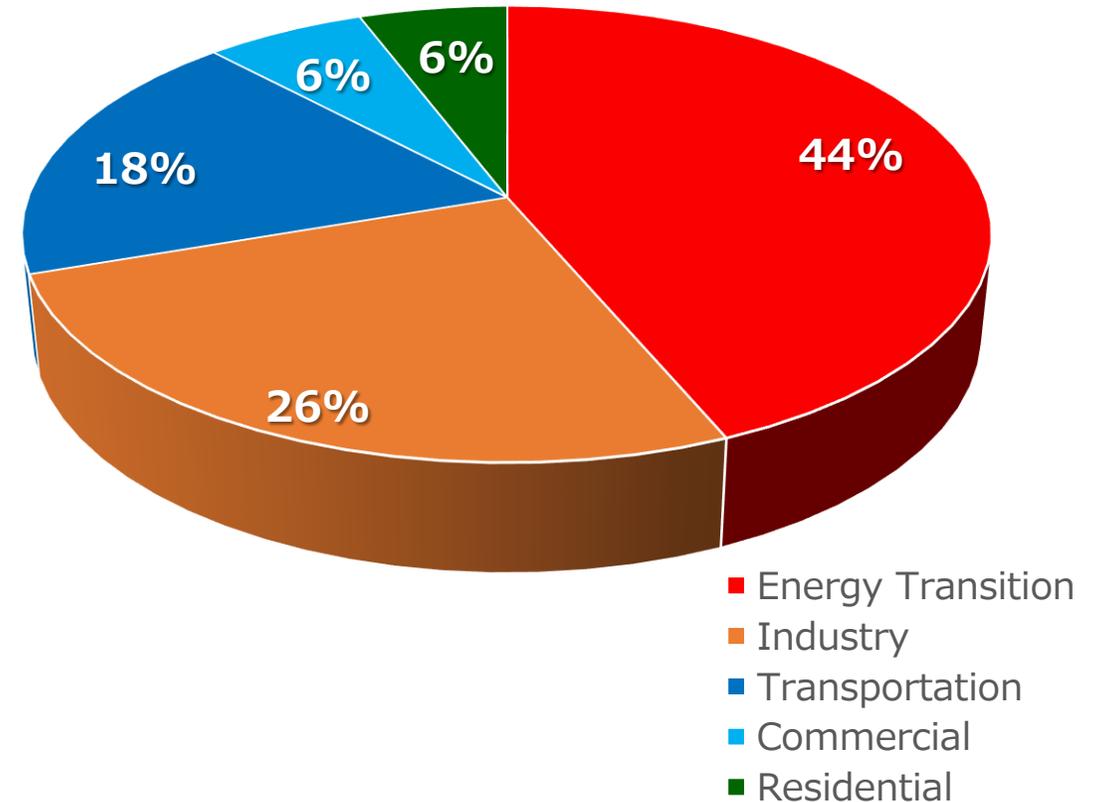


# Background: Japan's Energy Situation

Primary Energy  
(Total: 17,965 PJ in 2020)



Energy related CO<sub>2</sub> emission  
(Total: 971 Mt-CO<sub>2</sub> in 2020 / -21.7% from 2013)



**Need to increase renewables to address energy security & climate change, but...**

- Japanese government declared its ambition to reduce greenhouse gas emissions to **net zero by 2050** in October 2020.
- METI formulated a "**Green Growth Strategy** Through Achieving Carbon Neutrality in 2050" including "**Green Innovation Fund**" for supporting 10 years R&DD activities (JPY 2 trillion).
- **1% Hydrogen/Ammonia are positioned in 2030 energy mix** by 6th Japan's Strategic Energy Plan (October 2021)
- METI has established new committee to discuss on support measures for the **hydrogen supply chain**.
- METI allocated its FY2022 budget to;
  - Subsidy for **Hydrogen Refueling Station**: JPY 9 billion (OPEX / CAPEX)
  - Subsidy for **FCV** / EV / other clean energy vehicle: JPY 15.5 billion
  - R&DD: JPY 22.6 billion (through NEDO, not including Green Innovation Fund)

# Towards 2050 Carbon Neutrality

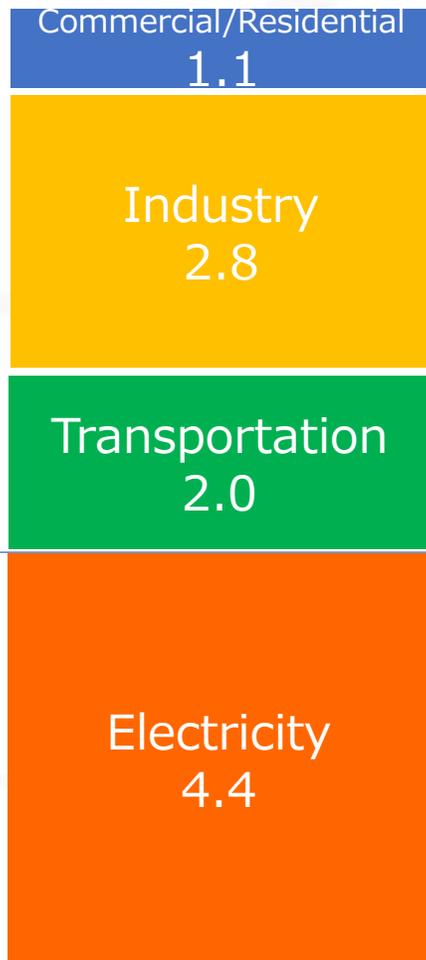
2019: 1,029Mt-CO<sub>2</sub>

2030: ▲46%(GHG total)

2050  
Carbon Neutral (-100%)

Non-Electricity

Electricity



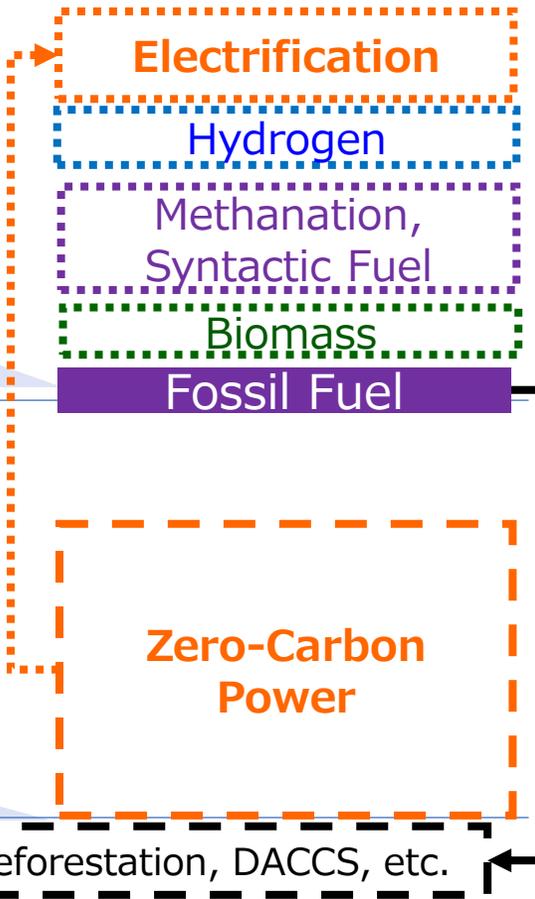
- Promotion of energy conservation by combining regulatory and supportive measures
- Strengthening of efforts toward the realization of a hydrogen-based society

- Efforts utilize renewables as main power source
- Restructuring of nuclear policy
- Reduction of thermal power plant ratio on the premise of stable supply
- Utilization of hydrogen / ammonia power generation



- Electrification with decarbonized electricity
- Pursuit of new options such as **hydrogen**, ammonia, CCUS / carbon recycling
- Afforestation, DACCS, BECCS, and other carbon removal technologies

- Maximum introduction of renewable energy
- Utilization of nuclear power
- Pursuit of new options such as **hydrogen**, ammonia, CCUS / carbon recycling



Hydrogen/Ammonia : 1%

# Prioritized sectors in Green Growth Strategy



## 14 growth sectors

### Energy related industries

 01\_Offshore wind pwr.  
Solar, heat energy

 02\_Hydrogen, Fuel Ammonia

 03\_Next generation heat energy

 04\_Nuclear power

### Transport/manufacturing industries

 05\_Automobile, Storage batteries

 07\_Shipping

 09\_Food, Agri. fishery, forestry

 11\_Carbon Recycling, Materials

 06\_Semiconductors Info/Com.

 08\_Logistics, people flow, Civil eng.

 10\_Aircraft

### Home/Office related industries

 12\_Housing/Building  
Next gen. electric power management

 13\_Resource circulation

 14\_Lifestyle related

# Direction: How to promote Hydrogen

## Goals

Cost (\$/kg): \$3/kg by 2030 & less than \$2/kg by 2050

	Short Term (- 2025) Approx. 2 million tons	Mid Term (- 2030) Max. 3 million tons	Long Term (- 2050) 20 million tons
Supply	Existing source (ex. By products)	Maximize utilization as major source	Decarbonization of hydrogen production (with CCUS)
	Import	Accumulation of knowledge and cost reduction through demonstration project	Development of large-scale international hydrogen supply chain
	New domestic source	Accumulation of knowledge and cost reduction through demonstration project	Start up hydrogen production by electrolysis using excess energy from renewables
Demand	Transportation	Expansion to FC trucks in addition to FCVs and FC buses	Launch of ships (FC ships, etc.) to the market
	Power generation	Using of stationary fuel cell and small gas turbine for distributed energy	Commercialization of large-scale hydrogen power generation turbine
	Industry (raw material)	Conducting technology demonstration project (refinery, steel process, chemical process, etc.)	Realizing hydrogen steel process, green chemical, etc.
	Thermal (Industry, business, household)	Substitute fossil fuels through installation of fuel cell and decarbonization of supply infrastructure using electrolysis and existing gas pipes	Expanding supply through infrastructure development and hydrogen cost reduction

# Current status

Items	Japan's Target (in 2030)	Current status (as of July 2022)
<b>Stationary Fuel Cell</b>		
Residential Fuel Cell (EneFarm)	5.3 million	439,852 (June 2022)
<b>Mobility</b>		
Passenger Vehicles	800,000	7,418
Fuel Cell Buses	1,200	120
<b>Hydrogen Refueling Station</b>		
Public Stations	900	160



# • NEDO's Activities in Hydrogen

## (1) Production : Electrolysis System (Alkaline, PEM, etc.)

The world's largest-class one-unit hydrogen production (Alkaline. 10MW) at FH2R (Fukushima Hydrogen Energy Research Field)



1.5MW PEM electrolysis (Yamanashi Hydrogen Company)



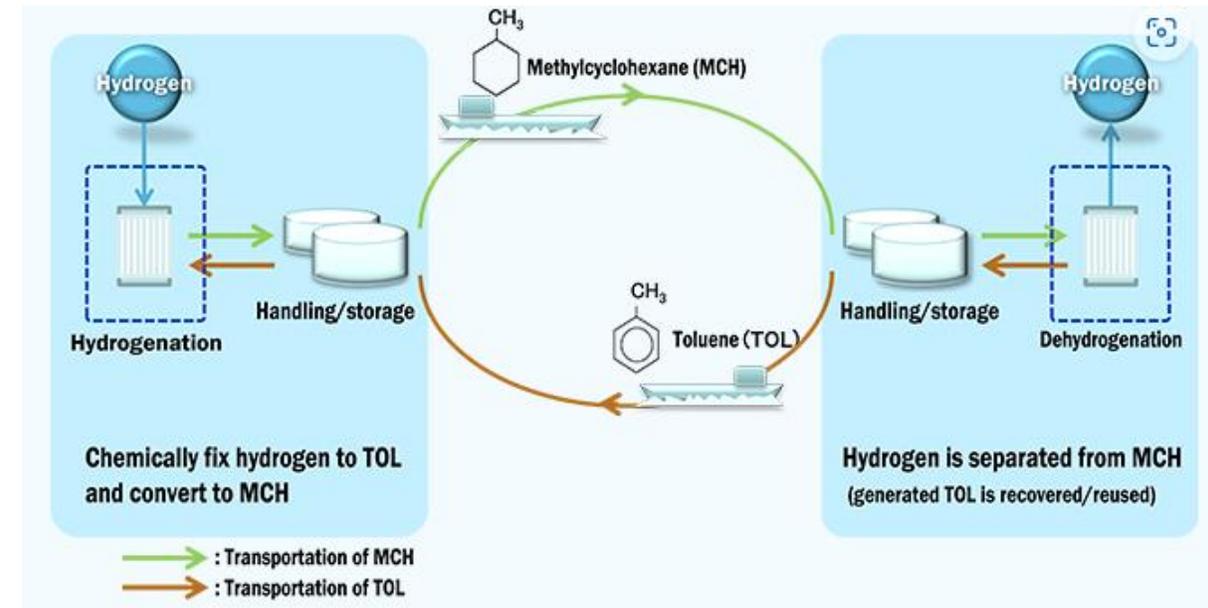
# • NEDO's Activities in Hydrogen

## (2) Transportation : Energy Carrier (Liquefied H<sub>2</sub>, MCH, etc.)

World's first liquefied hydrogen carrier ship was launched. Hydrogen is transported from Australia.



International hydrogen supply chain using MCH as the hydrogen carrier in the demonstration project

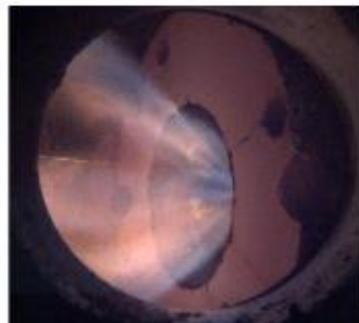


# • NEDO's Activities in Hydrogen

## (3) Use : H2 Co-firing, Fuel Cells (Mobility, Generation) etc.

Hydrogen Burner Technology  
for Industrial Boilers

FCV, Hydrogen charging station, etc.



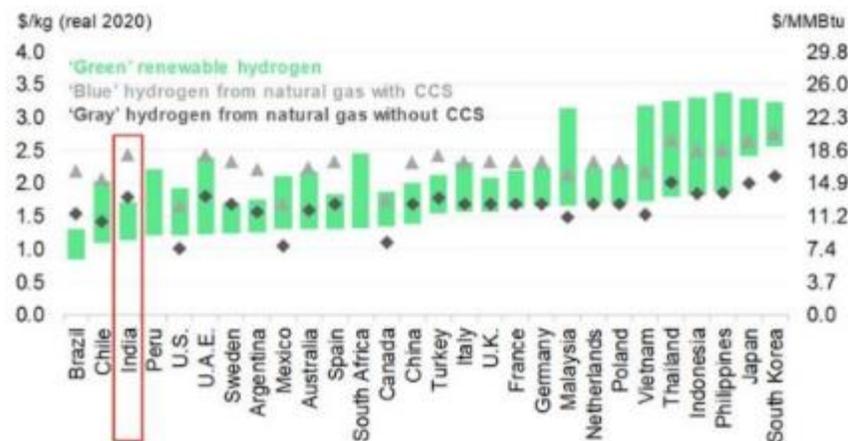
Port, Ship, Aviation...

# NEDO India's Report concerning Hydrogen Potentials in India



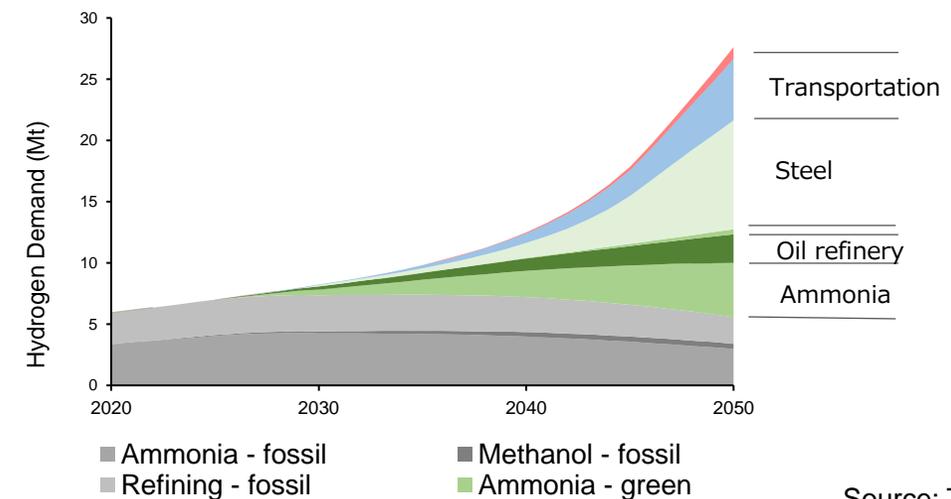
- India concentrates on supporting **green hydrogen/ammonia**, backed by solar power's potential (bidding price : INR 1.99 in December 2020). India aims to become a **global hub of hydrogen**.
- Some analyses say that India's **green hydrogen is highly cost competitive** in the world.  
(According to an analysis by TERI, a local think tank, the cost of hydrogen production is expected to be "**\$2/kg in 2030, \$1/kg in 2050**")
- The Indian government announced the "**National Hydrogen Energy Mission**" in 2021, and is currently promoting and considering various policies to promote hydrogen.
- **Demand for hydrogen** in India is estimated to increase five-fold, mainly in the manufacturing and transportation sectors.
- Against these backgrounds, **India's public or private conglomerate companies** are stepping up their hydrogen efforts. Also, **US and European companies** are actively cooperating with them.

Figure: Global levelized costs of hydrogen production, 2030 (\$/kg)



Source: BNEF, 2021

Hydrogen demand projection in the Low-Carbon scenario, 2020-2050



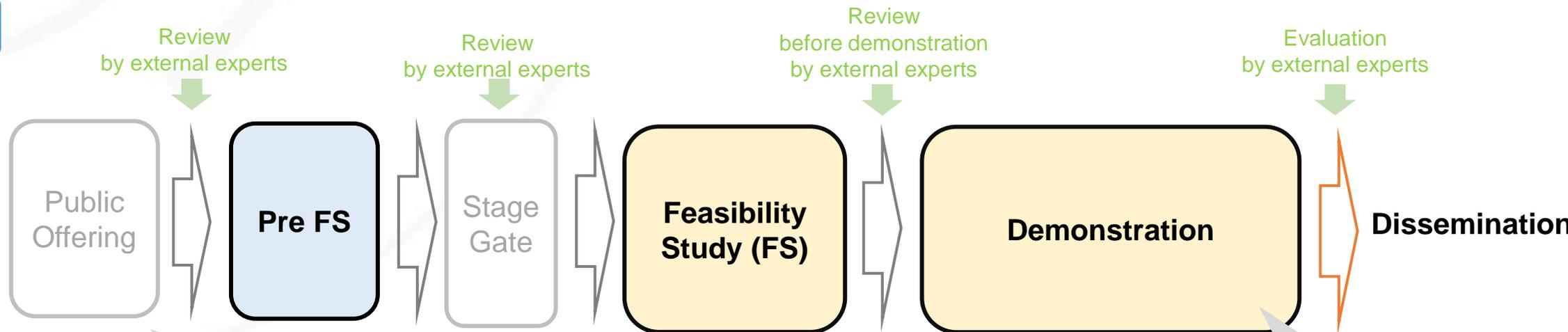
Source: TERI Analysis 12

# International Energy Demonstration Project

## Purpose

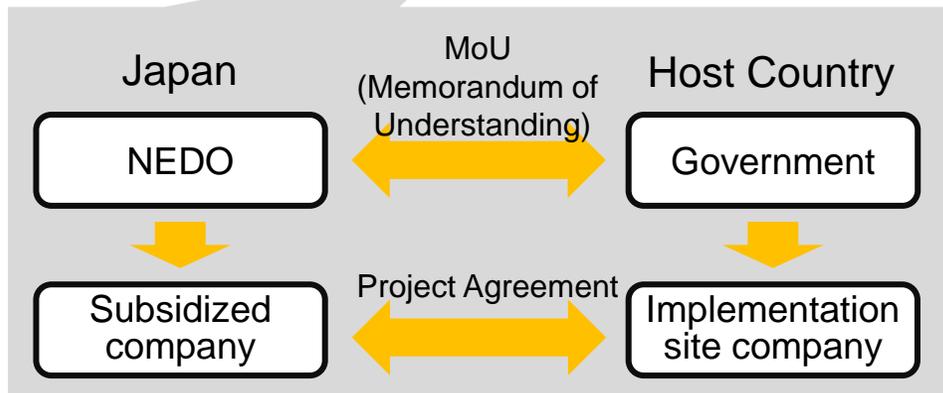
- ✓ Contribute to solving foreign energy problems through a demonstration of Japanese technology and systems for energy conservation.
- ✓ Contribute to obtaining energy security by reducing energy consumption through the dissemination of technology.

## Scheme



2 public bids / year  
(A new public offering has just started since July 11<sup>th</sup>.)

※ Indian companies or universities may participate in the projects, together with Japanese companies which are supposed to apply for the offering.



Maximum for each project is around **3 Billion Rupees** (4 Billion Yen)

# Implemented Demonstration Projects in India



## Current Projects

- NEW** Micro-Substation for electrification using transformers for Large-Capacity Instruments

## Completed Projects (FY)

- EMS for Multiple Energy Sources at Steel Plant
- Sinter Cooler Waste Heat Recovery (2014)
- Coke Dry Quenching System (2011)
- Utilization of Sensible Heat from Blast Furnace Hot Stove Waste Gas (2004)
- Green Telecom Tower Project (2016)
- Micro-Grid System with PV Power Generation (2019)
- Highly Efficient Coal Preparation Technology (2014)
- Smart Grid Pilot Project (2018)
- Converting a Diesel Generator to Dual-fuel Operation (2011)
- Regional Energy Efficiency Centre (2011)
- ICT Based Green Hospital (2019)
- Waste Heat Recovery System of Cement Plant (2004)

# International Energy Demonstration Project (Current Projects)



Project	Companies	Period	Phase
Micro-Substation for electrification using transformers for Large-Capacity Instruments	Nissin Electric	2020~	Demonstration
Electric Mobility Operation System for realizing Last-mile Transportation	Panasonic	2020~	Demonstration
Energy optimization in chemical industry	Toyo Engineering Corp.	2020~	Pre FS
Empirical research about LNG delivery by Indian railways and improvement of cold chain infrastructure in India with LNG cold energy for the energy-consumption efficiency & the CO2-emission reduction	Sojitz Corp. JR Freight Suzuki Motor Corp.	2021~	Pre FS
<b>NEW</b> Demonstration of Ammonia Co-Firing at existing Coal Fired Power Plant in the state of Gujarat	IHI Corp. Kowa Company	2022~	Pre FS
<b>NEW</b> Study on Conformity with Demonstration Requirements for Hydrogen Technology to Achieve Efficient Thermal Operation in Indian Factories	Yamanashi Hydrogen Company Suzuki Motor Corp.	2022~	Pre FS

# International Energy Demonstration Project (Hydrogen-related Projects)



## Study on Conformity with Demonstration Requirements for Hydrogen Technology to Achieve Efficient Thermal Operation in Indian Factories (Pre-FS)

- Yamanashi Hydrogen Company (YHC: invested by Yamanashi Prefecture, Tokyo Electric Power Company (TEPCO) and Toray Industries) and Suzuki Motor will study the possibility of establishing an optimal thermal operation system in Maruti Suzuki's automobile plant, by utilizing hydrogen produced by a Power-to-Gas (P2G: electrolysis of water) system and surplus solar power.



← YHC's Green Hydrogen Demonstration Site in Komekurayama, Yamanashi Prefecture (Source : YHC)

## Demonstration of Ammonia Co-Firing at existing Coal Fired Power Plant in the state of Gujarat (Pre-FS)

- IHI Corp., Kowa Company and Adani Power Ltd. (APL), one of the largest private power generation companies in India, will jointly study various technologies and evaluate the economic feasibility of co-firing 20% ammonia gas into the existing boilers at APL-owned Mundra Coal Power Plant.



← Mundra Coal Power Plant (Source : Adani Power)

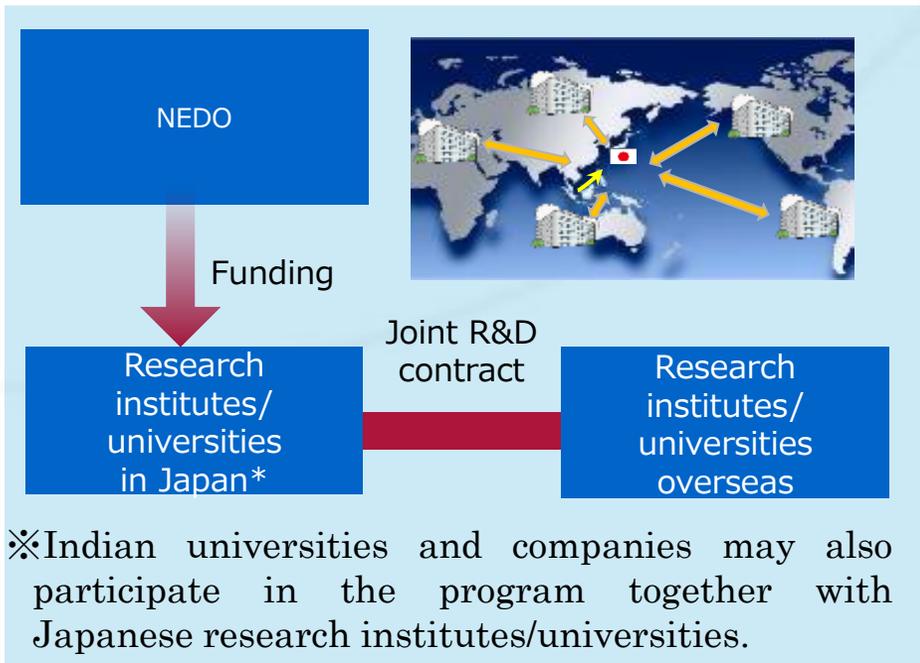
# R&D Program for Promoting Innovative Clean Energy Technologies Through International Collaboration



## ● Program Outline

- ✓ The aim of this program is to develop and strengthen international joint Research and Development between Japan and other countries in order to create new and innovative clean energy technologies that will have practical use after 2030.
- ✓ This program supports Japanese research institutes and universities conducting joint international R&D projects with institutions from G20 member and other countries.

## ● Program Scheme



## ● Project Details

<b>Project scheme</b>	International collaboration between Japanese research institutes/universities and research institutes/universities overseas. Private companies may participate but only when research institutes/universities also participate.
<b>Project budget</b>	Maximum of almost <b>INR 1.7 crores</b> (25 Million Yen) per project/per year. Note: NEDO will only fund the Japanese side of the international collaboration.
<b>Project term</b>	<b>Maximum of 3 years.</b>
<b>Target technologies</b>	- Clean energy technologies, including RE and energy-saving and environmental technologies that will have practical application after 2030. - 2 R&D themes have been selected for FY2022.
<b>NEW Project with India-Japan collaboration</b>	<b>“Development of Innovative High-temperature Thermal Energy Storage technology”</b> (Hokkaido Univ., AIST, IIT Jammu etc.) has been adopted in FY2021.

# NEDO New Delhi Office Webinar (Launched in 2021)

## **(1) 4<sup>th</sup> of February 2021**

Theme : India Electricity situation and Renewable energy

Speakers : CEA, SECI, Avaada, Toshiba JSW Power Systems Pvt.

## **(2) 10<sup>th</sup> of March 2021**

Theme : Power distribution, Grid management  
& Energy Distribution Management and Energy Storage

Speakers : NITI Aayog, POSOCO, Tata Power Delhi, Sumitomo Electric, etc.

## **(3) 24<sup>th</sup> of March 2021**

Theme : Indo-Japanese Drone Ecosystem and Potential Collaborations

Speakers : MOCA, DFI, Gov. of Japan(Cabinet Secretariat, METI), ACSL

## **(4) 14<sup>th</sup> of January 2022**

Theme : Carbon Neutrality in India

Speakers : NITI Aayog, MOP(BEE), CEEW, Reliance Industries, Mizuho Bank

## **(5) 15<sup>th</sup> of February 2022**

Theme : Mobility and Battery Storage

Speakers : CESL, ETO Motors, Ather Energy,  
TDSG(TDS Lithium ion Battery Gujarat)

## **(6) 24<sup>th</sup> of February 2022**

Theme : Biomass Energy

Speakers : MoPNG, PRESPL, IOCL, Hitachi Zosen



## **(7) 15<sup>th</sup> of March 2022**

Theme : Solar Power and Mini Grid

Speakers : ISA, OMC Power, Gov. of Uttar Pradesh etc.

## **(8) 24<sup>th</sup> of March 2022 (Hybrid of Physical & Online)**

Theme : Hydrogen

Speakers : NITI Aayog, MNRE, MoPNG(CHAT), Kerala State,  
TERI, Gateway House, Emb.of Japan in India, JBIC etc.

## **(9) 30<sup>th</sup> of March 2022**

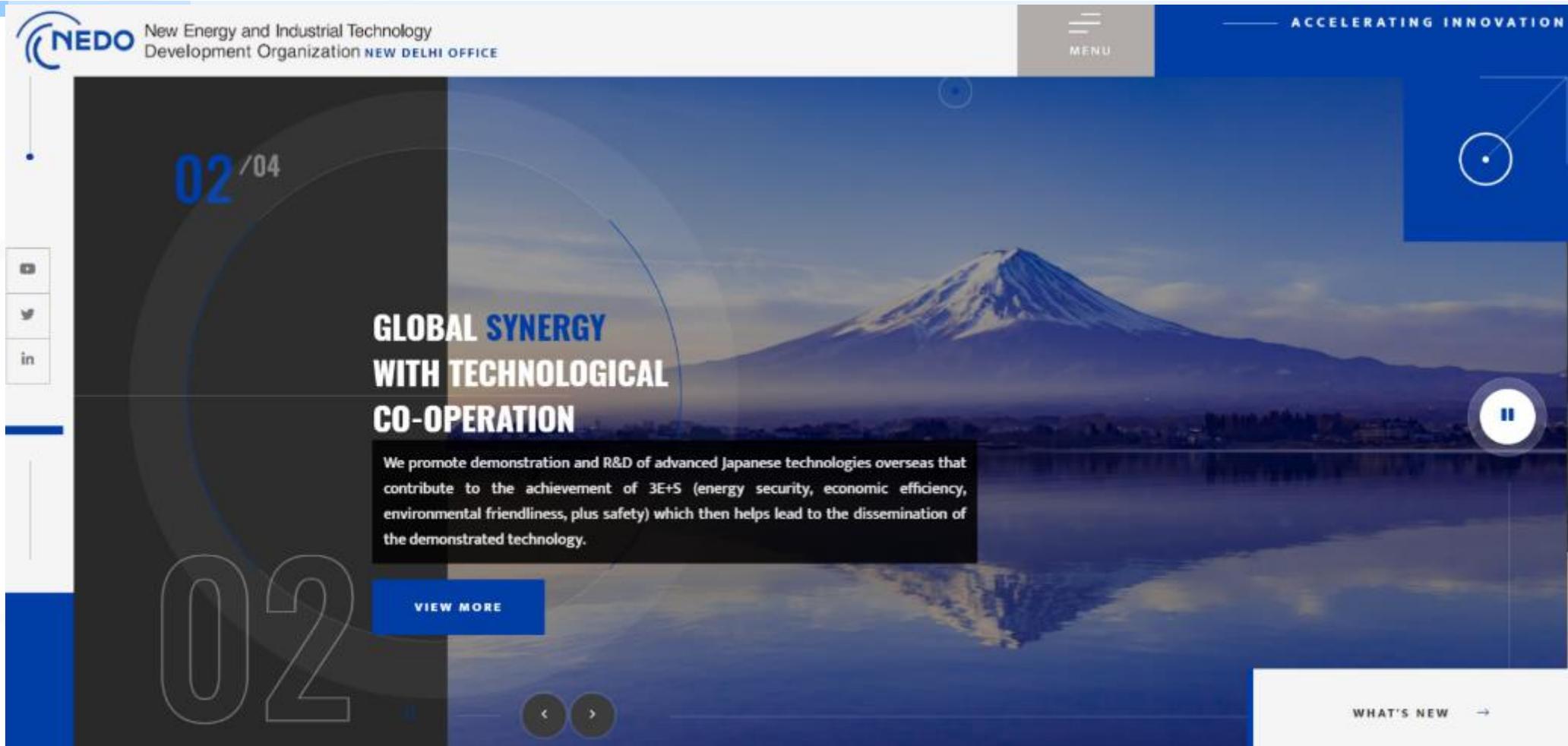
Theme : Drones

Speakers : Tech-Sci Research

## Conclusion

- *Hydrogen is key technology for carbon neutral*
  - *Japan has been strongly promoting hydrogen*
- *Just started market penetration*
  - *need to enhance application, improve technology*
- *Our goal: Developing low-carbon energy system*
  - *scaling-up / integration with other energy system*

# Thank you for your attention!



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