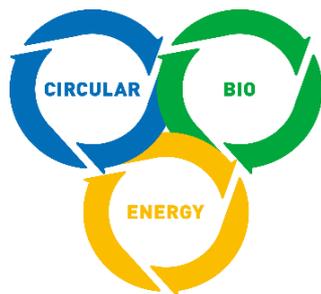




# Japan's Green Growth Strategy Through Achieving Carbon Neutrality in 2050 and NEDO's Efforts to Realize a Sustainable Society

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1. Introduction of NEDO-TSC
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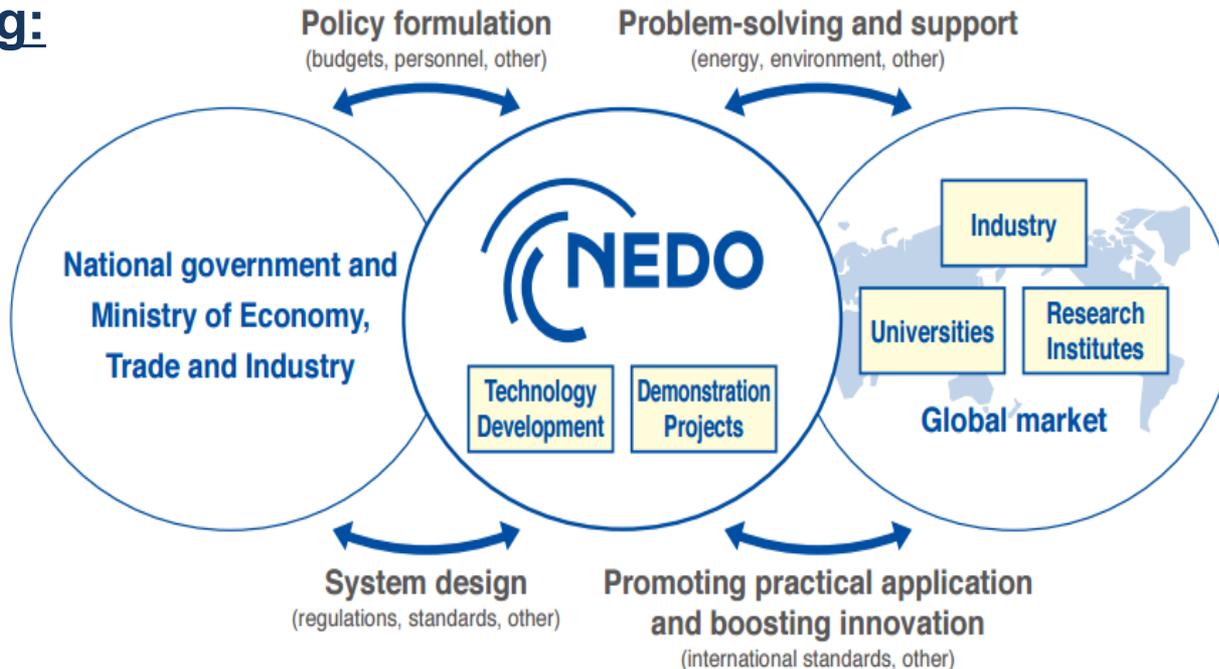
## History:

- 1980 **New Energy Development Organization** established
- 1988 **Industrial Technology** research and development added
- Name changed to “New Energy and Industrial Technology Development Organization”

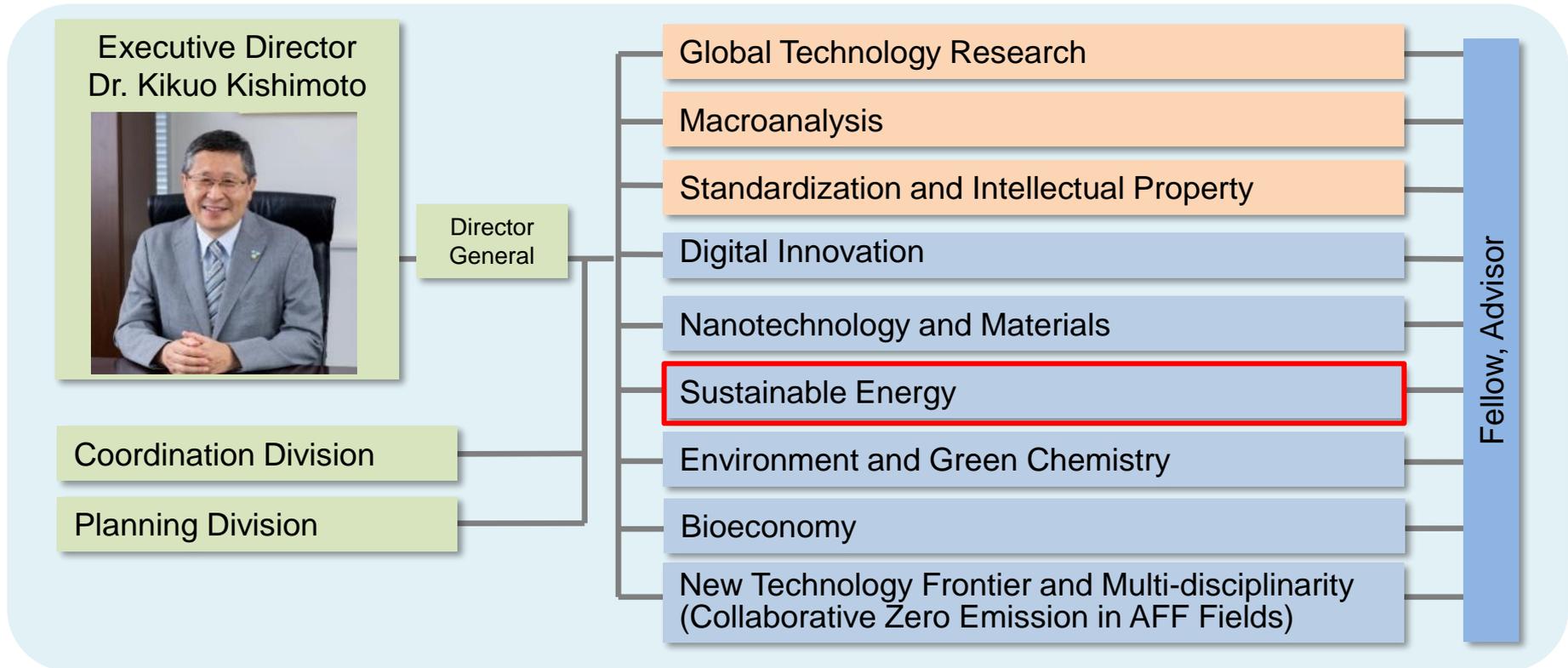
## Two basic missions:

1. Addressing energy and global environmental problems
2. Enhancing industrial technology

## Positioning:



- Conducting surveys and analysis of domestic and international technology trends
- Formulating technology strategies in key fields
- Planning and designing strategy-based NEDO projects





## 2. Japan's Green Growth Strategy



Technology Strategy Center



provisional translation

# Overview of Japan's Green Growth Strategy Through Achieving Carbon Neutrality in 2050

Jan 2021

## 1(1). Green Growth Strategy in line with Carbon Neutrality in 2050

- In Oct 2020, Japan declared its intention to achieve a carbon neutral society by 2050.
- Tackling climate change is an opportunity for further growth.
  - Green Growth Strategy is an industrial policy towards a “Positive cycle of economic growth and environmental protection”
- However, it is not easy to realize.
  - Support for the private sector to tackle ambitious goals = Role of the Government
- The Government presents a concrete national vision and goals, which motivates business players
  - This strategy provides a reference on both the energy policy and energy outlook for 2050 CN in order to identify industries with high potential
  - This will constitute a list of 14 sectors with high growth potential, for which the Government will provide necessary policy measures and show ambitious goals.

## 1(2). Green Growth Strategy in line with Carbon Neutrality in 2050

### ● Decarbonization of electricity

- Renewables

Maximum introduction. Grid development, cost reduction, batteries.

→ Offshore wind and battery industry

- Hydrogen power

Pursue as an option. Increase of supply/demand, infrastructure, cost reduction

→ Hydrogen industry

- Thermal power generation with CCUS/Carbon Recycling

Pursue as an option. Technology development, site development, cost reduction

→ Carbon Recycling, ammonia as fuel industry

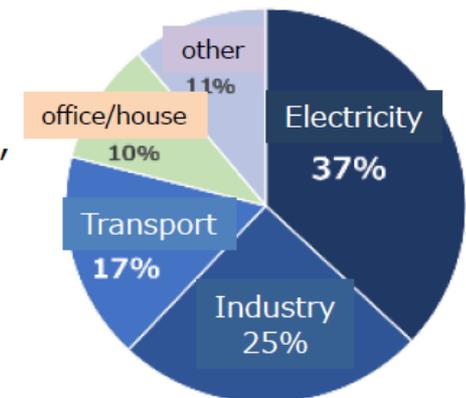
- Nuclear Power

Proven de-carbonization technology. Further safety enhancement, restart of plants.

→ Maximizing utilization of existing nuclear infrastructure, while aiming to decrease dependency on nuclear power.

→ R&D for safer next-generation reactors

CO2 emission by sector



## 1(3). Green Growth Strategy in line with Carbon Neutrality in 2050

- Promote “**electrification**” in all sectors. For non-electricity demand, “**hydrogen use**” and “**CCUS**”.

Industry      ... Manufacturing process

Transport      ... **Electrification**, bio fuel, hydrogen fuel

Business/household      ... **Electrification, hydrogen, batteries**

→ **Hydrogen, auto/battery, transport and housing industries**

- Storage of electricity      ... **Carbon neutral society means electrification.**

Green Growth Strategy underpins **robust digital infrastructure**

→ **Semiconductor/ICT industry**

Electricity      ... Smart grid, supply/demand response, infrastructure maintenance

Transport      ... Self driving

Factory      ... Factory automation

Business/household      ... Smart houses, robots

→ From R&D to **implementation** + **cost reduction**

→ **Expected economic gain is 90 trillion yen in 2030 and 190 trillion yen in 2050**

(approximately, 880 billion USD and 1.8 trillion USD)

## 2(1) Energy Outlook of Carbon Neutrality in 2050 (Reference)

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- Electricity demand will increase by 30-50% (1.3~1.5 trillion kWh)
- Maximum introduction of renewables
  - Challenges: power adjustment/transmission/grid inertia, social conditions, cost
  - Unrealistic to cover all electricity demand only with renewables
  - Setting "50-60% renewables in 2050" as a reference, based on experts' comments
- Further innovation needed in thermal power plants with CCUS and hydrogen
  - 10% - hydrogen and ammonia power generation, 30-40% - nuclear and thermal power plants with CCUS as a reference
- Analyzing scenarios further, discussion continues towards revision of the Strategic Energy Plan.

- **Green Innovation Fund: 2 trillion yen** over 10 years
- Stimulate **15 trillion yen** worth of private R&D and investment

## 14 Growth Sectors

ENERGY	TRANSPORT/ MANUFACTURING	Home/ Office
① Offshore Wind Power Photovoltaics Geothermal	⑤ Mobility and Battery	⑫ Housing and Building
② Hydrogen Fuel Ammonia	⑥ Semiconductor and ICT	⑬ Resource Circulation
③ Next Generation Thermal Energy	⑦ Maritime	⑭ Lifestyle-Related Industry
④ Nuclear Power	⑧ Logistics, People Flow and Infrastructure	
	⑨ Foods, Agriculture, Forestry and Fisheries	
	⑩ Aviation	
	⑪ Carbon Recycling and Material	

### 3.Comprehensive R&D Principle for Sustainable Society 2020 published by NEDO on February 14, 2020

<https://www.nedo.go.jp/content/100925057.pdf>

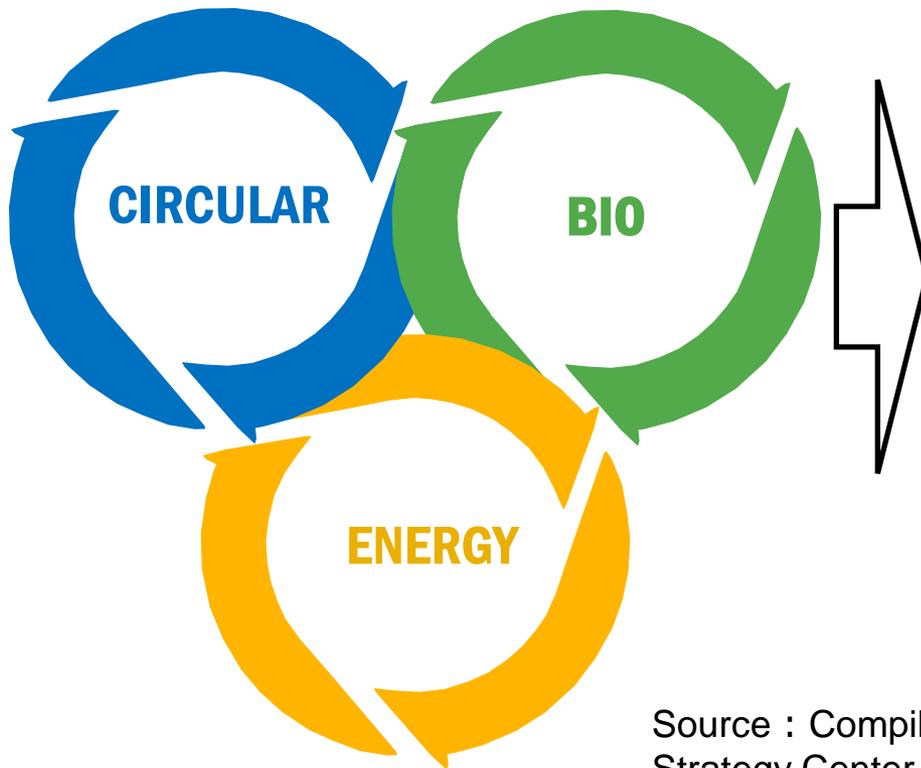
Climate change is a challenge that humans have to overcome. Even if considerable difficulty exists, humans need to build a society where they can overcome the climate change, ensure harmonization among the environment, economy and society, continue creating new values, and keep evolving in a sustainable way, namely, *a sustainable society*.

## A vision of the future to reach for sustainable society

- To keep the international society economically rich, environmentally friendly and coexisting with nature after a hundred years, two hundred years and even thereafter;
- To ensure that nature and ecosystem diversity are maintained and continuously developed in the future;
- To meet the social needs of the current generation and not impede on the social needs of future generations, rather, to pass on a better society to future generations;

The challenges for climate changes are promoted in consistency with the elements of Sustainable Development Goals (SDGs) by UN.

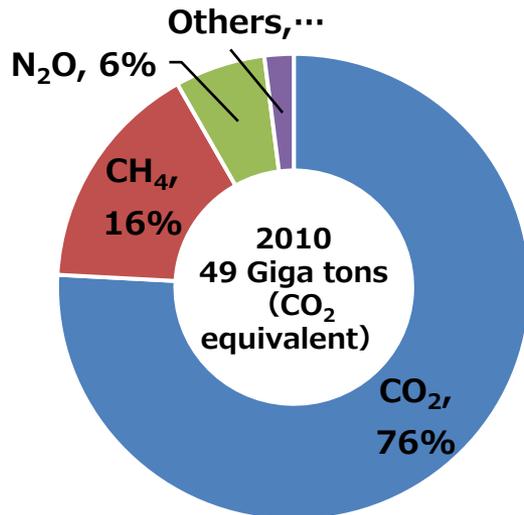
On the basis of the movement for realizing a *decarbonized society*, it is indispensable to continuously develop 3 Essential Social Systems: (1) Circular Economy, (2) Bioeconomy, and (3) Sustainable Energy, creating discontinuous innovation and implementing with economic rationality



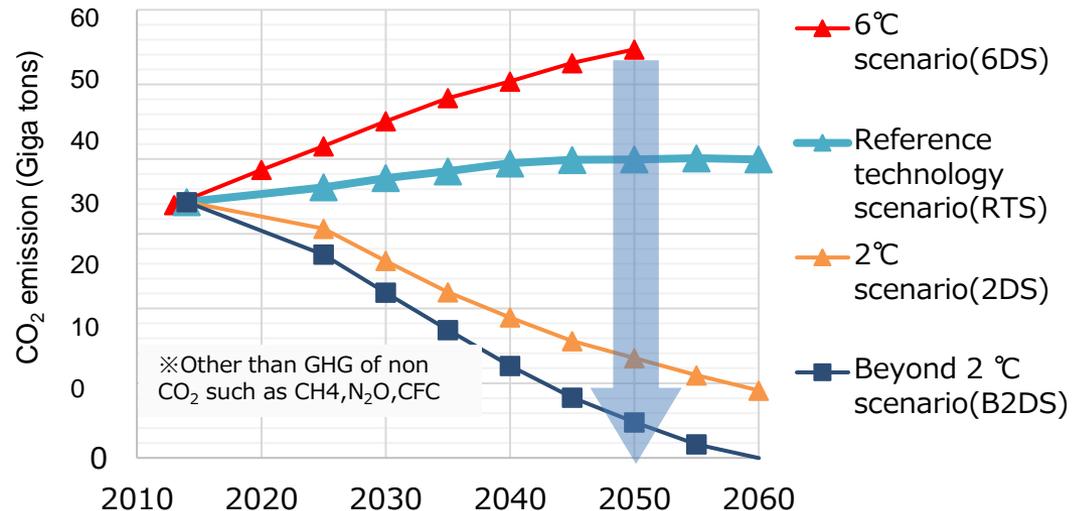
The 3 Essential Social Systems, which are indispensable to realizing a sustainable society, can continue developing, relate with each other, affect each other, and are optimally harmonized.

Source : Compiled by NEDO Technology Strategy Center (2020)

- The GHG emissions in 2010 were about 49 Gt CO<sub>2</sub>. Of these, 76% is attributable to CO<sub>2</sub>, followed by CH<sub>4</sub> (16%), N<sub>2</sub>O (6%) and fluorine gases (2%) .
- **In 2050**, approximately 15 Gt is expected to be reduced by expanding conventional technologies(RTS), and **40 Gt CO<sub>2</sub>** still remains.
- This Comprehensive Principle mainly discusses reduction of CO<sub>2</sub> emissions though reduction of other GHGs is also a future challenge.

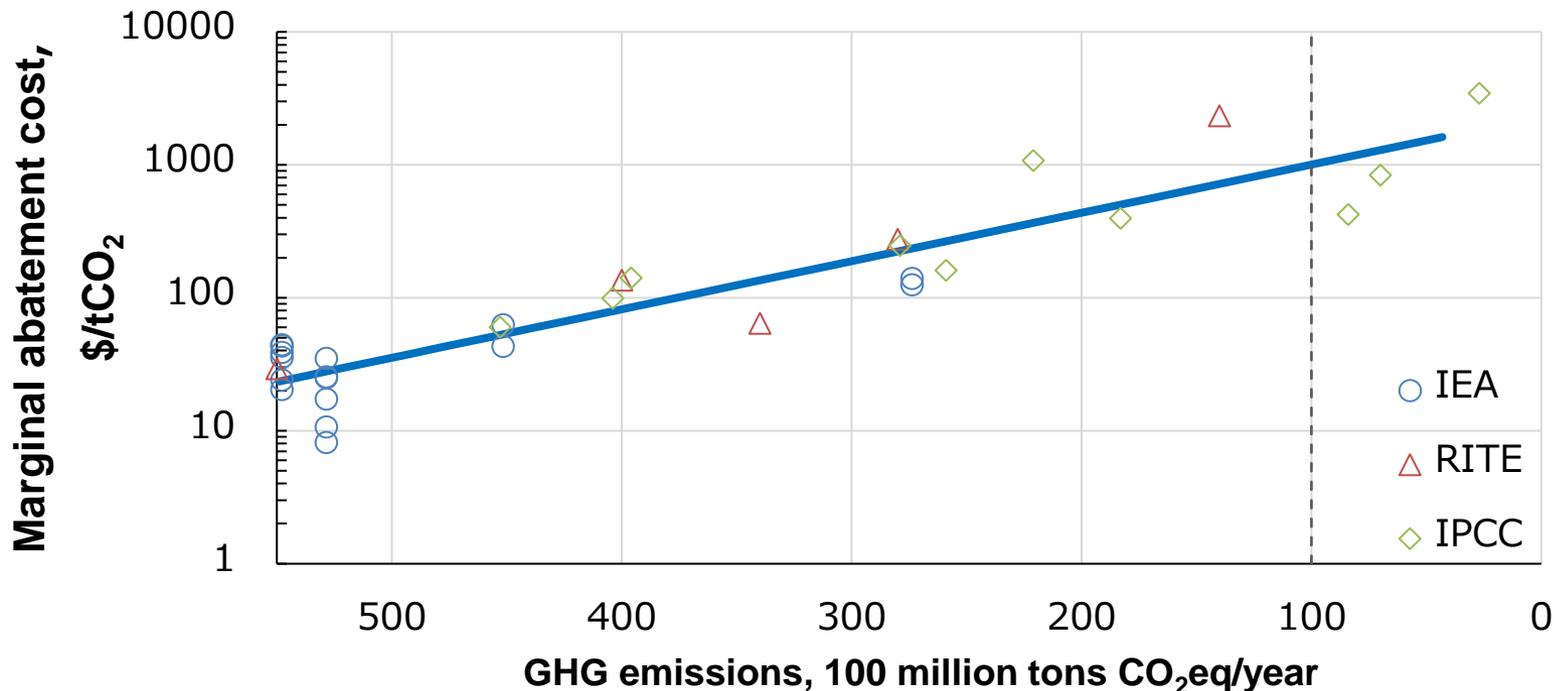


Source : Compiled by NEDO Technology Strategy Center based on Climate Change 2014 Synthesis Report(IPCC2014) (2020)



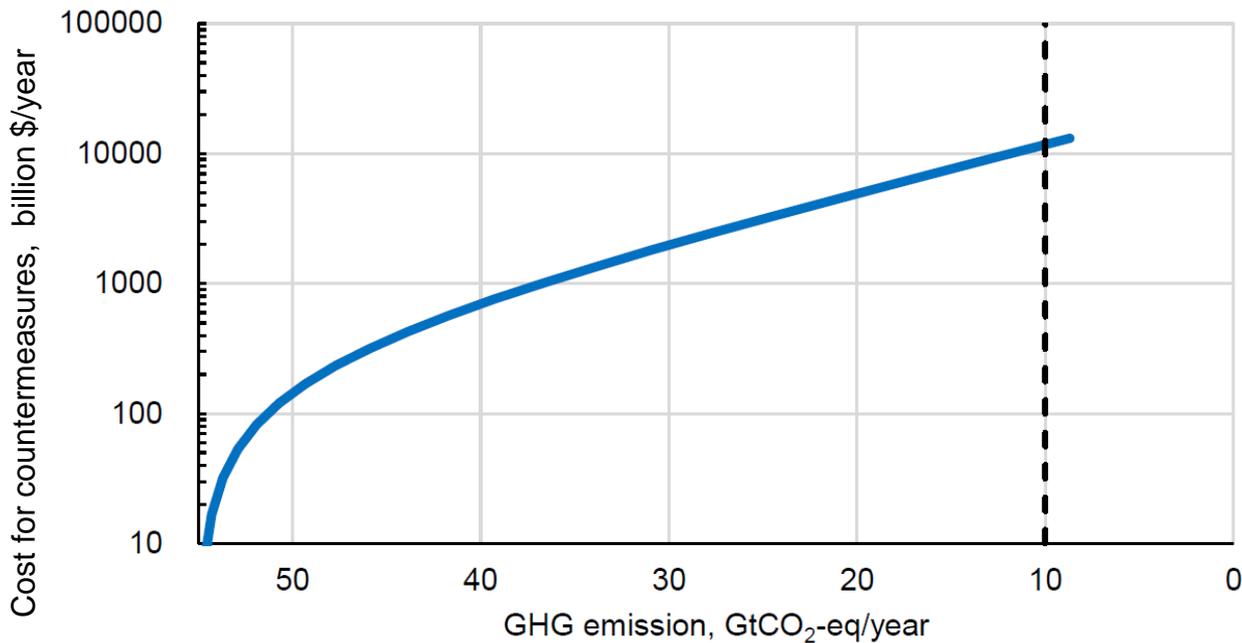
Source : Compiled by NEDO Technology Strategy Center based on Energy Technology Perspectives 2016 and Energy Technology Perspectives (2020)

- The estimations of global GHG emissions and marginal abatement cost published by some international research institutes are shown in the figure.
- The marginal abatement cost increases exponentially along with the reduction of GHG emissions .
- The marginal abatement costs will exceed **\$1,000/tCO<sub>2</sub>** to reduce **40 billion tons of CO<sub>2</sub>** .



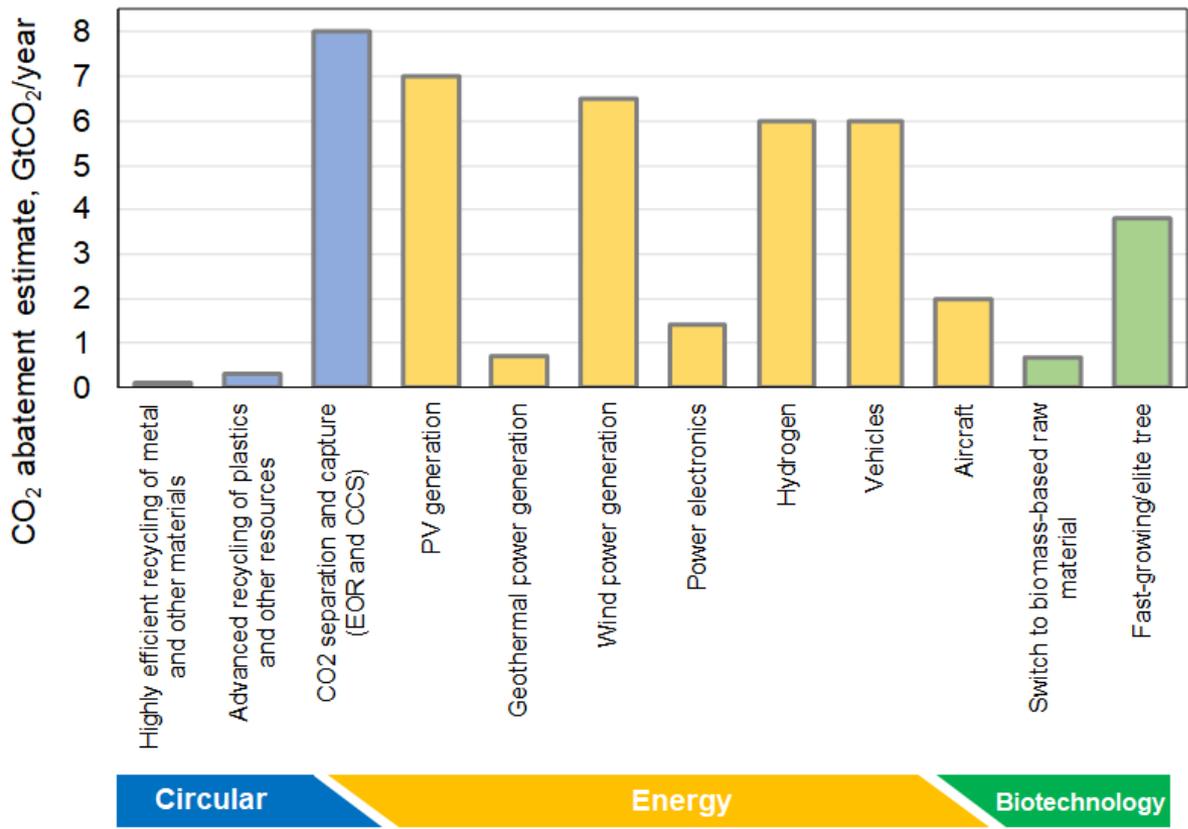
Source : Compiled by NEDO Technology Strategy Center based on Global warming of 1.5°C (IPCC,2018) World Energy Outlook 2018 (IEA,2018) and Analyses on Japan's GHG Emission Reduction Target for 2050 in Light of the 2°C Target Stipulated in the Paris Agreement(RITE2017) (2020)

- The costs for countermeasures will take approximately \$10,000 billion scale to reduce 40 billion tons of CO<sub>2</sub> every year in the world.
- \$10,000 billion corresponds approximately to 12 % of global GDP and it is extremely difficult for society to accept.
- Discontinuous innovation to lower this huge cost to a globally acceptable level is indispensable.

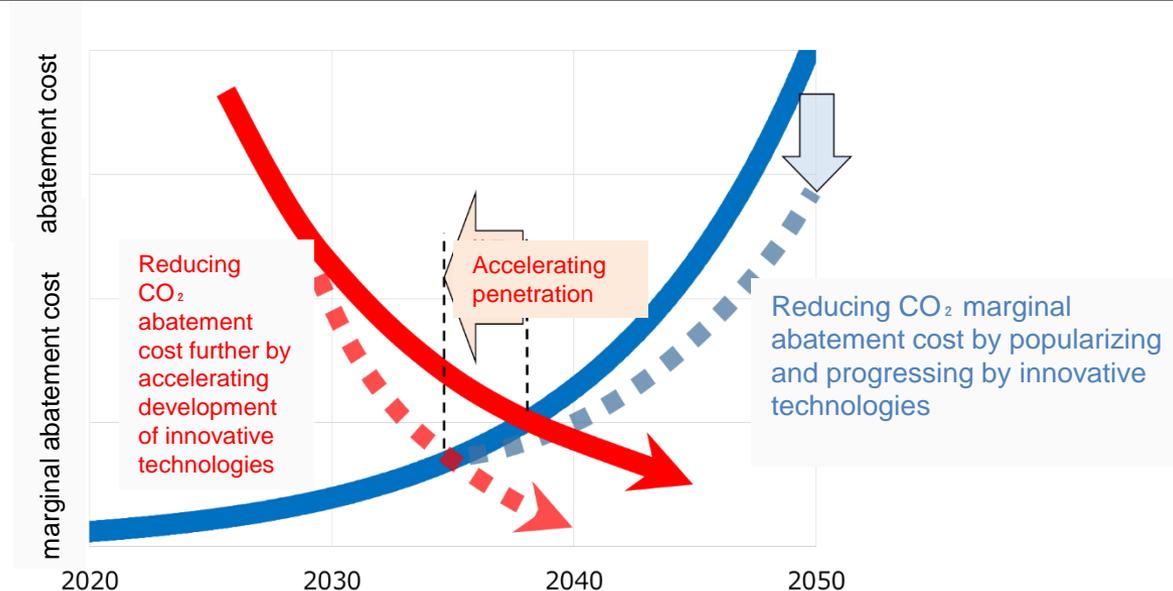


Source : Compiled by NEDO Technology Strategy Center based on the analytical result of marginal abatement costs (2020)

- The CO<sub>2</sub> reduction potential of each technology discussed here can be high at 0.1-10 Gt, indicating that CO<sub>2</sub> emissions can be dramatically reduced by promoting the development of these technologies.
- We have to use all the possible technologies to achieve carbon neutrality.



- The figure shows the relationship between the CO<sub>2</sub> abatement cost of a target technology (red line) and the marginal CO<sub>2</sub> abatement cost of its counterpart traditional technology (blue line).
- The **social implementation will progress rapidly from the point where CO<sub>2</sub> abatement costs of innovative technologies intersects with the marginal abatement cost.**
- With the introduction of innovative technologies, the CO<sub>2</sub> abatement cost as well as marginal CO<sub>2</sub> abatement cost can be significantly lowered. This, in turn, will enable the social implementation schedule to be brought forward, helping dramatically reduce the costs of countermeasures.



## 4. Examples of Research Topics NEDO is Promoting



- Electricity demand could be increased through increased electrification, including in heating transportation and industrial sectors, and expectations for PV are expanding.
- New applications such as side wall of the buildings, on water, in farmland and on cars can accelerate the penetration of PV systems further.
- Next generation solar cells such as Perovskite, tandem, etc. have to be developed for such applications.



## Offshore Wind Industry Vision

### ■ Basic strategy

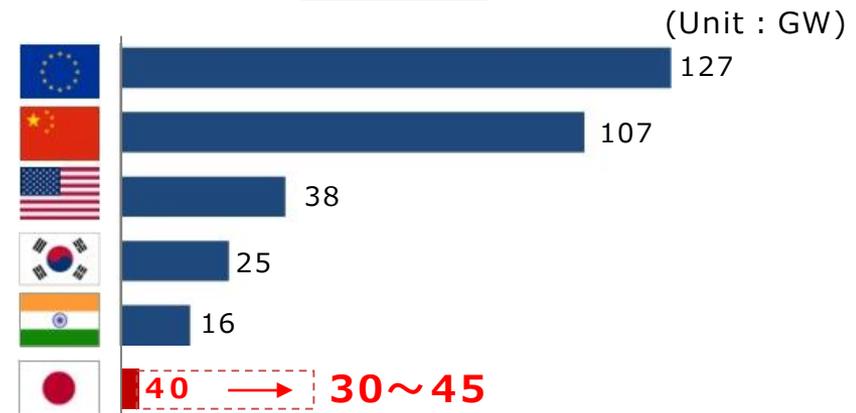
1. Creating an attractive domestic offshore wind power market.
2. Promoting investment and raising up domestic supply chain.
3. Developing next-generation technology and enhancement of international cooperation aiming at Asian market.

### ■ Major Targets

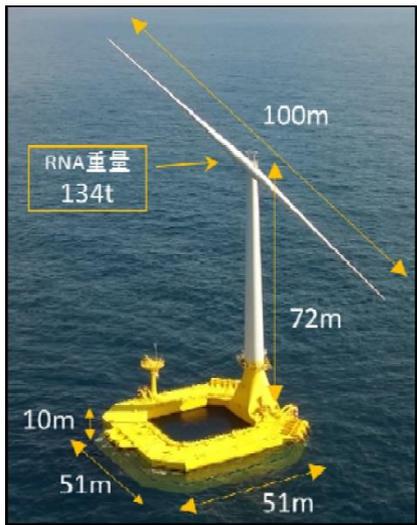
- 10GW Projects by 2030,
- 30 to 45GW Projects by 2040
- Japan content: 60% by 2040
- Cost Reduction : 8 to 9 JPY/kWh  
by 2030 to 2035  
(Net Generation Cost)

Source : JWPA HP,  
[http://jwpa.jp/page\\_301\\_englishsite/jwpa/detail\\_e.html](http://jwpa.jp/page_301_englishsite/jwpa/detail_e.html)  
 (modified by NEDO TSC)

### Government Target of Offshore Wind For 2040



Source : IEA Offshore Wind Outlook 2019(Stated Policies Scenario)



Demonstrator: Hibiki



Installing site

## Objectives:

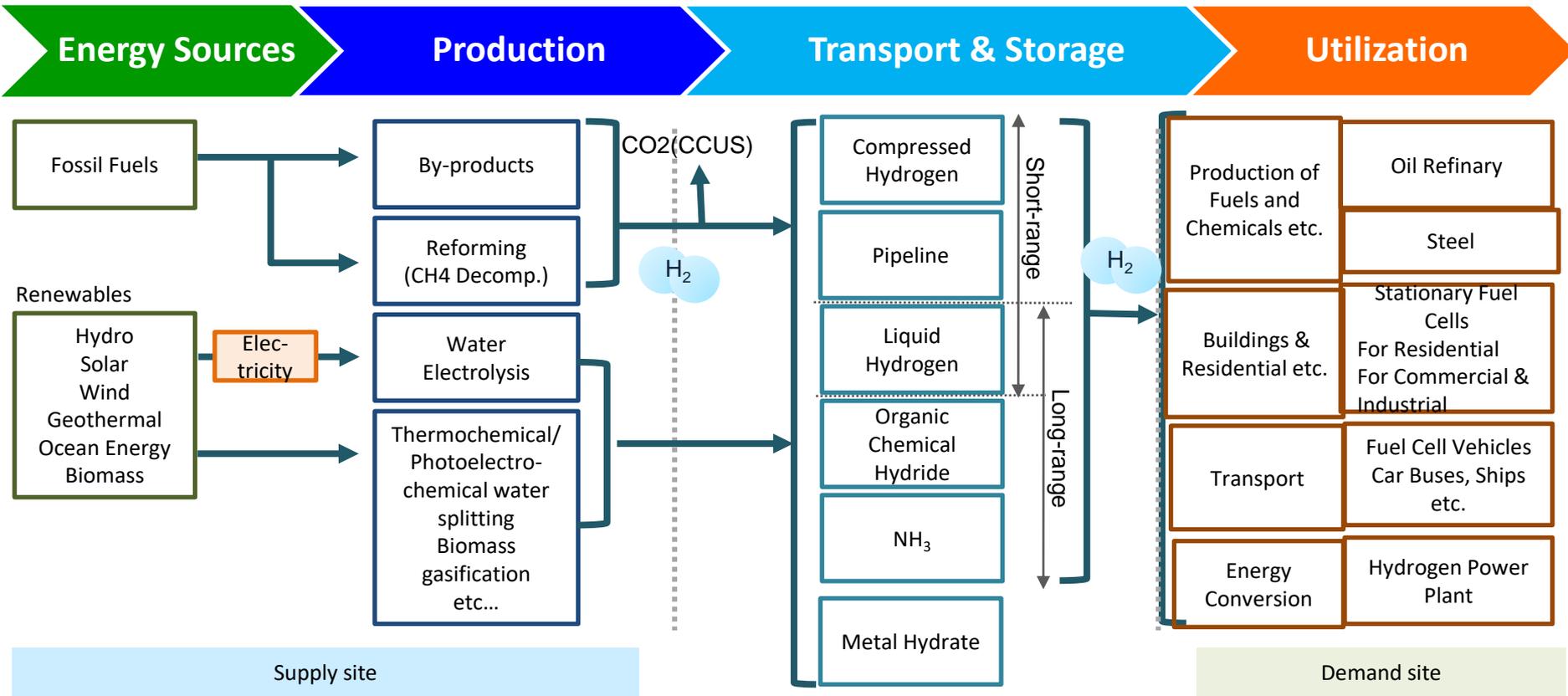
- Suitable for Japanese wind & sea conditions
- To comply with the Japanese technical standards and guidelines
- System that can be installed in the depth of 50m
- Cost reduction by light weight system
- Technical evaluation & Economic evaluation

## Characteristics:

- Steel barge floater  
(Size: 51m×51m×10m, Draft: 7.5m)
- 9 steel chain and drag anchor moorings
- 2-Blade, Upwind, 3MW wind turbine

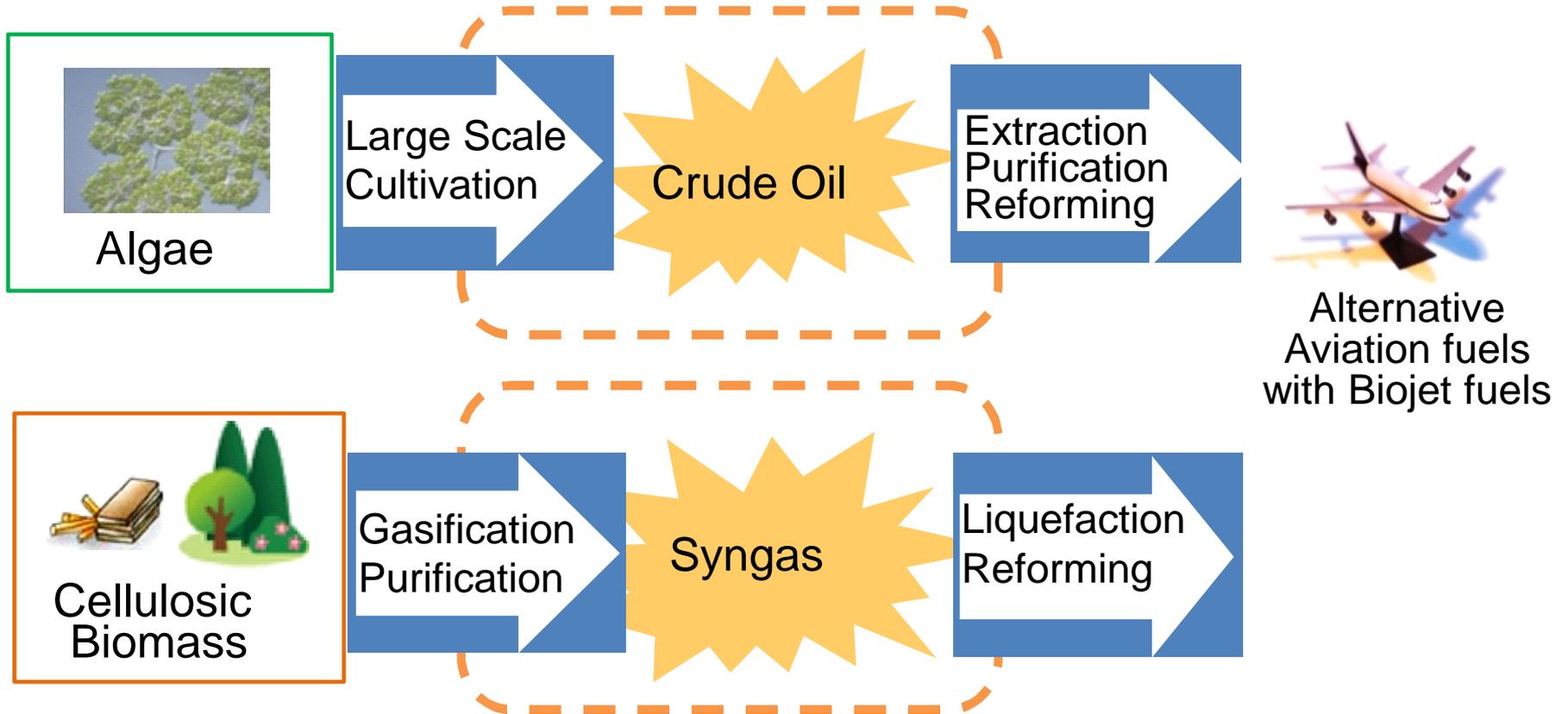


- Hydrogen can be produced without CO<sub>2</sub> emission.
- Hydrogen can be transported for a long distance and stored for a long time.
- Hydrogen can be utilized without CO<sub>2</sub> emission.



Hydrogen is one of the most important technologies for realizing carbon neutrality.

- The goal of this project is to achieve commercialization of biojet fuel by around 2030.
- We have been developing the technologies necessary to achieve the integrated production of biojet fuel from microalgae, wood chips, and other biomass raw materials.



*Thank you for your attention.*