

# Japan's current progress of GHG reduction



**SBI50, Bonn, 24 June 2019**

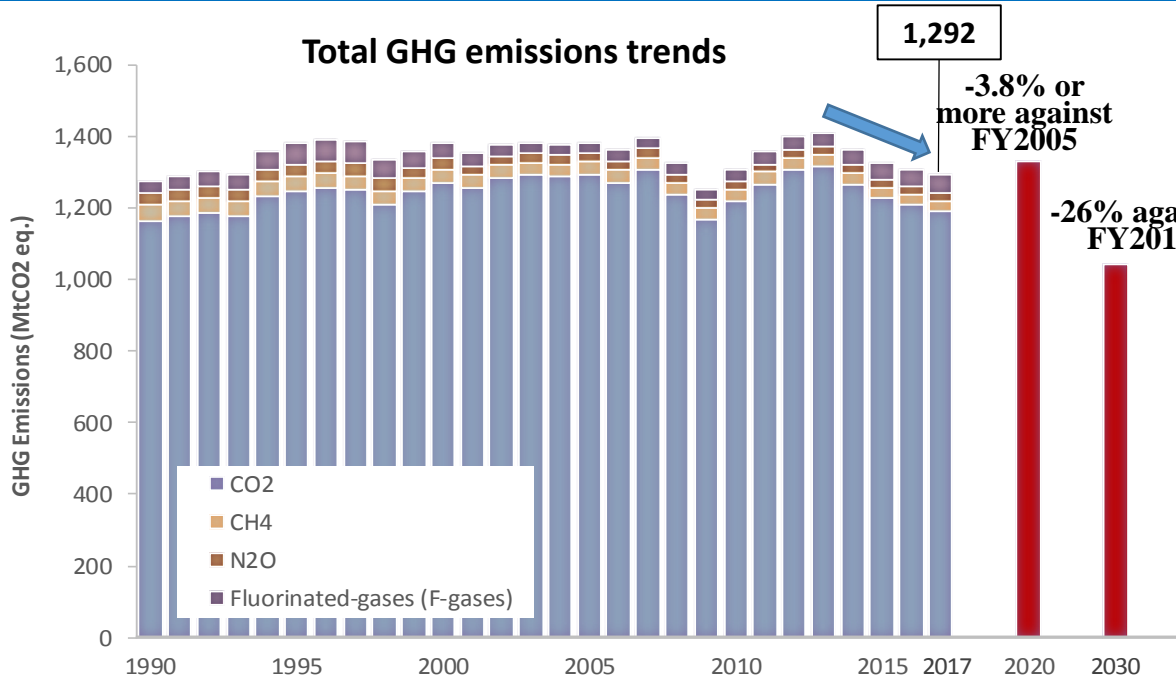
# Outline of the Presentation

- GHG Emissions and Trends
- Current Progress Status on Emission Reduction Target
- Policies and Measures
- Japan's Long-Term Strategy
- Summary

# GHG Emissions and Trends

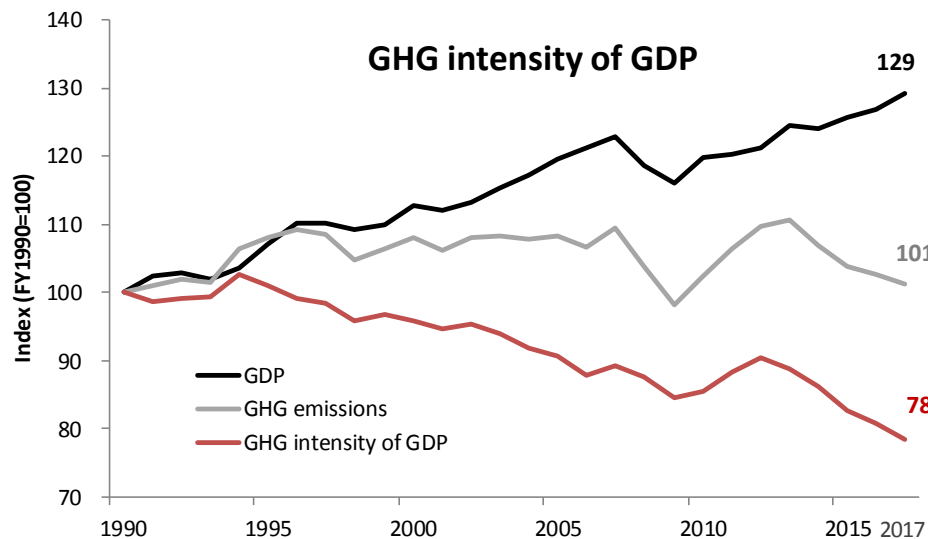


# GHG Emissions Trends (1990 – 2017)



● Japan's **GHG emissions** in FY2017 are **1,292 million tons-CO<sub>2</sub>**:

- ✓ GHG emissions have been **decreasing** for four consecutive years.
- ✓ Returning to levels before **the Great East Japan Earthquake** that caused a **nuclear power plant accident in 2011**.



● **The decoupling has been observed** between GHG emissions and economic growth:

- ✓ GHG intensity of GDP has been **decreasing** for five consecutive years.

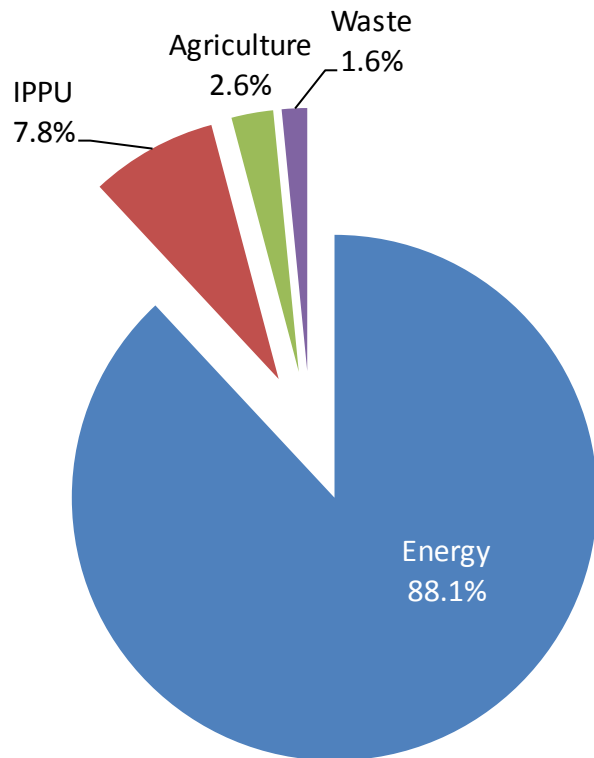
(Source) National Greenhouse Gas Inventory Report of Japan (April, 2019), Global Warming Countermeasures Plan

Note: The values of GHG emissions are based on the 2019 GHG inventory submission, which were revised from the values reported in the BR3.

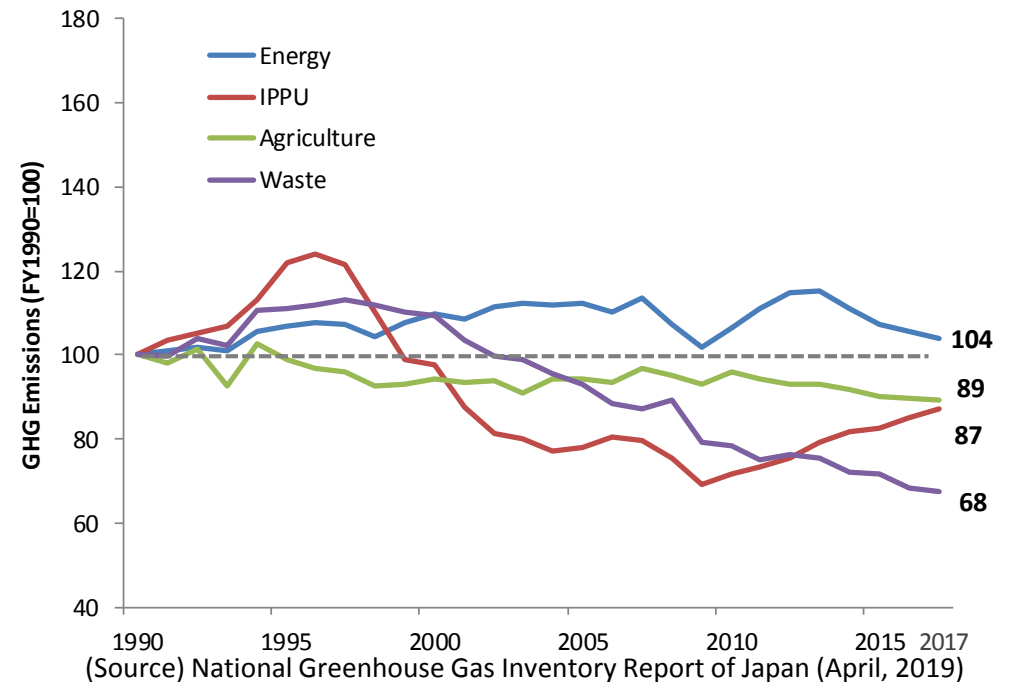
# GHG Emissions by Sector (1990 – 2017)

- The largest emission source is the energy sector, which covers around 90% of total GHG emissions.
- Since 2014, CO<sub>2</sub> emissions from the energy sector have decreased due to the progress in energy saving activities and the decrease in thermal power generation.

**Emissions by gas in FY 2017**  
(excluding LULUCF)



**Emissions trends by sector**

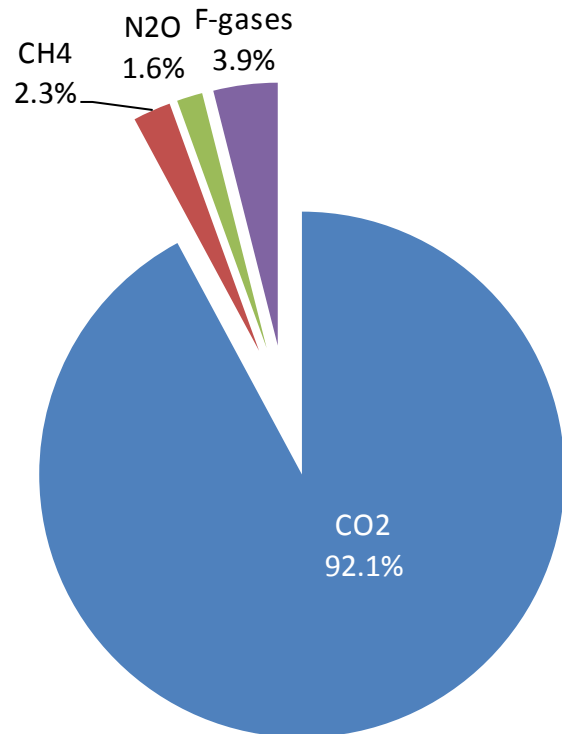


Note: The values of GHG emissions are based on the 2019 GHG inventory submission, which were revised from the values reported in the BR3.

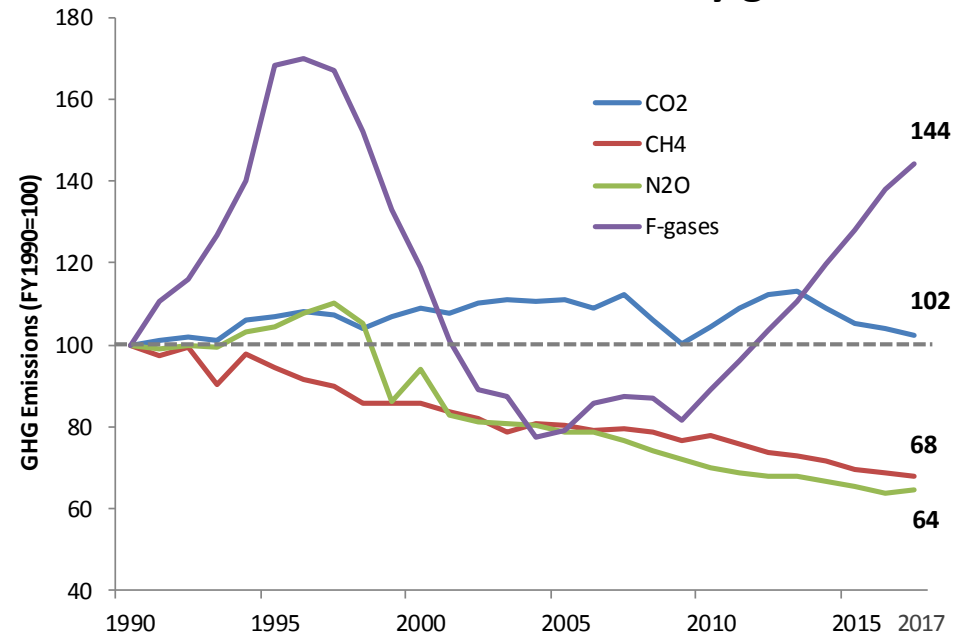
# GHG Emissions by Gas (1990 – 2017)

- In emissions trends by gas, CO<sub>2</sub> covers over 90% of total GHG emissions.
- Methane (CH<sub>4</sub>) and Nitrous oxide (N<sub>2</sub>O) emissions have decreased as a result of implementation of policies and measures.
- In recent years, the increase in fluorocarbon emissions is a issue to be resolved.

**Emissions by gas in FY 2017**  
(excluding LULUCF)



**Emissions trends by gas**



(Source) National Greenhouse Gas Inventory Report of Japan (April, 2019)

Note: The values of GHG emissions are based on the 2019 GHG inventory submission, which were revised from the values reported in the BR3.

# Current Progress Status on Emission Reduction Target



# Current Progress Status on Japan's Emission Reduction Target

- 2020 target: 3.8% or more emission reduction by FY2020 against FY2005 (Updated on May, 2016)
- 2030 target (Japan's 1<sup>st</sup> NDC): 26.0% reduction by FY2030 against FY2013 (25.4% reduction against FY2005)

	2020	2030
*Current status (FY2017)	<u>-10.6%</u> (excluding LULUCF: -6.5%) against <u>FY2005</u>	<u>-12.4%</u> (excluding LULUCF: -8.4%) against <u>FY2013</u>
Emission reduction target	<u>3.8% or more</u> reduction against <u>FY2005</u>	<u>26.0%</u> reduction against <u>FY2013</u> (25.4% reduction against FY2005)
Covered gases	CO <sub>2</sub> , CH <sub>4</sub> , N <sub>2</sub> O, HFCs, PFCs, SF <sub>6</sub> and NF <sub>3</sub>	CO <sub>2</sub> , CH <sub>4</sub> , N <sub>2</sub> O, HFCs, PFCs, SF <sub>6</sub> and NF <sub>3</sub>
GWP	IPCC AR4	IPCC AR4
Covered sectors	Energy, Transport, IPPU, Agriculture, LULUCF and Waste	Energy, Transport, IPPU, Agriculture, LULUCF and Waste
Removals from the LULUCF	Included (Activity-based approach) * Forest-related activities (Afforestation, Reforestation, Deforestation and Forest Management): gross-net basis compared with 1990 - Cropland management, Grassland management and Revegetation: net-net basis compared with 1990	Included (Activity-based approach) * Forest-related activities (Afforestation, Reforestation, Deforestation and Forest Management): gross-net basis compared with 1990 - Cropland management, Grassland management and Revegetation: net-net basis compared with 1990



# Policies and Measures



# Plan for Global Warming Countermeasures (May 2016)

- **Japan's official general plan for global warming prevention**; in order to promote global warming countermeasures comprehensively and strategically.
- **Decided by the Cabinet on May 13, 2016**
- Prescribes the targets of emissions reduction and removal of GHG, the basic matters on measures to be taken by businesses and the public etc., and policies to be implemented by the National Government and Local Government.

## ■ Contents

### ✓ Direction to pursue:

- **Actions to achieve mid-term target** (26% reduction by FY 2030)
- Strategic actions towards long-term goal (80% reduction by 2050)
- Actions toward global GHG reduction

### ✓ Basic concept:

Integrated improvements of the environment, economy and society

Steady implementation of measures listed in Japan's NDC

Response to Paris Agreement (consideration of long-term and strategic actions)

Enhancement of R&D and contribution to global GHG emissions reduction through Japan's leading technologies

Transformation in consciousness of all actors, evocation of action and enhancement of collaboration

Importance of PDCA cycle

# Progress management of Plan for Global Warming Countermeasures

- Strictly implement the **progress management in three stages** to achieve 26.0% reduction target in 2030.
  - 1) **National level**  
 Disclose the national total GHG emissions twice a year (preliminary figure in November or December, confirmed figure in April (submitted to UNFCCC)).
  - 2) **By gas and by sector**  
 Targets are established by gas and by sector, and the progress are reviewed annually at the Global Warming Prevention Headquarters.
  - 3) **For individual measures**  
 Individual evaluation indexes are established and reviewed annually at Global Warming Prevention Headquarters.  
 (Note: If the progress is delayed, consider possible further actions including enhancing and strengthening the measures or adding new measures)  
 ⇒ The results of evaluation are confirmed by a council composed of experts and then disclosed to the public.  
 ➤ Based on these results, the Plan is considered to be revised every three years.

## Examples of measure evaluation indexes for individual measures

Measure evaluation index	Results in FY2017	Milestone in FY2020	Target in FY2030
Accumulated introduction capacity of co-generation	10,600MW	11,340MW	13,200MW
Introduction of high-efficiency lightning (LED)	160 million (Commercial) 240 million (Residential)	180 million (Commercial) 240 million (Residential)	320 million (Commercial) 440 million (Residential)
CO <sub>2</sub> intensity of electricity sector	0.496 kg-CO <sub>2</sub> /kWh	—	0.37 kg-CO <sub>2</sub> /kWh
Share of next-generation vehicle in new car sales	35.7%	50%	70%

# Industry's action plan towards a low-carbon society

- Industrial organizations voluntarily set up emission reduction targets, prior to the Government's target setting, and promoted efforts for their achievement from 1997.
- Action plans comprise 4 pillars:
  - 1) emission reduction targets from domestic business operations (2020 reduction target, 2030 reduction target)
  - 2) development/diffusion of low-carbon products;
  - 3) contribution at the international level through contribution to other sectors through technology transfer
  - 4) development/introduction of innovative technologies.
- Electric, Oil & Gas, Iron & Steel, Chemical, Electronics & Machinery, Automobile, etc., 115 major industrial associations have been seriously tackling with climate change actions through their action plans.

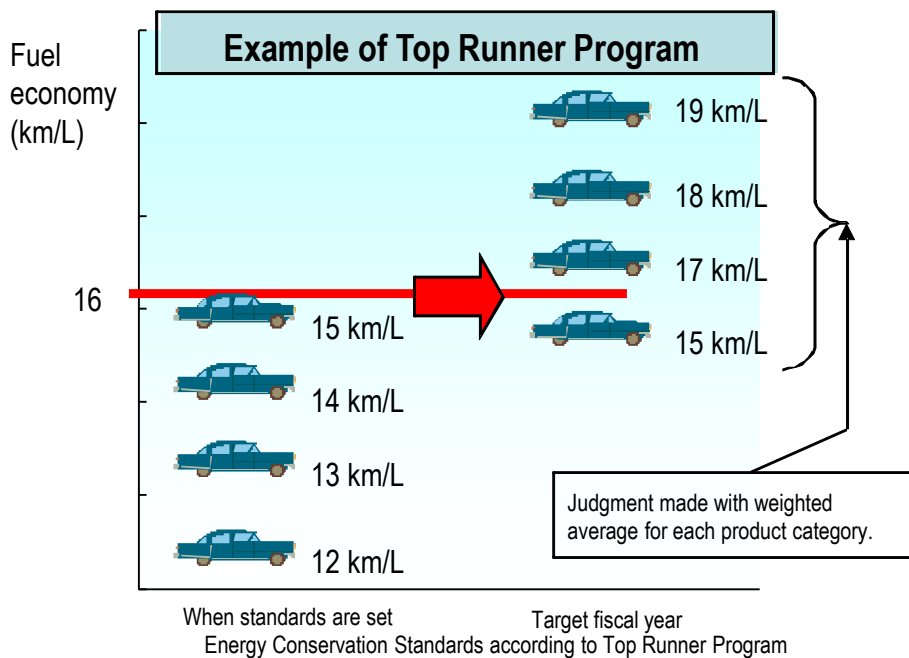
Examples of 2030 reduction target	Target indicator	Baseline year	2030 reduction target
Japan Iron and Steel Federation	CO2 emissions	BAU	-9 Mil t-CO2
Japan Chemical Industry Association	CO2 emissions	BAU	-2 Mil t-CO2
Japan Paper Association	CO2 emissions	BAU	-2.86 Mil t-CO2
Japan Cement Association	Energy intensity	2010	Less than -49MJ/t-cem (more than -1.4%)
Liaison Group of Japanese Electrical and Electronics Industries for Global Warming Prevention	Energy intensity	2012	More than -16.55%
Japan Automobile Manufacturers Association / Japan Auto-Body Industries Association	CO2 emissions	1990	-38%

# Japan's policies and measures (2)

## Top Runner Program

- Energy conservation standards according to the Top Runner Program have been implemented for automobiles and household electrical appliances according to Act on the Rational Use of Energy as amended in 1998.
- 32 equipment and materials are subject to these standards.

### <Equipment subject to Top Runner Program according to Act on the Rational Use of Energy>



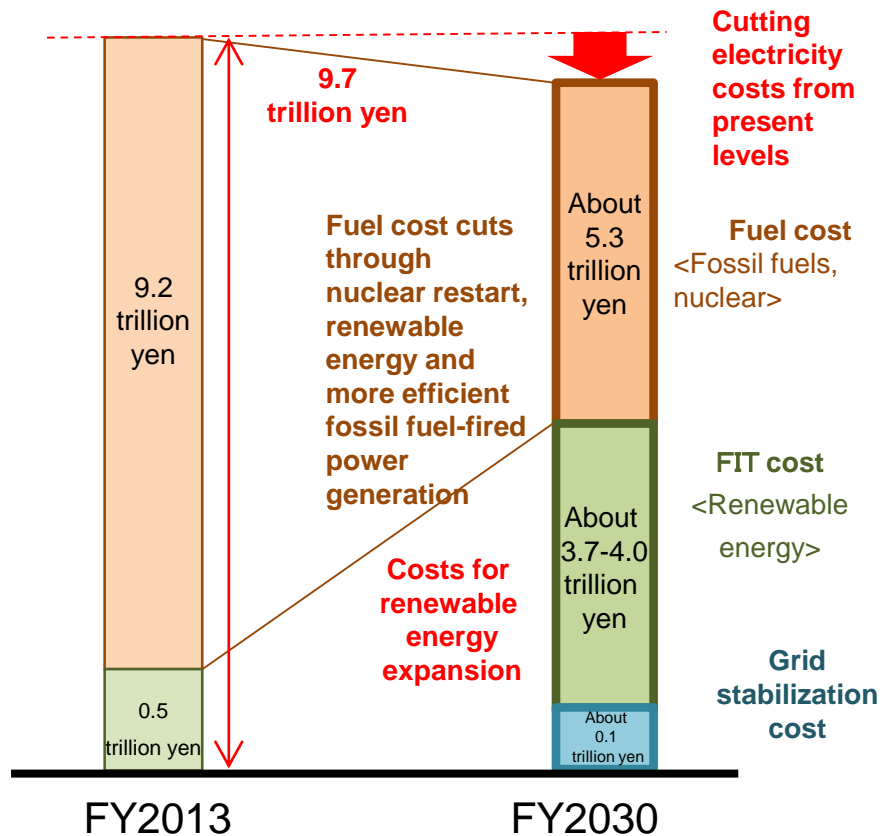
### 32 equipment and materials

- |                              |                            |                            |
|------------------------------|----------------------------|----------------------------|
| 1. Passenger vehicles        | 12. Space heaters          | 23. Switching units        |
| 2. Air conditioners          | 13. Gas cooking appliances | 24. Multifunction devices  |
| 3. Lighting equipment        | 14. Gas water heaters      | 25. Printers               |
| 4. TV sets                   | 15. Oil water heaters      | 26. Electric water heaters |
| 5. Copying machines          | 16. Electric toilet seats  | 27. AC motors              |
| 6. Computers                 | 17. Vending machines       | 28. Lamps                  |
| 7. Magnetic disk units       | 18. Transformers           | 29. Showcase               |
| 8. Freight Vehicles          | 19. Electric rice cookers  | 30. Insulation materials   |
| 9. Video cassette recorders  | 20. Microwave ovens        | 31. Sashes                 |
| 10. Electrical refrigerators | 21. DVD recorders          | 32. Multi-paned glazing    |
| 11. Electrical freezers      | 22. Routers                |                            |

# Efficient renewable energy expansion giving consideration to surcharges

- In considering the target energy mix, the government estimates the feed-in tariff cost at 3.7 – 4.0 trillion yen for expanding renewable energy after cutting electricity costs from present levels.
- After the FIT introduction, the FIT cost in FY2019 already reached about 3.6 trillion yen (with FIT surcharges totaling about 2.4 trillion yen). Cost-efficient renewable energy expansion is required for achieving both the maximum expansion of renewable energy and the containment of FIT surcharges.

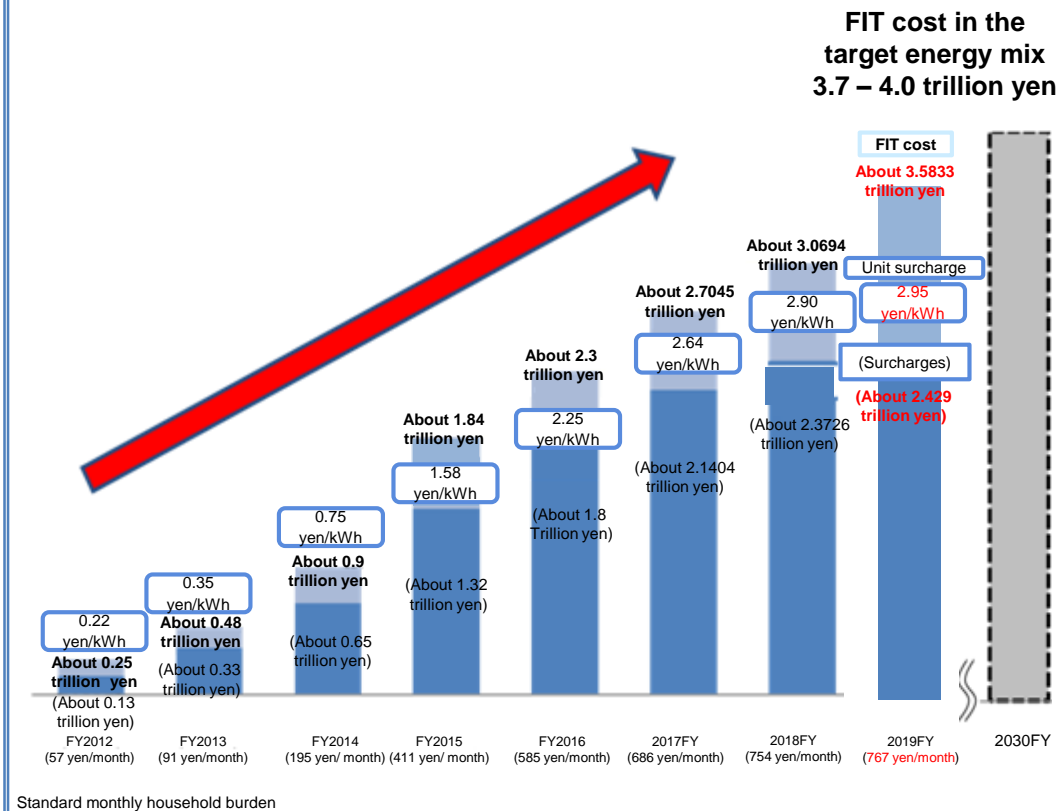
## Concept of electricity costs in the target energy mix



(Note) The FIT cost represents the cost accompanying renewable energy introduction and expansion. The cost includes some avoidable costs equal to fuel cost cuts.

Source: "Long-term Energy Supply and Demand Outlook Appendix"

## Surcharge trend after FIT system introduction



Standard monthly household burden

# Legislations and Regulations for Fluorocarbons

- **Act on the Protection of the Ozone Layer Through the Control of Specified Substances and Other Measures (Ozone Layer Protection Law):** enacted in 1988. In order to implement obligation to reduce production and consumption of fluorocarbons based on Montreal Protocol, manufactures and imports of fluorocarbons are controlled. Pursuant to the Kigali amendment, HFCs become among those subject to be controlled from 2019.
- **Act on Rational Use and Proper Management of Fluorocarbons (Fluorocarbons Emission Restraining Law):** Aiming for restraining emission of fluorocarbons, the Act provides comprehensive approaches throughout the lifecycle of fluorocarbons, including periodical inspection of commercial refrigeration and air-conditioning equipment using fluorocarbons, in addition to recovery of fluorocarbons from these equipment at the time of disposal. The Act was amended on May 2019 for further improvement of the system of the recovery at the disposal.

## Ozone Layer Protection Law (Amended in 2018)

- Control over Manufacture and Imports of Fluorocarbons (CFCs, HCFCs and HFCs)

Fluorocarbons  
Manufacturer



Product Manufacturers Using  
Fluorocarbons



Refrigerator and Air  
Conditioner Users



Recovery of  
Fluorocarbons at  
Equipment Disposal

Periodical  
Inspection

Report Leakage Amount

## Fluorocarbons Emission Restraining Law

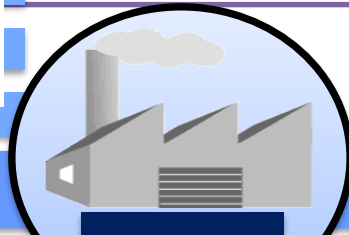
- Comprehensive Approaches throughout the Lifecycle of Fluorocarbons

- Reduction of Environmental Impact of Fluorocarbons Used to Designated Products
- Periodical Inspection of Equipment and Report of Leakage Amount
- Recovery of Refrigerant Fluorocarbons at Equipment Disposal
- Appropriate Destruction or Recycle of Recovered Refrigerant Fluorocarbons

and Others

Recycle

Destruction/Recycling  
Operator



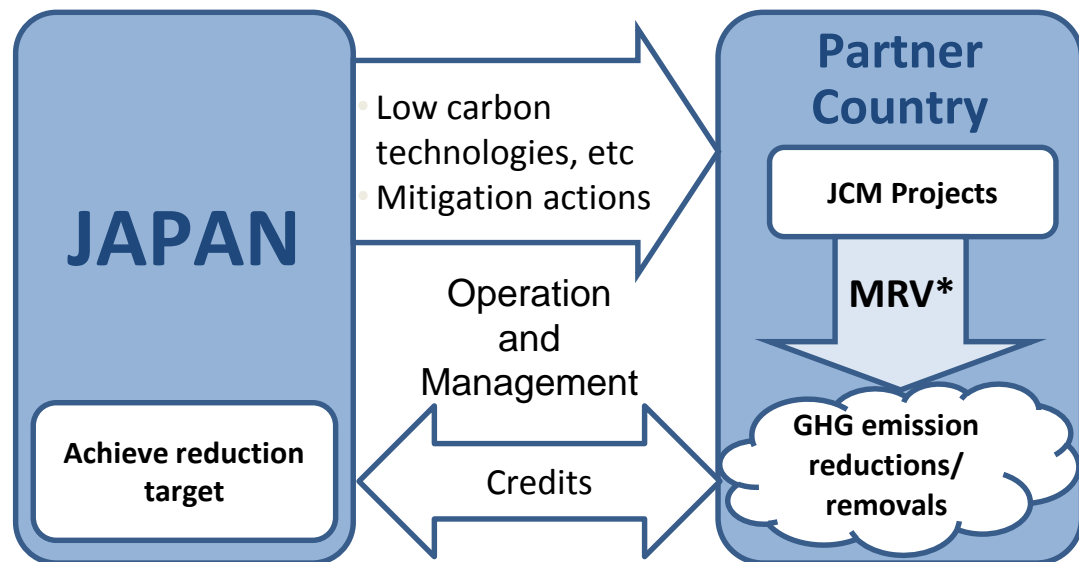
Filling/Recovery  
Operator



# Joint Crediting Mechanism (JCM)

## Progress:

- 17 partner countries with 146 projects in the pipeline
- Credits already issued from 21 projects
- 69 MRV\* methodologies



MRV: measurement, reporting and verification

## (Example of pipeline projects)



【Waste heat recovery in cement industry】  
(Indonesia)  
149,063tCO<sub>2</sub>/y.  
Start operation: Jun. 2018.



【Waste to Energy plant】  
(Myanmar)  
4,125tCO<sub>2</sub>/y.  
Start operation: Jun. 2017



【Operation Optimization in Utility Facility】  
(Indonesia)  
34,956t  
Start operation Dec. 2017



【Low carbonization of mobile communication station】  
(Indonesia)  
146t  
Start operation: Apr. 2017



# Japan's Assistance

## Actions for Cool Earth: ACE 2.0

- Mobilize JPY 1.3 trillion of climate finance in 2020 to commit USD 100 billion goal



Olkaria geothermal plant, Kenya

## Innovation for Cool Earth Forum: ICEF

- Annually host a global conference on innovative technologies to tackle climate change



## Partnership to Strengthen Transparency for Co-Innovation (PaSTI)

- Promote climate change actions from non-state actors such as private sector and local governments
- Highlight added-values to existing initiatives on transparency, and promotes engagement of the private sector by identifying incentive mechanisms



# Japan's Long-Term Strategy



# Process of Formulation of Japan's Long-term Strategy

Long-term Strategy based on the Paris Agreement

“All Parties should strive to formulate and communicate long-term low greenhouse gas emission development strategies, mindful of Article 2 (2°C goal, efforts to limit the temperature increase to 1.5 °C, etc.), ...” (Article 4, para19)



Under the instruction of the prime minister, meetings on **a Long-Term Strategy under the Paris Agreement as Growth Strategy** were held to discuss fundamental approach. In April 2019, a **recommendation** for the government was compiled.



Following the recommendation, relevant ministries developed a draft of the strategy. Invited views from members of councils, public comments, and opinion exchange with young generation and local communities.



In June, **Long-Term Strategy under the Paris Agreement as Growth Strategy** was approved by the cabinet.

## Chapter 1: Basic Concept

**Vision:** Proclaiming a “**decarbonized society**” as the ultimate goal and aiming to accomplish it ambitiously **as early as possible in the second half of this century**, while boldly taking measures towards the reduction of GHGs emissions by 80% by 2050

\* an unconventional vision of an “ideal future model”

\* contributing to the achievement of the long-term goals of the Paris Agreement, including efforts to limit the temperature increase to 1.5°C

### Basic Principles of Policy:

**Realizing “a virtuous cycle of environment and growth”** towards the vision with business-led disruptive innovation, Swift implementation of actions from now, contributing to the world, **Action Towards a bright Society with Hope for the Future**

[Factors: Achievement of SDGs, Co-creation, Society5.0, the Circulating and Ecological Economy, leading country in solving problems]

## Chapter 2: The Vision of Each Sector and the Direction of Measures



### 1. Energy

Pursuing every option for promoting **energy transitions and decarbonization**



### 2. Industry

**Decarbonized manufacturing**



### 3. Transport

Contribution to the challenge of **“Well-to-Wheel Zero Emission”**



### 4. Community and Living

Realizing **carbon neutrality**, resilient and comfortable **communities and lives** by 2050/ creating the **“Circulating and Ecological Economy”**



### 5. Measures for Carbon Sinks

Conserving the natural environment and creating sustainable new values in agriculture, forestry and fisheries industries to secure **sufficient carbon sink** for decarbonized society

## Chapter 3: Cross-sectoral Measures to realize “a virtuous cycle of environment and growth”

### 1. Promotion of Innovation

Promoting innovation for practical application and wider usage of cross-sectoral decarbonization technologies that lead to drastic reduction of GHG, achieving cost that allows commercialization

- (1) Progressive environment innovation strategy
- (2) Innovation in economic and social systems/Lifestyle innovation

### 2. Promotion of Green Finance

Appropriate “visualization” of innovation, and mobilization of finance for the innovation by financial institutions

- (1) Mobilizing green finance through TCFD\* disclosures and dialogues  
\* Task Force on Climate-related Financial Disclosures
- (2) Promoting initiatives to expand ESG finance

### 3. Business-led International Application and International Cooperation

Promoting environmental technologies and products that excel/  
Promoting “Co-innovation” that benefits both sides in collaboration with partner countries

- (1) International application of decarbonization technologies linked to policy / institution building and international rule-making
- (2) Increasing infrastructure development and investment that contributes to CO<sub>2</sub> emissions reduction
- (3) Building platforms for decarbonized societies on a global scale



Fuel Cell Bus



CO<sub>2</sub> Capture Plant



TCFD Consortium



ESG Finance High-Level Panel



JCM Partner Countries Meeting

## Chapter 4: Other Measures

- Human resource development
- Just transition
- Government-led initiatives
- Integrative promotion in collaboration with development of a resilient society by adaptation to climate change
- Carbon pricing (expert-driven technical debate is necessary)

## Chapter 5: Review and Implementation of Long Term Strategy

- **Review:** Flexibly considering of the long-term strategy taking circumstances into account and as necessary reviewing it, about every 6 years
- **Implementation:** Analysis that takes future change in situation into account/Partnerships/Dialogue

# Summary



# Summary

- Japan succeeded in reducing GHG emissions in the recent four years, and GHG intensity of GDP have been decreasing for five consecutive years.
- Current status on Japan's GHG emissions is 12.4% reduction against FY2013. (Japan's NDC: 26.0% reduction by FY2030 against FY2013)
- Japan aims to achieve the FY2030 target by implementing policies and measures based on “the Plan for Global Warming Countermeasures”. Every year, the government strictly reviews the progress of the plan.
- Japan formulated a long-term strategy with a vision that proclaims a “decarbonized society” as the ultimate goal and aims to accomplish it ambitiously as early as possible in the second half of this century.

**Thank you for your attention.**



# (Reference) Factor Analysis of Energy-related CO<sub>2</sub> Emissions

- Japan conducted a factor analysis of energy-related CO<sub>2</sub> regarding the contribution of each factor to changes in emissions.

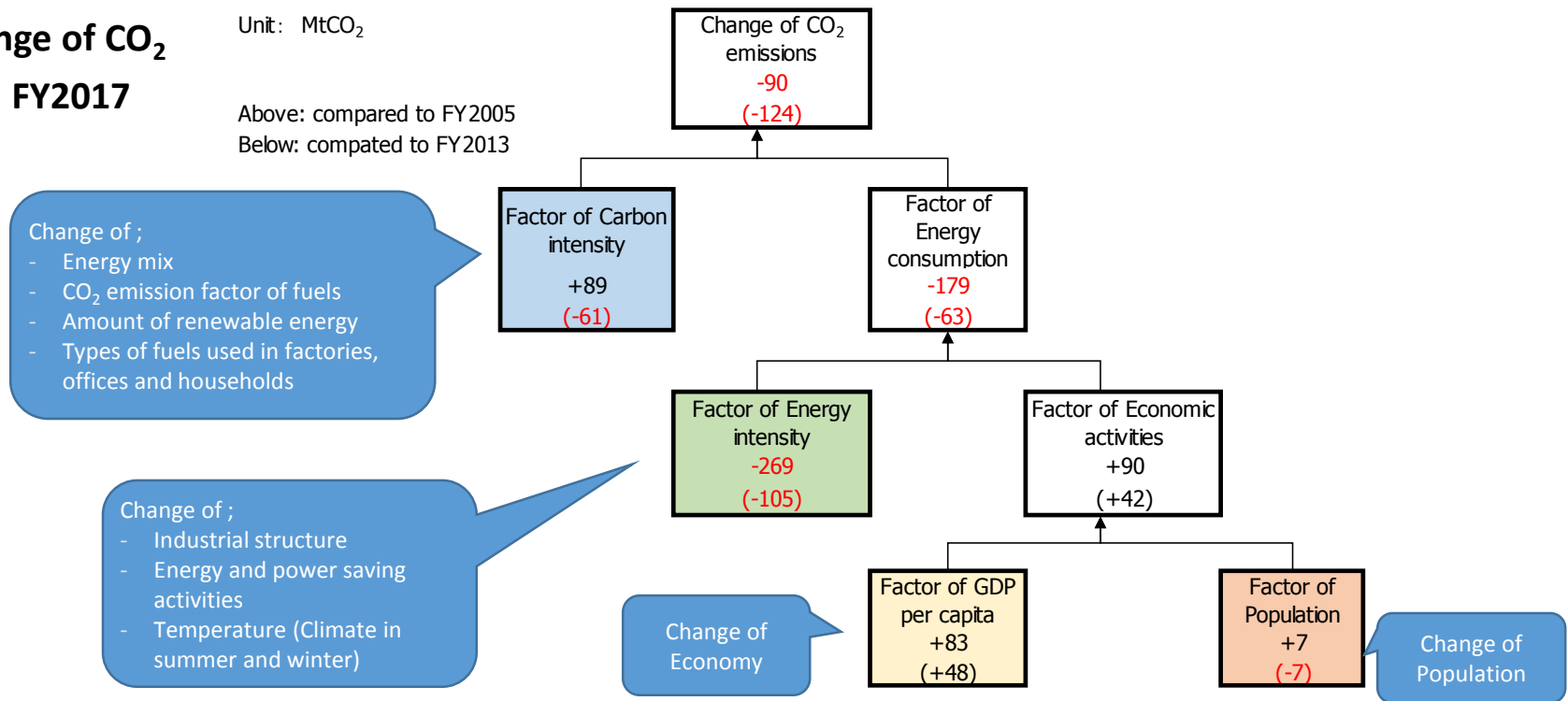
$$\text{CO}_2 \text{ emissions} = \frac{\text{CO}_2 \text{ emissions}}{\text{Energy consumption}} * \frac{\text{Energy consumption}}{\text{GDP}} * \frac{\text{GDP}}{\text{Population}} * \text{Population}$$

*Factor of Carbon intensity*
*Factor of Energy intensity*
*Factor of GDP per capita*
*Factor of population*

## Factors of change of CO<sub>2</sub> emissions in FY2017

Unit: MtCO<sub>2</sub>

Above: compared to FY2005  
Below: compared to FY2013



## Basic Act on Energy Policy

October 2003: 1st Strategic Energy Plan

March 2007: 2nd Strategic Energy Plan

June 2010: 3rd Strategic Energy Plan

## April 2014 4th Strategic Energy Plan

- Considered at Advisory Committee for Natural Resources and Energy → Cabinet decision
- Nuclear: To be reduced as much as possible
- Renewable energy: To be expanded (to more than 20% of total power generation)
- Considered every 3 years (Revised as necessary)

## July 2015 Long-term Energy Supply and Demand Outlook (Energy Mix)

- Considered at Advisory Committee for Natural Resources and Energy → Decision by Minister of Economy, Trade and Industry
- Nuclear: 20-22% (30% before the Great East Japan Earthquake)
- Renewable energy: 22-24% (double the present level)
- To be revised as necessary for considering the Strategic Energy Plan

## July 2018 5th Strategic Energy Plan

- Plans for 2030 and scenario for 2050
- For 2030: To achieve energy mix target
- For 2050: Challenges towards energy transitions and decarbonization

# (Reference) Energy Mix (July 2015) ~Realizing 3E + S simultaneously ~

## <Policy targets for 3E+S>

Safety is the top priority

**Energy self-sufficiency  
(Energy security)**

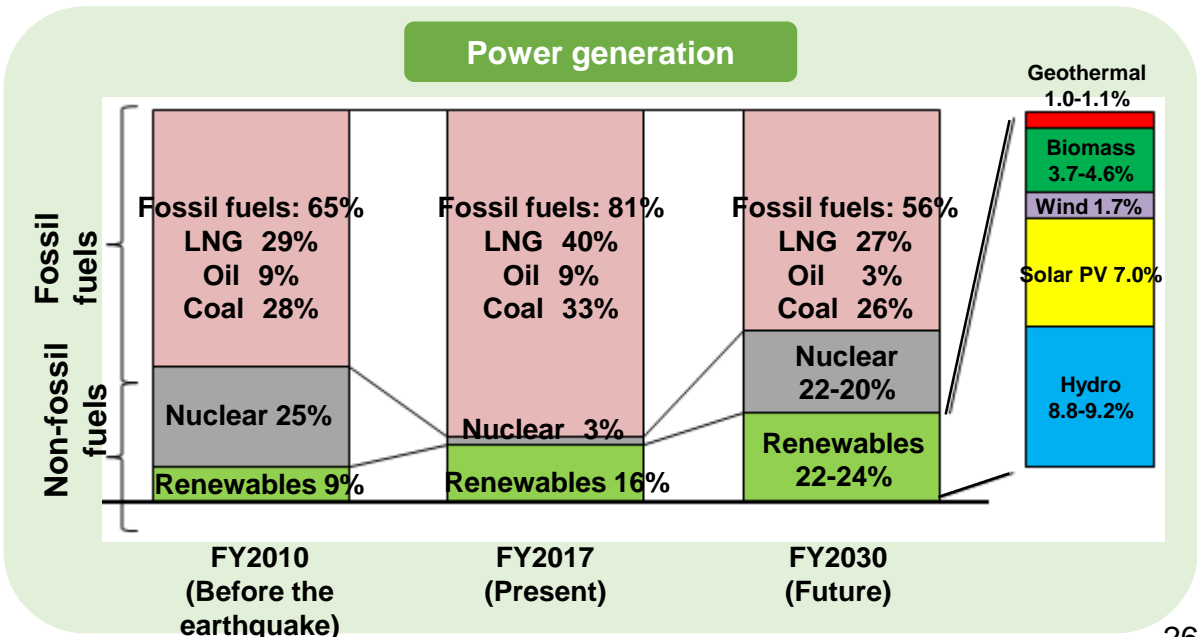
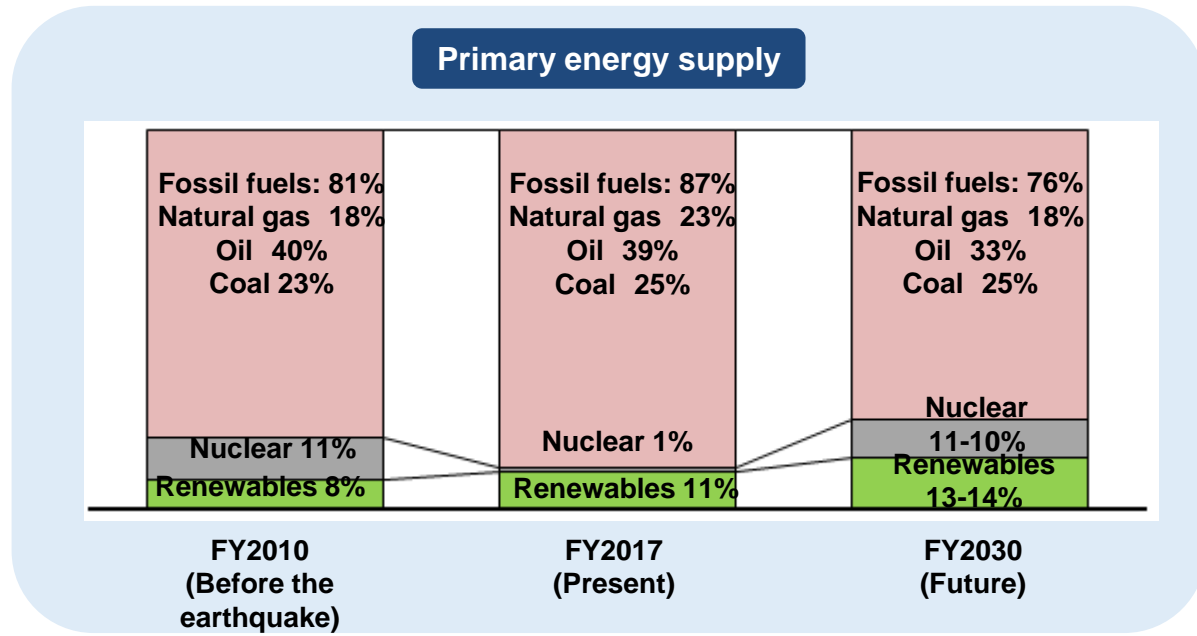
Energy self-sufficiency rate: About 25%, higher than before the Great East Japan Earthquake (about 20%)

**Efficiency (electric power cost)  
(Economic Efficiency)**

Lower compared to present

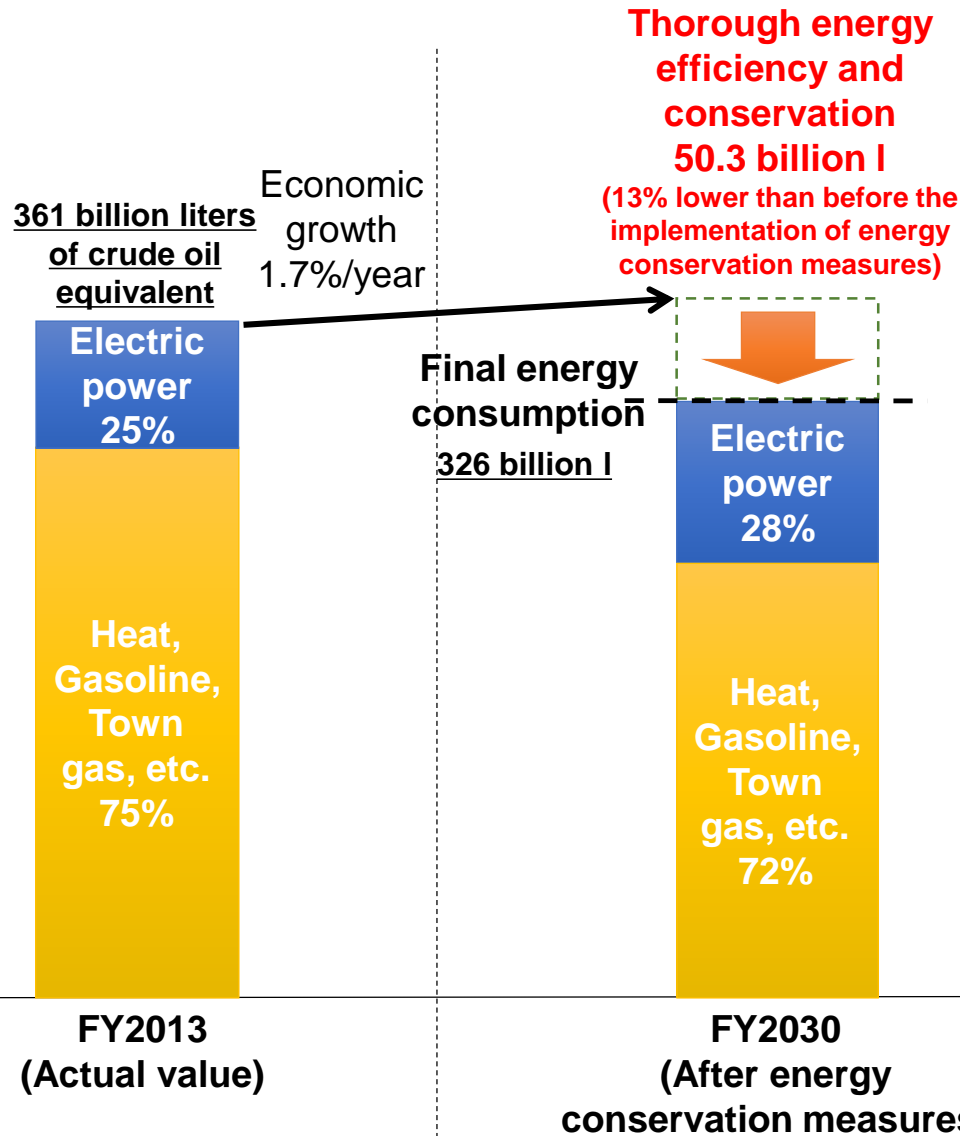
**Greenhouse gas emissions  
(Environment)**

A GHG emission reduction target comparable to EU and the U.S.

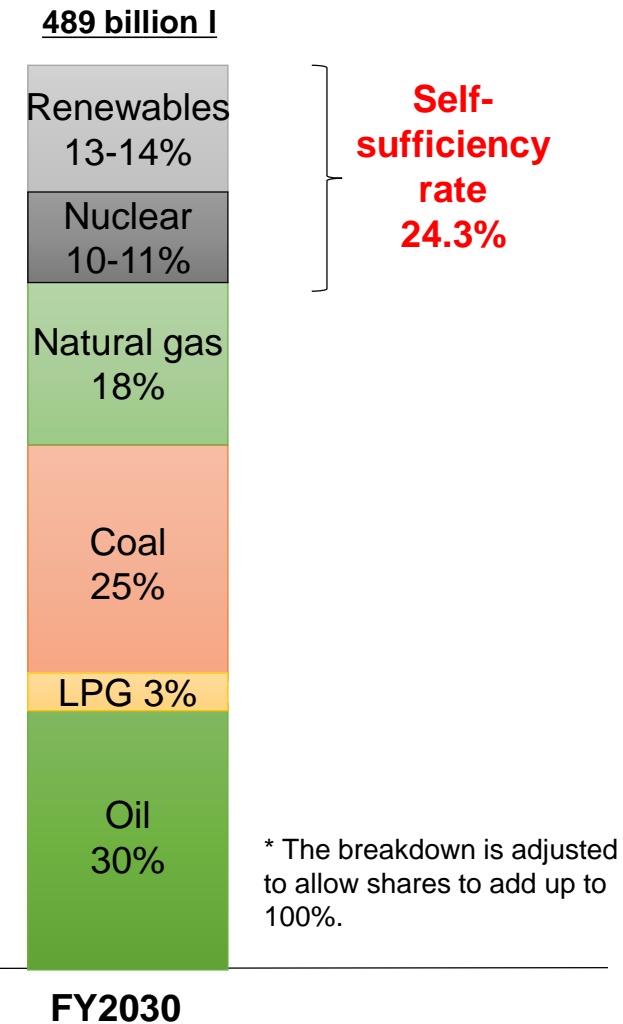


# (Reference) Energy supply and demand outlook for FY2030: Energy demand and primary energy supply

## Energy demand

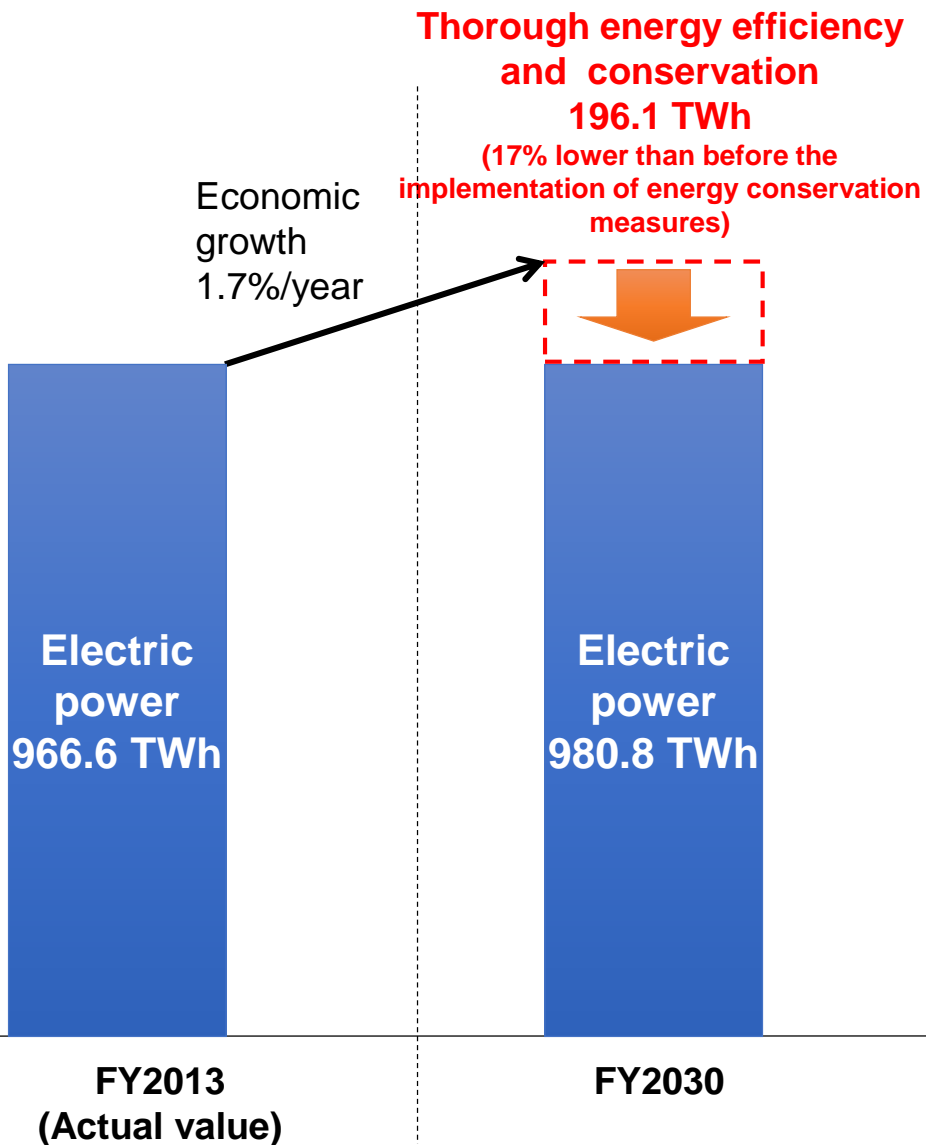


## Primary energy supply

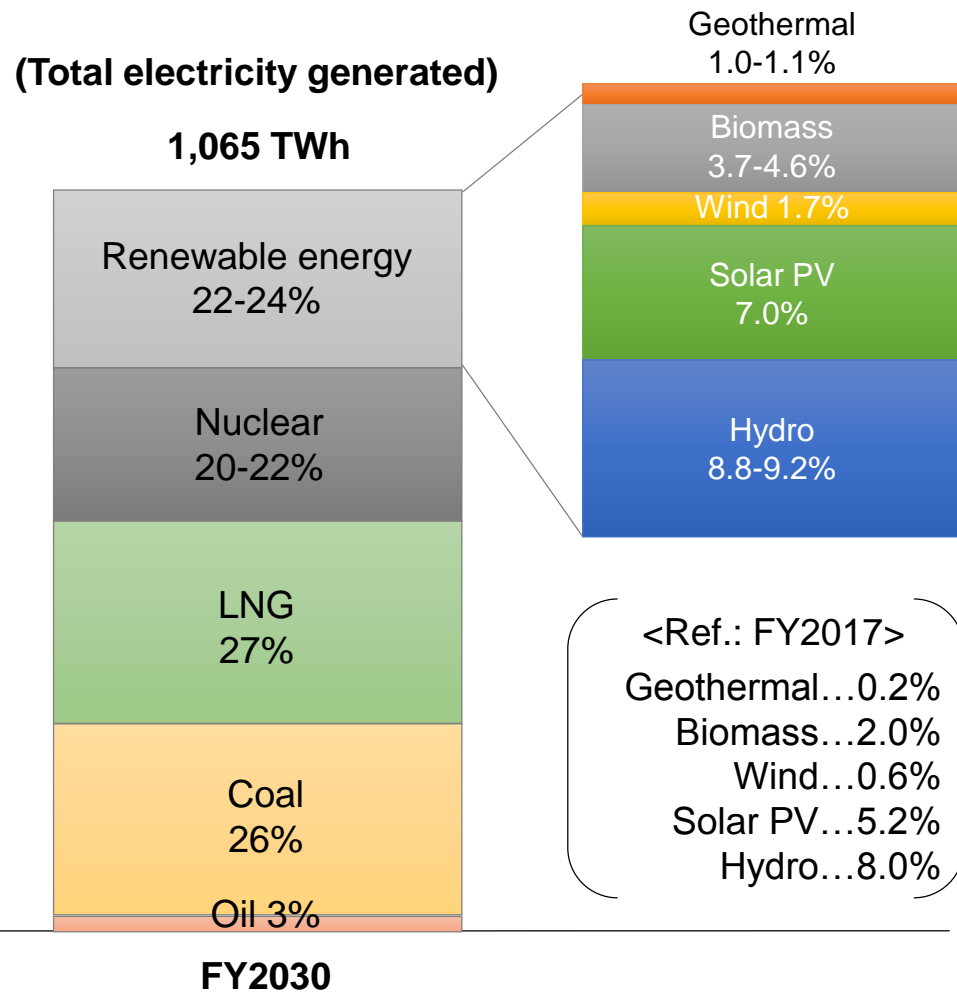


# (Reference) Energy supply and demand outlook for FY2030: Electricity demand and power source mix

## Electric power demand



## Power source mix



~ A process for taking action while always monitoring the latest changes and technologies is required for developing “a flexible scenario into which diversity is taken into account”

- Predictable future with a reasonable likelihood

(Predictability ↔ Realistic)

- Given infrastructure and system

- ✓ Existing human resources
- ✓ Existing technologies
- ✓ Existing infrastructure

- Uncertain future containing diverse possibilities

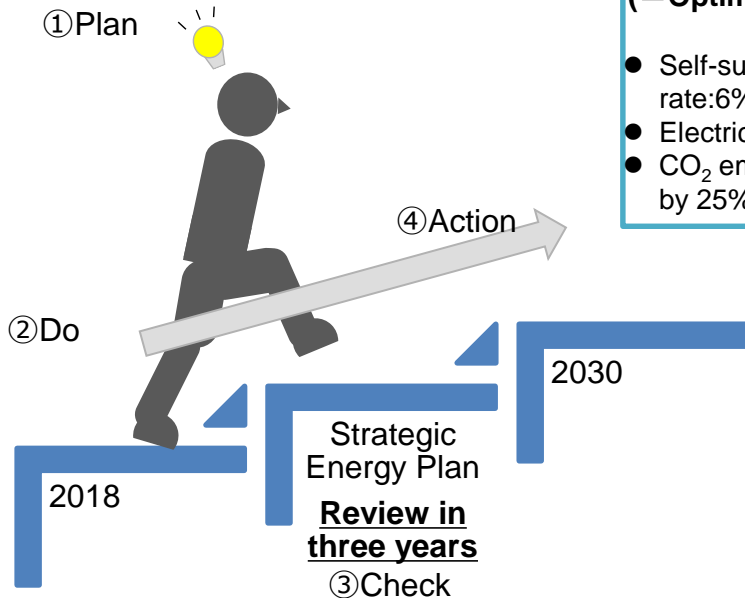
(Uncertainties ↔ Ambitious)  
 (VUCA: Volatility, Uncertainty, Complexity, Ambiguity)

- Changeable infrastructure and system

- ✓ Human resource development
- ✓ Technological innovation
- ✓ Updated Infrastructure

Straight-line efforts to achieve realistic targets

(PDCA cycle)



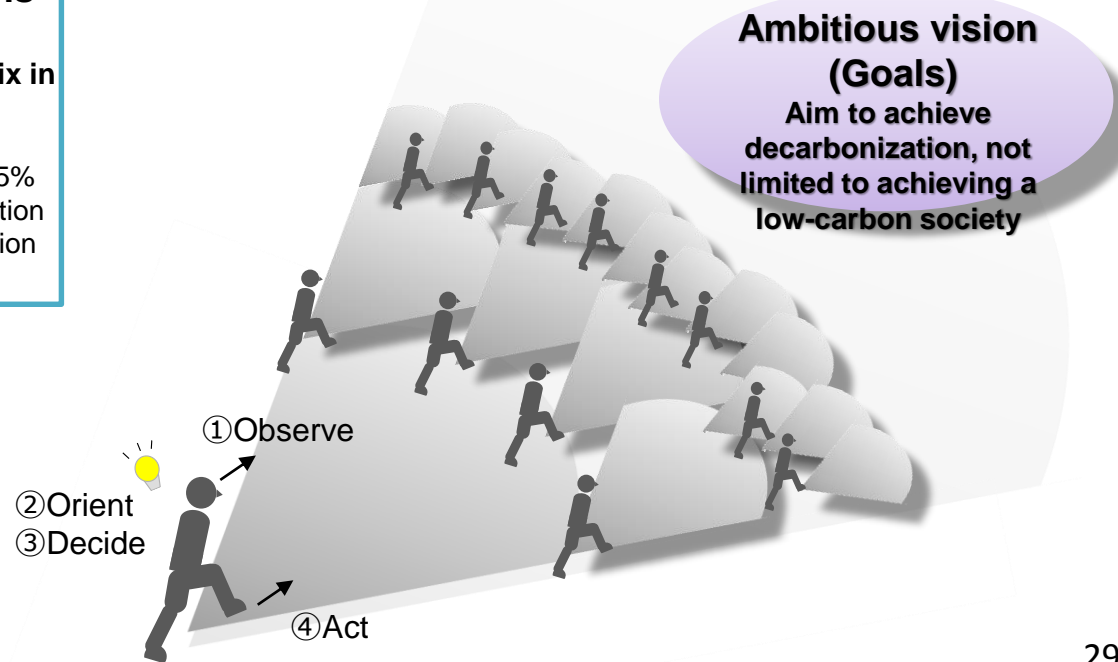
**Concrete actions (Targets)**

(= Optimal energy mix in 2030)

- Self-sufficiency rate: 6% → Approx. 25%
- Electricity cost reduction
- CO<sub>2</sub> emission reduction by 25%

Multi track scenario with diverse options

(OODA cycle)



## Chapter 1 Structural Issues, Changes in Circumstances, and Policy Timeframe

### Section 1 Structural issues faced by Japan

#### 1. Vulnerability due to high dependency on overseas energy resources

Worsening of the situation due to suspension of nuclear power plants; Japan's energy self-sufficiency rate for FY2016 remaining around 8%

#### 2. Mid- to long-term changes in the energy demand structure (population decline, etc.)

Demand decrease due to population decline; Possible changes in energy demand structure due to digitalization, such as the dissemination of AI, IoT and VPP

#### 3. Instability of resource prices (increased energy demand in emerging countries, etc.)

Changes in demand trends (China, etc.) and in supply structure (shale revolution) → Oil price in 2040 estimated to be 60 to 140 dollars (IEA)

#### 4. Increasing global greenhouse gas emissions

32 billion tons in 2016 → Approx. 36 billion tons in 2040 (IEA's New Policy Scenario); Momentum caused by the Paris Agreement and SDGs

### Section 2 Changes in energy environments

#### 1. Start of inter-technology competition for decarbonization

Efforts to create a decarbonized energy system by combining technologies for renewable energy, electricity storage, digital control, etc.

#### 2. Geopolitical risks increased by technology changes

Energy structure remaining subject to geopolitical risks; Geopolitical risks coming to the surface; Dependence on China for solar panels

#### 3. Intensified competition between nations and firms

Setting of ambitious visions by the national government; Individual firms' activities to pursue new technologies; Responses of financial and capital markets

### Section 3 Achievement of an optimal energy mix by 2030 and its relation with the 2050 scenario

#### ● Efforts to achieve an optimal energy mix by 2030 only half done

##### (i) Energy efficiency

Estimated to achieve energy reduction of around 50 million kl in FY2030

The amount of reduction as of FY2016 around 8.8 million kl

##### (ii) Zero-emission power source ratio

Estimated to be around 44% in FY2030

The ratio as of FY2016 being 16% (renewable energy: 15%; nuclear power: 2%)

##### (iii) Energy-derived CO2 emissions

Estimated to be around 0.93 billion tons in FY2030

The emissions as of FY2016 around 1.13 billion tons

##### (iv) Electricity cost

Estimated to be 9.2 trillion to 9.5 trillion yen in FY2030

The cost as of FY2016 around 6.2 trillion yen

##### (v) Energy self-sufficiency rate

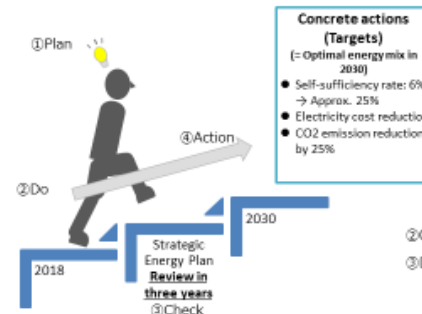
Estimated to be 24% in FY2030

The rate as of FY2016 around 8%

#### ● Ideas towards 2030

- Predictable future with a reasonable likelihood (Predictability ⇔ Realistic)
- Given infrastructure and systems
  - ✓ Existing human resources
  - ✓ Existing technologies
  - ✓ Existing infrastructure

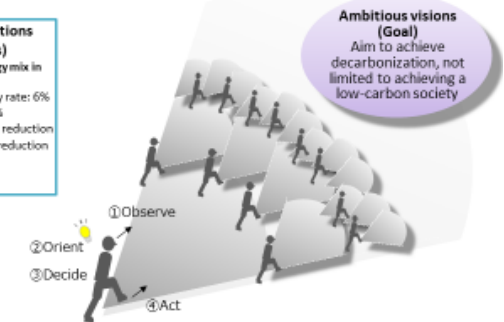
Straight-line efforts to achieve realistic targets (PDCA cycle)



#### ● Ideas towards 2050

- Uncertain future containing diverse possibilities (Uncertainties ⇔ Ambitious (VOCA: Volatile, Uncertain, Complex, Ambiguous))
- Changeable infrastructure and system
  - ✓ Human resource development
  - ✓ Technological innovation
  - ✓ Updated infrastructure

Multiple track scenario with diverse options (OODA cycle)



## Section 1 Basic policies

- 1. Confirmation of the basic viewpoint (3E+S):** To ensure environmental suitability while improving economic efficiency, on the premise of safety and with energy security as the top priority; To aim to achieve an optimal energy mix by 2030 under the principles of 3E+S
- 2. Building of a "multilayered and diversified flexible energy supply-demand structure" and policy direction:** Full utilization of AI and IoT
- 3. Position of each energy source in the primary energy structure and its policy direction:** Position of each energy source; Policy direction to achieve an optimal energy mix by 2030; Preparation for utilizing renewable energy as the major power source
- 4. Principles of the secondary energy structure:** Facilitation of strategic development of the system and infrastructure based on the Basic Hydrogen Strategy

## Section 2 Policy measures towards 2030

- 1. Promotion of securing of resources:** Promotion of independent development of fossil fuel and mineral resources and establishment of a robust industrial system
- 2. Realization of a thorough energy efficient society:** Integrated implementation of the Act on Rationalizing Energy Use and support measures
- 3. Efforts for the utilization of renewable energy as the major power source:** Efforts to reduce costs, overcome system constraints, and secure sufficient load following capacity
- 4. Re-establishment of the nuclear energy policy:** Reconstruction and revitalization of Fukushima; Continuous pursuit of safety and establishment of stable business environment
- 5. Efficient and stable use of fossil fuel:** Promotion of effective use of high-efficiency thermal power generation
- 6. Fundamental reinforcement of measures for realizing a hydrogen society:** Implementation of measures based on the Basic Hydrogen Strategy
- 7. Promotion of energy system reform:** Promotion of competition; Development of market environments for responding to public issues and balancing public interests
- 8. Enhancement of resilience of the domestic energy supply networks:** Strengthening of the preparedness against disaster risks such as earthquakes and snow damage
- 9. Improvement of the secondary energy structure:** Promotion of cogeneration; Utilization of storage batteries; Dissemination of next-generation vehicles
- 10. Development of energy industry policy:** Enhancement of competitiveness and international expansion; Promotion of a distributed energy system based on the idea of local production for local consumption
- 11. International energy cooperation:** Strengthening of collaboration with the US, Russia and Asian countries; Contribution to significant CO<sub>2</sub> emission reduction in the whole world

## Section 3 Promotion of technology development

- 1. Formulation of plans and roadmaps for energy-related technology development:** Promotion of energy and environmental innovation strategies
- 2. Technical challenges to be addressed:** Discovery and cultivation of innovative seeds of renewable energy; Innovation of nuclear technologies based on social demand; Reduction of hydrogen costs; Development of methanation technologies

## Section 4 Enhancement of communication with all levels of the society

- 1. Deepening of understanding of all levels of the society:** Ongoing efforts to improve PR activities and ways of information provision; Positive publication in an easy-to-understand manner
- 2. Transparent policy planning processes and enhancement of two-way communication:** Utmost disclosure of policy planning processes; Enhancement of two-way communication; Communication concerning nuclear power through a regional symbiosis platform



## Section 1 Ambitious multiple track scenario - Pursue every option

### ● Comparison with major countries

- UK: Combining multiple means for decarbonization, such as expanded use of renewable energy, shift to gas, and continuous use of nuclear power → Effectively reducing CO2 emissions
- Germany: Pursuing decarbonization-only through energy saving and expanded use of renewable energy → CO2 emission reduction stagnating due to dependence on coal

### ● Energy environments unique to Japan (poor in resources, lacking international interconnections, facing area constraints)

→ Adoption of ambitious multiple track scenario to pursue every option

## Section 2 Designing of the 2050 scenario

### 1. Sophisticated 3E+S

- Safety: With safety as the top priority, achieve innovation by technology/governance reform
- Energy Security: Raise resource self-sufficiency rate and technical self-sufficiency rate and ensure diversity of choice
- Environment: Work towards environmental suitability and decarbonization
- Economic Efficiency: Mitigate the cost burden on the people and enhance domestic industrial competitiveness

### 2. Scientific review mechanism

Regularly ascertain the latest technological trend and circumstances and flexibly correct and decide development goals and relative priorities of each option

### 3. Cost/risk verification and dynamism among decarbonizing energy systems

Shift from cost verification by power source to cost/risk verification among decarbonizing energy systems

- Comparison of all costs actually required (including costs for supply and demand adjustments and system reinforcement, etc.) is difficult through cost verification by power source.
- Verify technologies and costs of energy systems as a whole, including heat and transportation systems, and achieve dynamic energy transitions

## Section 3 Issues faced by each option and priorities in response thereto

- **Renewable energy:** Aim to develop and utilize renewable energy as the major power source, economically independent and decarbonized; Development of high-performance low-price storage batteries
- **Nuclear power:** Practical option for decarbonization; Pursuit of safe reactors and development of back end technologies for restoring social trust
- **Fossil fuel:** Major power source during the transitional period until the achievement of decarbonization; Shift to gas; Fadeout of inefficient coal use; CCS and shift to hydrogen

## Section 4 All-out efforts to realize the scenario

- **All-out efforts:** Public-private collaborative efforts to constantly promote technological innovation and foster and secure human resources
- **Measures for the global issue of underinvestment:** Steady designing and creation of a mechanism to secure required investment
- **Implementation scenario:** Intensive allocation of policy resources to achieve energy transitions and decarbonization; Implementation of political measures such as market reform and system reform; Efforts to make international collaboration; Enforcement of the industry and reconstruction of energy infrastructure; Reconstruction of a fund flow mechanism