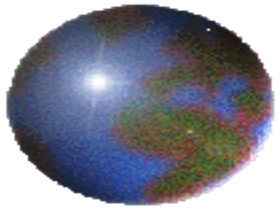
Japan's Green Transformation (GX): Its potential and limitation



Hiroshi Ohta, Ph.D.
A Professor Emeritus of Waseda University

Prepared for CENRIT Blue Sky Seminar
19 June 2024

This work was supported by JSPS KAKENHI Grant Number JP21K01357.

The Content

- Japan's NDC and Net Carbon Neutrality 2050
  - Green Growth Strategy
- Japan's Green Transformation (GX)
  - The Gist of "Pathways to Japan's Green Transformation (GX)"
- Some critical reflections on Japan's (METI's) GX policy and diplomacy
- GX potential and limitation
  - Solar
  - Wind
- Analysis of Japan's RE laggard

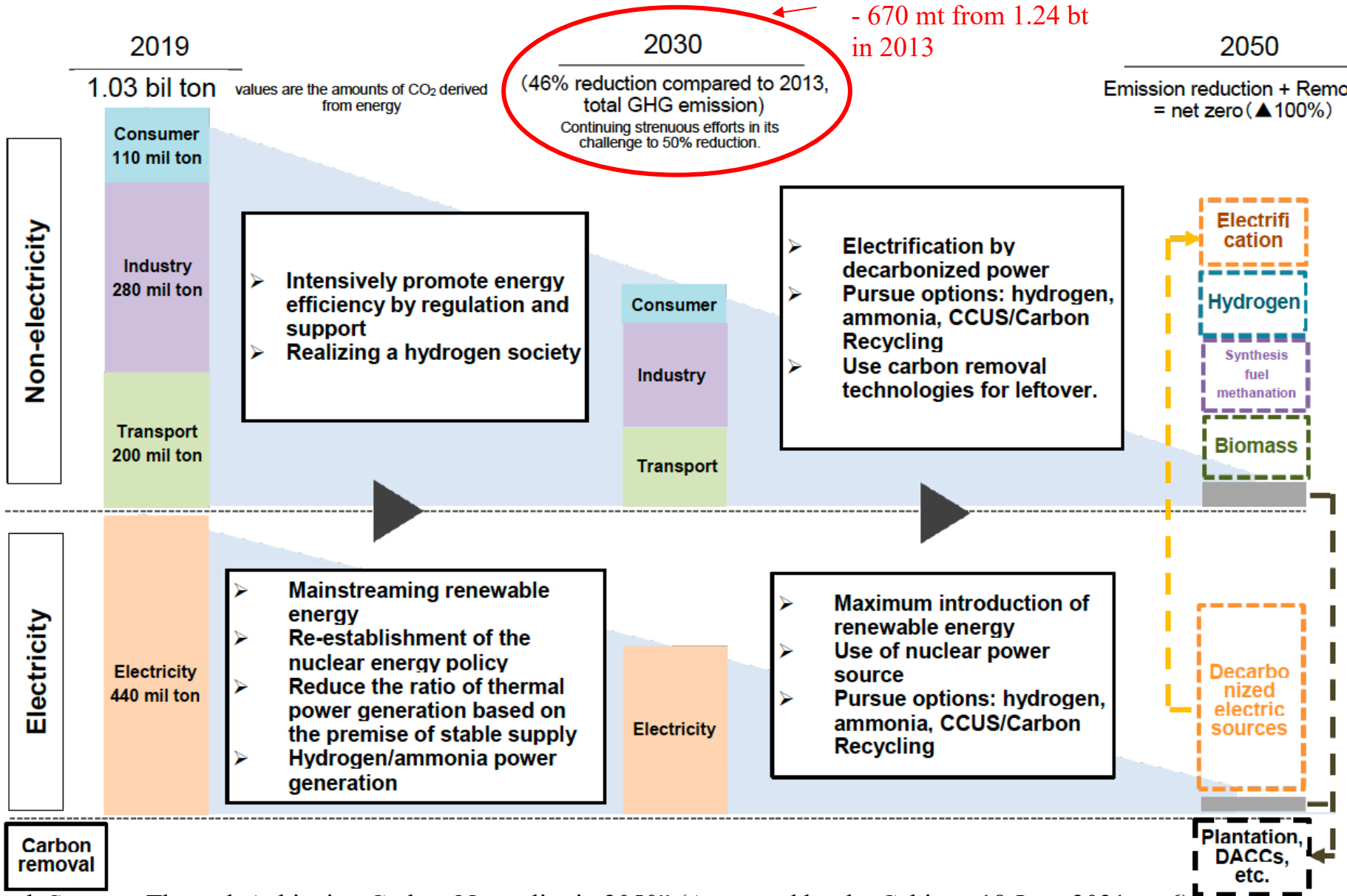
COP26, Glasgow, Scotland, Oct-Nov 2021

Japan's new NDC is 46% (50% aspirational) reduction from 2013 levels by 2030 and net carbon neutrality by 2050.

Does Japan cap up with front runners?

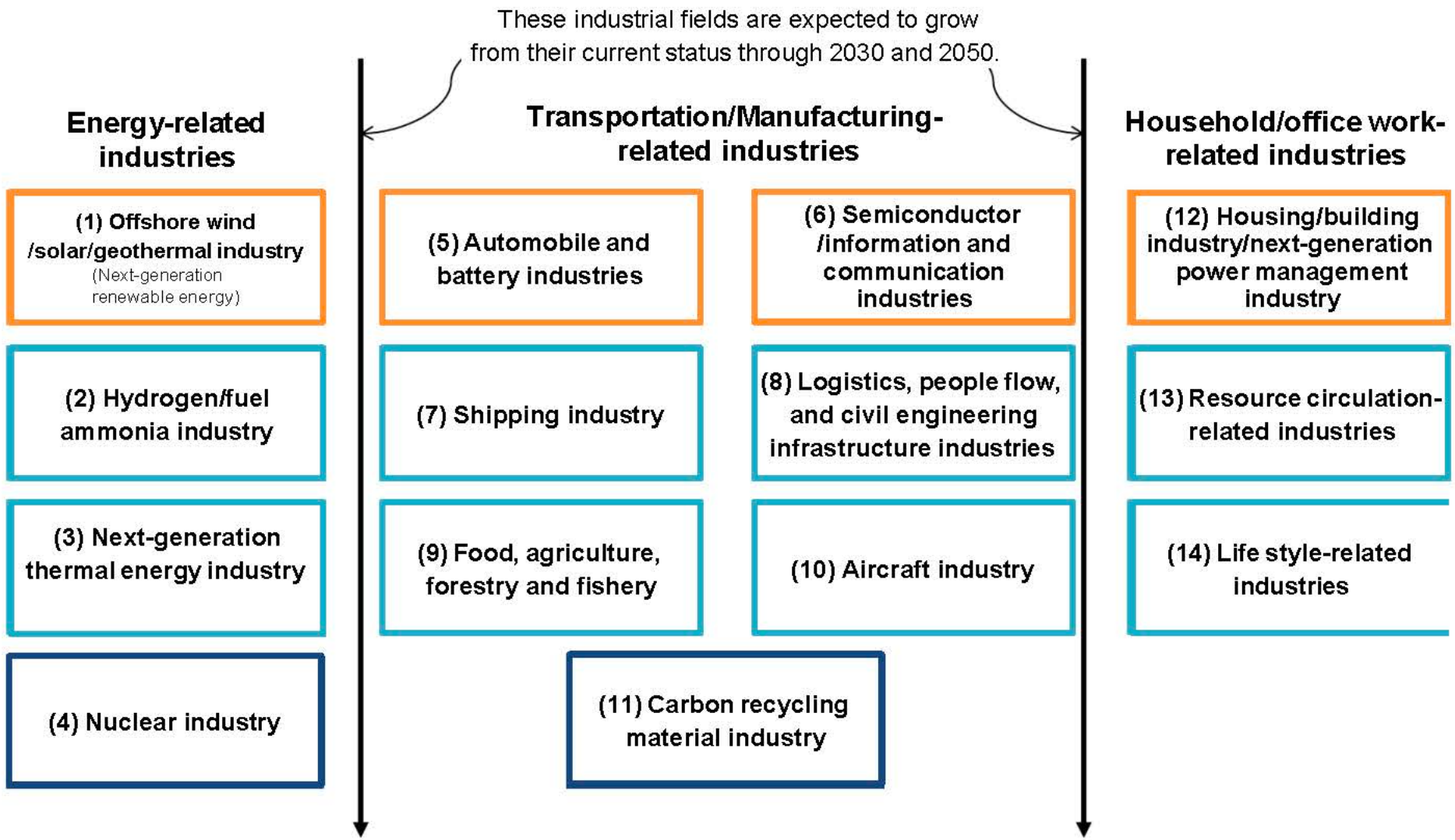
Source: UNFCCC Photo Desk
UNFCCC flicker
https://www.flickr.com/photos/unfccc/sets/

Realization of Carbon Neutrality by 2050 (June 2021)



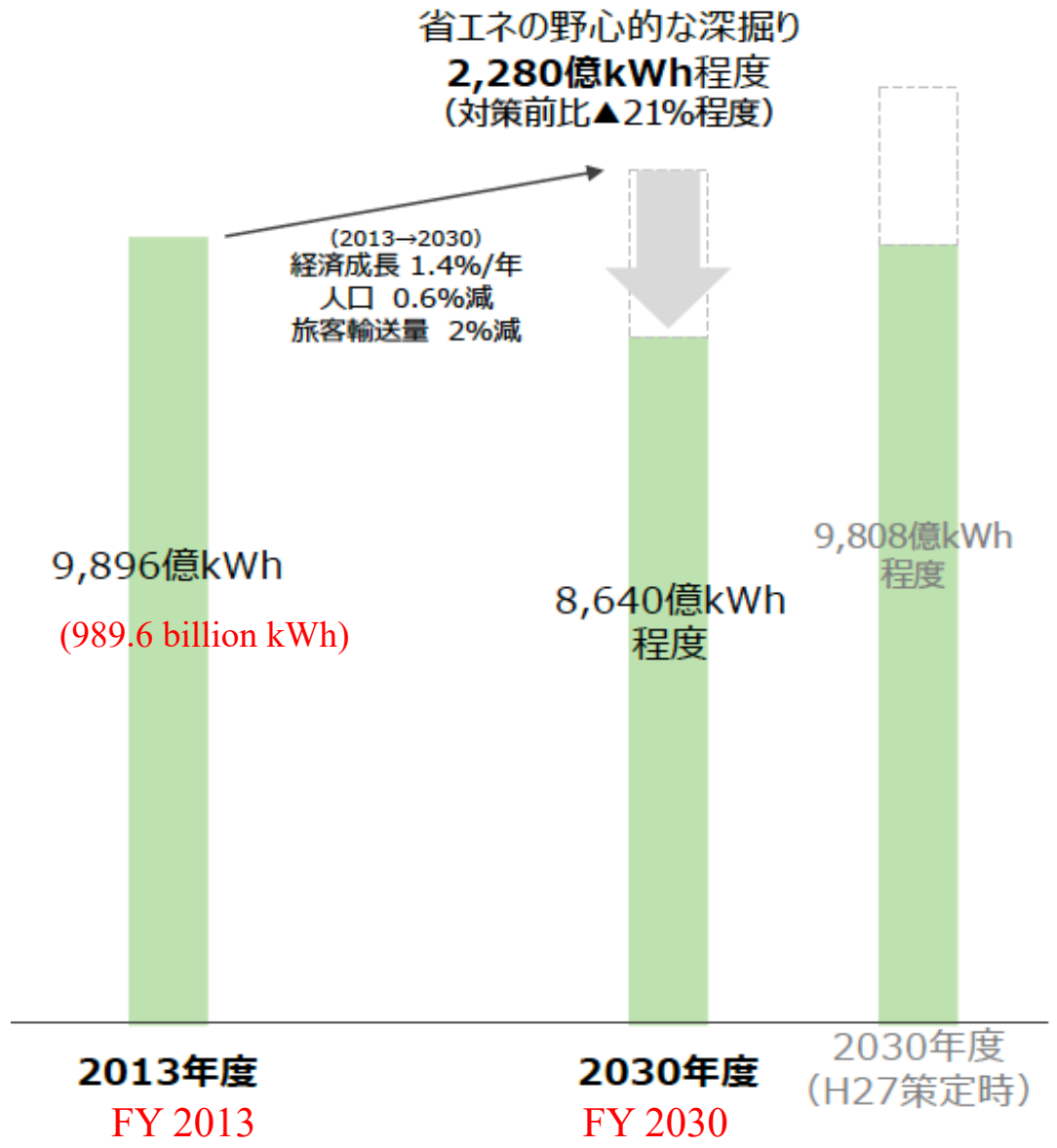
"Green Growth Strategy Through Achieving Carbon Neutrality in 2050" (Approved by the Cabinet, 18 June 2021, p. 6)

Selected 14 sectors for the Green Growth Strategy

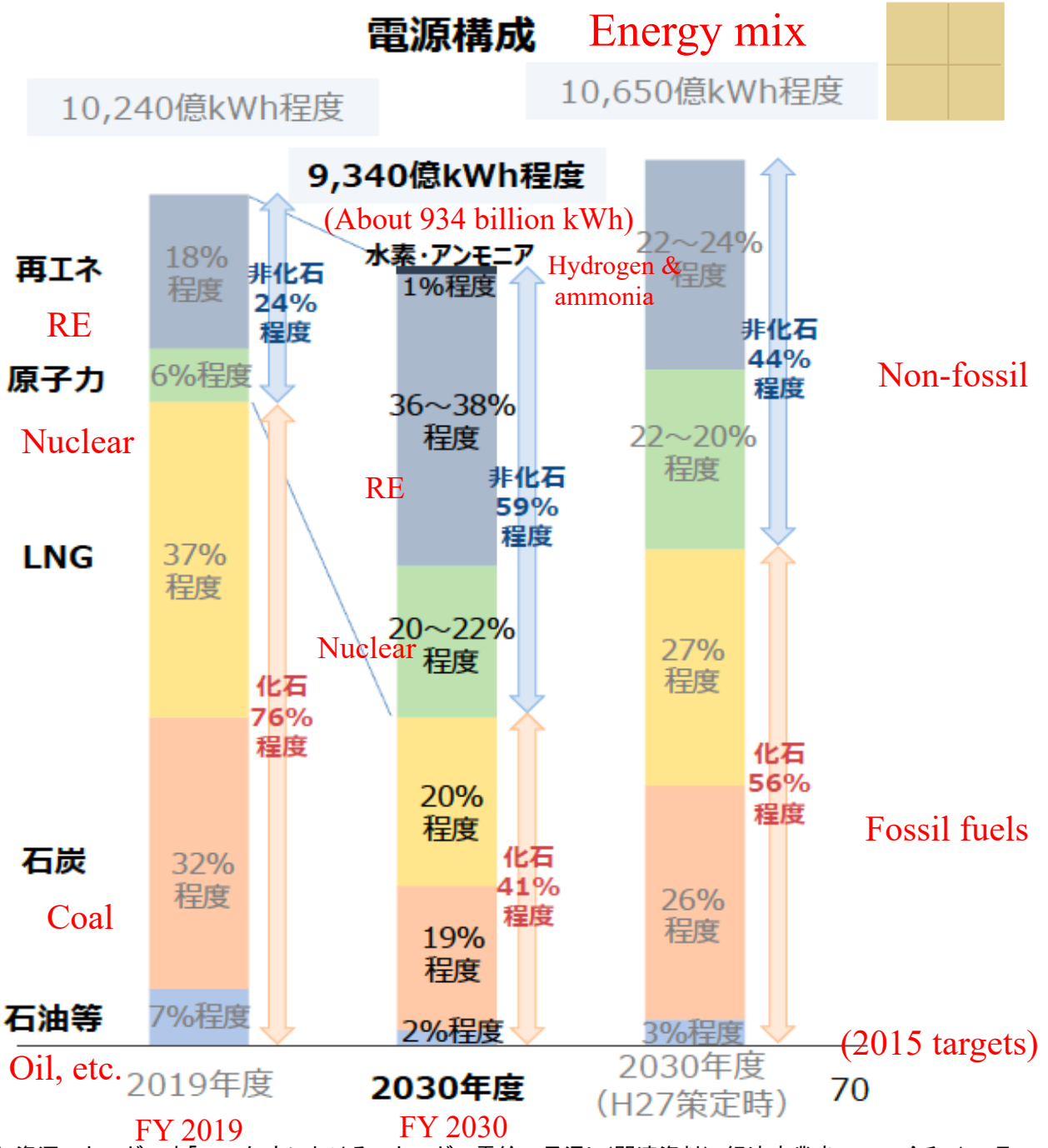


Source: The Cabinet Office, "Green Growth Strategy Through Achieving Carbon Neutrality in 2050," 18 June 2021, available at the METI website at https://www.meti.go.jp/english/policy/energy_environment/global_warming/ggs2050/index.html

電力需要
The demand of electricity



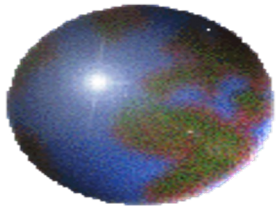
電源構成 Energy mix



出所: 資源エネルギー庁「2030年度におけるエネルギー需給の見通し(関連資料)」経済産業省、2021(令和3)10月

Challenges ahead

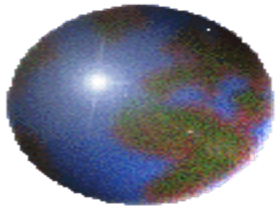
- Nuclear and thermal power plants with CCS/CCUS 30-40% by 2050 are too ambitious, whereas 50-60% for renewables are too small.
- The steel industry (14% of Japan's total CO_2 emissions): Hydrogen for the blast furnace is too expensive and electricity furnaces require large amounts of electricity.
- The automobile industries (15% of Japan's total): EVs on Japan's roads today constitute only 1% of the total fleets (passenger cars and tucks)
- The provision of infrastructures for EVs and fuel cell vehicles.
- Development of alternative fuels for airplanes and ships.



Japan's green transformation

Kishida's Green Transformation (GX) Policy and Legal Instruments

- Japan's green transformation strategy:
  - Basic Policy for Realization of Green Transformation: Roadmap for the Next 10 Years (GX Basic Policy) (February 2023)
  - Act on the Promotion of a Smooth Transition to a Decarbonized Growth-Oriented Economic Structure (GX Promotion ACT) (May 2023)
  - GX Decarbonization Electricity Act Amending Renewable Energy Law and Regulations/Local Taxation on Renewables – Pressing for Coexistence with Local Community (GX Decarbonization Electricity Act)(May 2023)



The Gist of "Pathways to Japan's Green Transformation (GX)"

Ministry of Economy, Trade and Industry (METI)

Japan's goals and strategies (Carbon Neutrality)

■ Speech by Prime Minister KISHIDA Fumio at the Guildhall in London (2022.5.5)

【Goals】

- ✓ Japan will achieve its international commitments to **carbon neutrality by 2050** and to **reduce greenhouse gas emissions by 46% by 2030**, while ensuring a stable energy supply.

- ✓ To achieve these goals, **150 trillion yen in new investments** will be raised over the next decade through public-private collaboration, including 17 trillion yen in fiscal 2030.

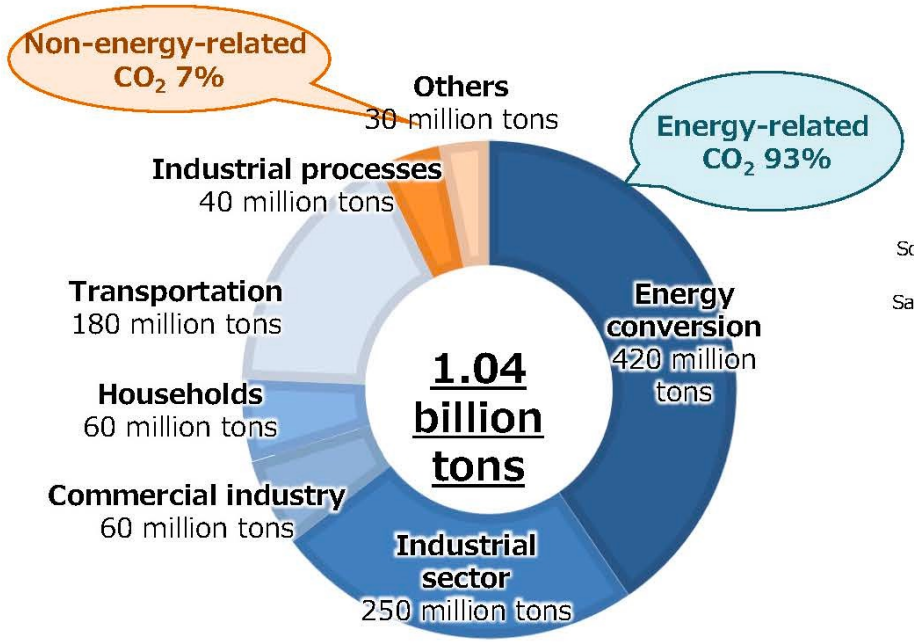
5

METI, Pathways to Japan's Green Transformation (GX) , 30 Jan. 2024, p.5,
www.meti.go.jp/policy/energy_environment/global_warming/transition/pathways_to_green_transformation_eng.pdf - 2024-01-30

Japan's CO2 emissions

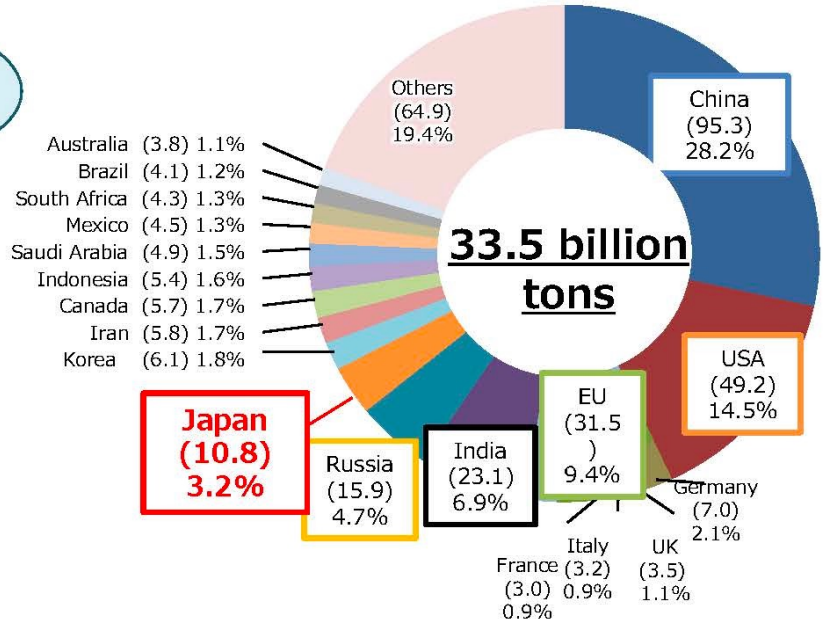
- In Japan, CO2 emissions from **power sector accounts for 40%**. Emission reduction from Industrial and other sectors are crucial towards carbon neutral.
- Japan will contribute to global emission reduction by providing solution for ourselves and beyond.

Japan's CO_2 emissions (2020)



(Source)
Created from Greenhouse Gas Inventory Office "Japanese greenhouse gas emission data"

Global energy-related CO2 emissions (2020)



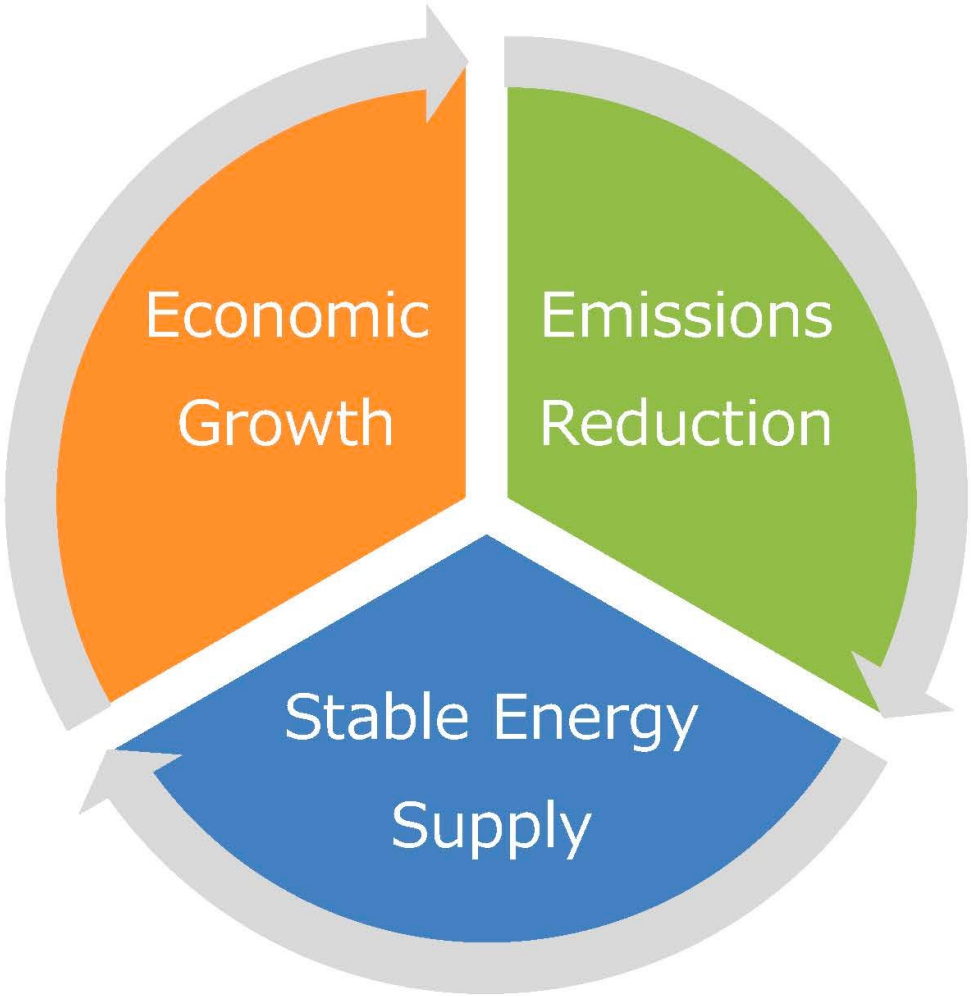
(Source) IEA, CO2 Emissions from Fuel Combustion Highlights 2020

7

METI, Ibid. p.7,

The Concept of GX

GX（Green Transformation）



METI, ibid., p. 13

GX Promotion Strategy

■ Based on the **GX Promotion Act** (enacted May 2023), the Japanese government adopted the **"GX Promotion Strategy"** in July 2023. The **strategy sets forth necessary policies to be implemented to achieve 150 trillion yen of public and private investments** to realize GX (green transformation),a transition from a fossil fuel-oriented economic and industrial structure since the Industrial Revolution to a clean energy-oriented one.

1. Green Transformation based on the Steady Supply of Energy

①Efforts to promote energy saving

②Renewable energy as a major source
- ・Grid development
- ・Next generation solar panels and offshore wind

③Utilization of nuclear energy
- Replacement to next generation plants
- Extension of operation periods of existing plants with safety as a premise and under specific terms

④Other efforts
- ・Support towards hydrogen and ammonia
- ・Research & development, investment promotion and demand creation in carbon recycle fuel, batteries and other areas

2. Implementation and realization of "Pro-Growth Carbon Pricing Concept"

① Upfront investment support provided through issuing GX Economy Transition Bonds (20 trillion yen in 10 years)

②Adoption of Pro-Growth Carbon Pricing
- i. Emission Trading System 【FY2026～】
- ii. Auction of emission quotas by power producers 【FY2033～】
- iii. Carbon surcharges for fossil fuels 【FY2028～】

③Utilization of new financial measures

④International cooperation

⑤Social measures to promote GX (just transition, demand creation, SMEs)

14

METI, ibid., p. 14

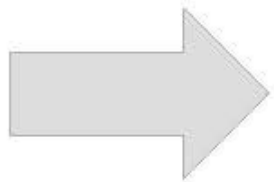
Approaches for investment promotion measures of 20 trillion yen

■ The contents of the 20 trillion yen "investment promotion measures" utilizing the GX Economy Transition Bonds (/Japan Climate Transition Bond) will be determined based on the following five principles, utilizing objective indicators and the knowledge of experts.

Principles for investment promotion measures

1. Basic principles: **a) investment decisions by the private sector alone are truly difficult,** b) contribute to **industrial competitiveness and economic growth, and c) emission reductions**
2. Addressing **high emission sectors**
3. Brush up and finalize **"Sector-specific investment strategies (roadmap)"** and decide on "investment promotion measures" in line with the strategies
4. **Analyze emission reduction effects (eg: marginal abatement cost analysis) , and economic impacts** (eg: profit analysis)
5. Detail measures will be decided by the GX Implementation Council drawing on the expertise of experts

20 Trillion Yen
Investment promotion measures



150 Trillion Yen
Public Private investment for decarbonization

~~16~~

METI, ibid., p. 16

Breakdown of "Investment Promotion Measures"

- To enhance the predictability for businesses and maximize GX investments:
  1) At the end of last year, government compiled a sectoral investment strategy for the next 10 years.
  2) Within these strategies, **develop a "5-year Action Plan" focusing on achieving carbon neutrality by 2050.**
- The GX Implementation Council and the expertise of specialists will be utilized to compile these plans and implement specific measures based on them.

Energy Supply Side: Approx. 50 trillion yen~

<GX in the Energy Transformation Sectors>

- Renewable Energy[*1] : Approx. 20tn yen~
- Next-generation Networks[*1]: Approx. 11tn yen~ (Grid and balancing capabilities)
- Next-generation innovative reactors: Approx. 1tn yen~
- Hydrogen and ammonia: Approx. 7tn yen~
- Carbon recycling fuels: Approx. 3tn yen~
- CCS: Approx. 4tn yen~

And more

Long-term decarbonized power source auctions will be newly established to promote investment in decarbonized power sources.

Energy Demand Side: Approx. 100 trillion yen~

<GX in Sectors related to people's lives> Approximately 60 trillion yen~

- Housing and buildings: Approx. 14tn yen~
- Automobiles and energy storage batteries: Approx. 34tn yen~
- Digital investments for decarbonization purposes: Approx. 12tn yen~

<GX in Industrial Sectors> Approx. 70 trillion yen~

- Materials (Iron and steel, chemical, cement and paper): Approx. 8tn yen~
- Automobiles and energy storage batteries: Approx. 34tn yen~ (repeated)
- Digital investments for decarbonization purposes: Approx. 12tn yen~ (repeated)
- Zero-emission ships (Maritime): Approx. 3tn yen~

And more

Note: The amounts provided are provisional values and have been mechanically calculated based on certain assumptions. They may change in the future, and there may be increases or decreases depending on the progress of projects, etc.

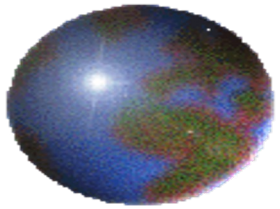
~~18~~

METI, ibid., p. 18

【Ref】Measures to Promote Investment through GX Economy Transition Bonds *currency: yen

		Amount of investment	Major Investment Promotion Measures	Actioned	Estimated amount of support (Under scrutiny)	remarks
manufacturing industry	iron and steel chemistry Pulp & Paper cement	3 trillion 3 trillion 1 trillion 1 trillion	・Capital Investment Support for Manufacturing Process Transformation (Innovative electric arc furnace, etc.)		5 years: 480 bill	・Total support for capital investment in the four fields (iron, chemicals, paper, and cement) is on the order of 1.3 trillion yen over 10 years
transport	automobile	34 trillion	・Support for the introduction of electrified vehicles	273.6 bill		・Tax deductions based on production volumes of EVs, etc.
	battery	7 trillion	・Support for the introduction of production equipment	597.4 bill	230.0 bill	・R&D support for all-solid batteries, etc
			・Support for the introduction of stationary storage batteries		3 years: 40 bill	
	aircraft	4 trillion	・Technological development of next-generation aircraft			・Consideration based on the "Next-Generation Aircraft Strategy" to be formulated by the end of the fiscal year
	SAF	1 trillion	・Support for SAF manufacturing and supply chain development		5 years: 340 bill	
	shipping	3 trillion	・Support for the introduction of production facilities for zero-emission vessels, etc.		5 years: 60 bill	・Measures to support R&D for ammonia carriers, etc.
Lifestyle, etc.	Life	14 trillion	・Renovation to insulated windows in the home ・Introduction of high-efficiency water heaters ・Renovation support for educational facilities, etc	235 billion 58 billion 33.9 billion		・**Support measures on the scale of 2 trillion yen during 3years**
	Resource circulation	2 trillion	・Support for building a recycling-oriented business model		3 years: 30 bill	・Including R&D on pyrolysis technology, etc.
	semiconductor	2 trillion	・Support for the introduction of power semiconductor production facilities ・AI semiconductors, optoelectronic fusion, etc	432.9 billion 103.1 billion		・Including R&D support for power semiconductors, etc.
energy	Hydrogen, etc.	7 trillion	・Support focusing on the price difference between raw materials and fuels		5 years: 460 bill	・Price differential support is on the scale of 3 trillion yen over 15 years ・R&D support for supply chains ,etc
			・Establishment of hydrogen supply bases			
	Next-Generation Renewable Energy	31 trillion	・Support for the construction of supply chains such as floating offshore wind farms and support for the introduction of perovskites		5 years: 420 bill	・Facility investment, etc., 1 trillion yen in 10 years ・Including R&D support for perovskites
	nuclear energy	1 trillion	・Development and construction of next-generation innovative reactors	89.1 billion	3 years: 160 bill	
	CCS	4 trillion	・CCS Value Chain Construction Support			・Examination based on the results of business surveys
	Cross-sectoral measures		・Energy-saving subsidies, etc.	340 billion		・**700 billion yen over 3 years**
			・Support for fostering deep tech startups		40 bill	・**Assistance on the scale of 200 billion yen over five years**
			・R&D through GI Fund, etc.	806 billion		・2 trillion yen measures in 2021
			・Financial support by the GX Organization		120 bill	・Assuming financing support through debt guarantees
			・Regional Decarbonization Grants	3 billion	6 bill	
	Tax Measures		・Establishment of new tax credits based on production volumes of green steel, green chemicals, SAF, EVs, etc.			

Amount of support since R6FY:Approx. 2.4 trillion円（赤の合計）



The Climate Transition Bond

Overview of the Climate Transition Bond Framework ①

- For the alignment with international standards such as the Green Bond Principles and Climate Transition Finance Handbook, **the framework clarifies the climate transition strategy, use of proceeds, reporting, etc.**
- The framework prioritizes investments in **sectors that contribute to reducing GHG emission and enhancing industrial competitiveness and economic growth**, focusing on **projects that are truly difficult for the private sector alone to make investment decisions,** as described in the "GX Promotion Strategy".

Overview of the Framework

✓ **Climate Transition Strategy：**

To achieve the international commitment of the 46% reduction in GHG emission by 2030 (compared to 2013 levels) and carbon neutrality by 2050, and to enhance industrial competitiveness and promote economic growth in our country, the "Green Transformation Promotion Strategy" was formulated in July 2023 based on the "GX Promotion Act".

✓ **Use of Proceeds：**

Based on the "Green Transformation Promotion Strategy", the framework categorizes projects under "Eligibility Criteria" and "Representative Use of Proceeds" such as the promotion of energy efficiency, structural transformation of the manufacturing industry, and the mainstreaming of renewable energy. For more details, refer to the next page.

✓ **Reporting：**

After issuance, annual reporting will be conducted on ①Allocation Reporting, which summarizes the allocation status of proceeds to GX budget projects, and ②Impact Reporting, which provides information on environmental impacts and case studies. ② will be conducted within two years from issuance, as the effects and impacts of the projects may take time to become apparent.

25

METI, ibid., p. 25

Overview of the Climate Transition Bond Framework ②
<Classification of Use of Proceeds>

Major categories		Eligibility Criteria	Representative Use of Proceeds (Eligible Projects)
1	Energy efficiency 	Promotion of thorough energy efficiency improvement	- Promote the spread of energy-efficient appliances
		Houses and buildings	- Support for building new houses and buildings with high energy efficiency and retrofitting to improve energy efficiency
		Digital investment aimed at decarbonization	- Facilitating the development of and investment in energy efficient semiconductors, photonics electronics convergence technologies, etc.
		Battery industry	- Investments in plants manufacturing batteries together with their material and components
2	Renewable energy 	Making renewable energy a major power source	- Floating offshore wind - Next-generation solar cells (perovskite)
		Infrastructure	- Development of cities and communities that will help decarbonization
3	Low-carbon and Decarbonized energy 	Utilization of nuclear power	- Next-generation advanced reactors with built-in new safety mechanisms
		Establishing electricity and gas markets to achieve carbon neutrality	- Promoting zero-emission thermal power - Development of submarine DC transmission systems, etc.
4	Clean transportation 	GX in transport sector	- Support for the introduction of next-generation vehicle - Developing demonstration aircraft by 2030s and spreading the use of zero-emissions ships, etc.
		Infrastructure (repeat)	- Development of cities and communities that will help decarbonization
5	Circular economy adapted products, production technologies and processes 	Restructuring the manufacturing industry (fuel and feedstocks transition)	- Development and introduction of innovative technologies such as hydrogen reduction for steelmaking - Conversion to Carbon-Recycling production systems
		Facilitating introduction of hydrogen and ammonia	- Building supply chain both in domestically and internationally - Research and development as well as the introduction support of both production and usage of hydrogen derived from excess renewable energy sources
		Carbon Recycling and CCS	- Support for research and development of Carbon Recycling fuel
6	Environmentally sustainable management of living natural resources and land use and Circular economy 	Food, agriculture, forestry, and fisheries	- Decarbonization of agriculture, forestry and fisheries
		Resource circulation	- Investment to accelerate the resource circulation such as plastics, metals, sustainable aviation fuel (SAF), etc

METI, ibid., p. 26

【Ref】 Contributing to the Realization of Asia's "Transition"

- In order to address global climate change issues and achieve economic growth, it is extremely important to realize GX in Asia. Social stability, including energy security, is also important. On the other hand, Asia faces **challenges such as limited renewable energy reserves and a surge in electricity demand** in the future.
- Therefore, **it is important to utilize "transition finance" to support the gradual transition to CN as well as green finances.**
- Specifically, it is important to (1) **disseminate transition-related technologies**, (2) support the formulation of rules related to transition finance, and (3) provide transition funds.

The Importance of Transition in Asia

potential

Asia's emissions are higher than the rest of the world's occupies more than half

By 2050 The size of **the economy is about 3 times***

subject

Compared to Europe and Africa, **the amount of renewable energy available is small**

Population growth and economic growth will **increase electricity demand by approximately tripling by 2050***

Examples of Initiatives to Promote the Use of "Transition Finance"

Technology is widespread

○ Expanding the results of GX investment in Japan to Asia
- Compiled a list of technologies to make it easier for financial institutions to provide funding
- Joint demonstration of transition technology

Rule formation

○ Establishment of rules for the Asian version of transition finance
→Bringing in global funds for GX
(It is estimated that the cumulative total will be 40 trillion $ by 2050.)

Fund Provisioning

○ Expand the provision of funds by the Japanese government and private financial institutions for transition technologies and projects such as ammonia, LNG, and CCUS.

⇒ Achieving economic growth and decarbonization together with Asia

Source: Created based on IEA's World Energy Outlook 2021, etc.
*Outlook for Southeast Asia

~~22~~

METI, ibid., p. 26

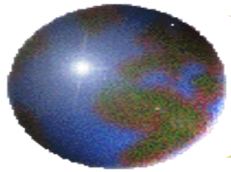
METI,
List of MOUs
(as of 16 Decmber2023) :

Public and private initiatives in building the Asia Zero Emissions Community (AZEC)

List of MOUs **16th December, 2023**

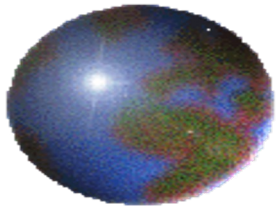
No.	Project	Country	Japanese Company	Company in AZEC Countries
1	HyNQ North Queensland Clean Energy Project: IHI to Join Japanese and Australian Green Ammonia Production and Export Joint Venture	Australia	IHI Corporation	Energy Estate CS Energy Idemitsu Renewable Development Australia
2	MOU with the Clean Energy Finance Corporation (CEFC) of Australia (October 2023)	Australia	Japan Bank for International Cooperation (JBIC)	Clean Energy Finance Corporation
3	MOU to contribute to Japanese investments towards projects on hydrogen, ammonia and CCS in the State of New South Wales, Australia	Australia	Japan Organization for Metals and Energy Security	the State of New South Wales, Australia
4	MOU for Feasibility Study of Commercial-scale Hydrogen Supply in Gladstone	Australia	SUMITOMO CORPORATION	Rio Tinto Aluminum
5	MOU for Feasibility Study to Establish a Japan-Australia CCS Value Chain	Australia	SUMITOMO CORPORATION Kawasaki Kisen Kaisha, Ltd. ("K" LINE) TOHO GAS Co., Ltd.	Woodside Energy
6	MOU for Feasibility Study to Realize "Setouchi / Shikoku CO2 Hub Concept"	Australia	SUMITOMO CORPORATION Kawasaki Kisen Kaisha, Ltd. ("K" LINE) JFE Steel Corporation Sumitomo Osaka Cement Co.,Ltd.	Woodside Energy
7	Cooperation in biomass projects between erex Co.,Ltd. and SPHP (Cambodia) Co., Ltd. and the MME of the Kingdom of Cambodia	Cambosia	erex Co.,Ltd.	KTC
8	Memorandum of Cooperation regarding the feasibility study of electricity transmission business between Kansai /Kansai TD , the Ministry of Energy and Mineral Resources of Indonesia (BBSP/ MEMR), and PT PLN	Indonesia	The Kansai Electric Power Company,Incorporated Kansai Transmission and Distribution, Inc.	PLN Survey and Testing Center of Electricity, New Energy, Renewable and Energy Conservation(BBSP)
9	Establishment of stable supply for Indonesian solid biomass by diversifying of biomass materials and realization of multi-shipment	Indonesia	PT SANTOMO RESOURCES INDONESIA	PPT ENERGY TRADING CO. LTD.
10	MOU between JICA and PT PLN (Persero) for Capacity Building to promote Energy Transition in Indonesia	Indonesia	Japan International Cooperation Agency (JICA)	PLN
11	Master Plan for Energy Management Project in Indonesia (PT PLN (Persero) and JICA)	Indonesia	Japan International Cooperation Agency (JICA)	PLN The Ministry of Energy and Mineral Resources, Indonesia
12	MOU with PT Pupuk Indonesia(Persero) of Indonesia (May 2023)	Indonesia	Japan Bank for International Cooperation (JBIC)	Pupuk Indonesia
13	MOU with Nusantara Capital Authority of Indonesia (May 2023)	Indonesia	Japan Bank for International Cooperation (JBIC)	the Nusantara National Capital Authority
14	MOU between Pertamina and JCCP - Capability development and technical cooperation in the energy sector -	Indonesia	Japan Cooperation Center for Petroleum and Sustainable Energy (JCCP)	Pertamina
15	JCCP-Indonesia Cooperation Plan for FY2023-2024 - Capability development and technical cooperation in the energy sector -	Indonesia	Japan Cooperation Center for Petroleum and Sustainable Energy (JCCP)	Pertamina The Ministry of Energy and Mineral Resources, Indonesia
16	MOU between JERA and PERTAMINA on LNG/LCF Value Chain Collaboration	Indonesia	JERA Co., Inc.	Pertamina
17	MOU on Methane emission measurement and CI quantification project between Pertamina and JOGMEC	Indonesia	Japan Organization for Metals and Energy Security (JOGMEC)	Pertamina
18	Joint Study towards Implementing CO2 Injection Field Test in Sukowati Field in Indonesia	Indonesia	Japan Organization for Metals and Energy Security Japan Petroleum Exploration Co., Ltd. (Abbreviation: JAPEX)	Pertamina
19	Joint Commitment for Plan on the Signing of PPP Agreement for Legok Nangka WTE Project	Indonesia	SUMITOMO CORPORATION Hitachi Zosen Corporation PT Energia Prima Nusantara	West Java Gov.
20	PT. Olympic Bangun Persada and Sumitomo Forestry Signed a JV Agreement to Build Detached Housing Project Equipped with Solar Panel as a Standard Feature	Indonesia	Sumitomo Forestry Co., Ltd.	PT Olympic Bangun Persada
21	MOU on decarbonization in GIIC industrial park and Deltamas City	Indonesia	Sojitz Corporation	Sinar Mas Land
22	Basic agreement on carbon credit creation associated with EFB pellet production	Indonesia	TESS Holdings Co., Ltd.	Perkebunan Nusantara3 PTEC
23	MoU for Joint Study on the Full-scale Geothermal Utilization between PT Geo Dipa Energi (GDE) and TOYO Engineering Corporation (TOYO)	Indonesia	Toyo Engineering Corporation	Geo Dipa

https://www.meti.go.jp/press/2023/12/20231217002/20231217002-d.pdf



No.	Project	Country	Japanese Company	Company in AZEC Countries
24	MOU on joint development of Renewable Natural Gas Projects between PT. Toyota Tsusho Indonesia（TTI）and PT. Perusahaan Gas Negara Tbk（PGN）	Indonesia	Toyota Tsusho Corporation	PGN
25	Heads of Agreement on the Development of Biomethane from Palm Oil Waste	Indonesia	JGC Holdings Corporation Osaka Gas Co., Ltd. INPEX	Perusahaan Gas Negara Tbk
26	Commercial operation contract signed with PT. PLN, Indonesia's state-owned power company, for Tongar Hydro Power Plant	Indonesia	NiX JAPAN Co., Ltd.	PT. PLN
27	MOU between PERTAMINA and NEXI	Indonesia	Nippon Export and Investment Insurance (NEXI)	Pertamina
28	Memorandum of Understanding with BRIN（Indonesia National Research and innovation agency）for cooperation in carbon neutral contribution technology	Indonesia	New Energy and Industrial Technology Development Organization	BRIN
29	Indonesia's Energy Transition - Net Zero	Indonesia	Hitachi Energy Ltd.	The Ministry of Energy and Mineral Resources, Indonesia
30	MOU related with Energy Management Utilizing Battery	Indonesia	Mitsubishi Corporation	ICON PLUS
31	Joint Development Agreement on pilot scale development of green hydrogen and green ammonia	Indonesia	Tokyo Electric Power Company Holdings, Incorporated Yamanashi Hydrogen Company, Inc.	Pertamina Power Indonesia
32	Agreement to confirm cooperation to launch a joint philanthropic fund to provide funding, mentoring, and policy advocacy support for projects that address social issues in the ASEAN region	Indonesia	PoliPoli	Pijar Foundation
33	LOI on Low Carbon Fertilizer Off-take Agreement	Laos	Tsubame BHB Co., Ltd.	Agri laos co., Ltd
34	Coffee Roasting using Green Hydrogen in Pakse-Japan SME SEZ, Champasak Province, Lao PDR	Laos	TTCL Public Company Limited	Phetsavangjoint
35	Basic agreement on the commercial use of the world's first dedicated ammonia gas turbine	Malaysia	IHI Corporation	Gentari Hydrogen Sdn. Bhd
36	MoU between IHI and TNB Power Generation Sdn Bhd regarding basic design for small scale ammonia and/or biomass mix-firing	Malaysia	IHI Corporation	TNB Power Generation Sdn Bhd (GENCO)
37	MOU on FEED study for 60 MW class alkaline water electrolyser to produce green hydrogen in Malaysia	Malaysia	Asahi Kasei Corp. JGC Holdings Corporation	Gentari Hydrogen Sdn. Bhd
38	Joint Development Agreement (JDA) for Production and Exportation of Green Hydrogen/MCH in Sarawak, Malaysia	Malaysia	SUMITOMO CORPORATION ENEOS Corporation	SEDC Energy
39	e-methane Production in Malaysia using Biomass	Malaysia	Osaka Gas Co., Ltd. IHI Corporation	Petronas
40	MOU for hydrogen and ammonia and other utilization projects in Johor, Malaysia	Malaysia	Mitsubishi Heavy Industries, Ltd. Sojitz Corporation	Johor Corporation
41	Strategic Technology Partnership between TNB Power Generation SDN. BHD ("TNB GENCO") and Toshiba Energy Systems & Solutions Corporation ("TESS") for TNB GENCO CCUS pilot plant facility	Malaysia	Toshiba Energy Systems & Solutions Corporation	TNB Power Generation Sdn Bhd (GENCO)
42	MOC on the cross-border of CO2 transportation between METI, JOGMEC and PETRONAS	Malaysia	Ministry of Economy, Trade and Industry Japan Organization for Metals and Energy Security	Petronas
43	Offshore Peninsular Malaysia CCS Value Chain	Malaysia	MITSUI & CO., LTD.	Petronas, TotalEnergies
44	MOU for AZEC promotion in the Philippines (October 2023)	Philippine	Japan Bank for International Cooperation (JBIC)	Aboitiz Power Corporation, MPIC
45	Tri-parties' MOU to study retrofitting with ammonia combustion by Sembcorp, IHI and GE in Singapore	Singapore	IHI Corporation	Sembcorp, GE Vernova
46	Asuene partnering with Pavilion Energy	Singapore	Asuene Inc	Pavilion Energy Trading & Supply Pte. Ltd.
47	India/ MOU of Green Ammonia Production Business	Singapore	Kyushu Electric Power Company, Incorporated Sojitz Corporation	Sembcorp Industries

No.	Project	Country	Japanese Company	Company in AZEC Countries
48	Business partnership to create a credit fund with the theme of ASEAN sustainability	Singapore	Mercuria Investment Co., Ltd.	OCBC
49	Mizuho and Climate Impact X join forces to scale carbon credit market in Asia	Singapore	Mizuho Financial Group, Inc.	Climate Impact X
50	Zeroboard(Japan) / Summit Auto Body Industry Co., Ltd. (Thailand) MOU	Thailand	Zeroboard Inc.	Summit Group
51	Zeroboard (Japan)/Innopower (Thailand) MoU	Thailand	Zeroboard Inc.	INNOPOWER
52	Zeroboard (Japan)/SENA Development (Thailand) MoU	Thailand	Zeroboard Inc.	SENA
53	Zeroboard(Japan) / TPA (Thailand)MOU	Thailand	Zeroboard Inc.	TPA
54	Zeroboard (Japan)/THS Innovations (Thailand) MoU	Thailand	Zeroboard Inc.	THS Innovations
55	Signing a Term Sheet for Producing Bio Jet Fuel from Inedible feedstocks	Thailand	Sojitz Corporation	PTT Group
56	Memorandum of Understanding on Cooperation in Innovation and Technology Research and Development	Thailand	New Energy and Industrial Technology Development Organization	NIA
57	Memorandum of Understanding on Cooperation in Development of a Startup Ecosystem	Thailand	New Energy and Industrial Technology Development Organization	NIA
58	MOU for the utilization of hydrogen, ammonia and CCS to de-carbonize petrochemical plant in Thailand	Thailand	Mitsubishi Heavy Industries, Ltd.	PTT Global Chemical(GC)
59	Mitsubishi Corporation and Thai CP Group Memorandum on joint FS for decarbonization of the manufacturing industry in Thailand	Thailand	Mitsubishi Corporation	CP Group
60	Memorandum of Understanding between Mitsubishi Corporation and PTT Public Company Limited regarding joint study on the development of next-generation fuel for automobiles	Thailand	Mitsubishi Corporation	PTT
61	Three Parties' Joint Feasibility Study for FPV Project in Laos	Vietnam	ITOCHU Corporation	Electricite De France SA, Viet Lao Power JSC
62	MEMORANDUM OF UNDERSTANDING For the joint development of the TraVinh Offshore Wind Farm with a total expected capacity of 1.8 GW in TraVinh province, Vietnam	Vietnam	Kumagai Gumi Co., Ltd. INPEX The Kansai Electric Power Company, Incorporated	TTVN（Truong Thanh Vietnam Group), REE Corp
63	MEMORANDUM OF AGREEMENT ON JOINT PROJECT "Improving the Capacity of LPG Cylinder Distribution Management in Vietnam by using barcode seals"	Vietnam	Japan Cooperation Center for Petroleum and Sustainable Energy (JCCP)	PV Gas PV Gas LPG
64	Memorandum of Understanding with Vietnam Electricity("EVN") for collaboration on Decarbonization Roadmap development	Vietnam	JERA Co., Inc.	EVN
65	MOU with VietinBank of Vietnam (December 2023)	Vietnam	Japan Bank for International Cooperation (JBIC)	VietinBank
66	MOU between PV Gas and Sumitomo Corporation for LNG to Power Project	Vietnam	SUMITOMO CORPORATION	PV Gas
67	MOU for business development to realize a Carbon Neutral Society	Vietnam	Tokyo Electric Power Company Holdings, Inc.	Vietnam Electricity Group
68	Memorandum of Understanding with NATIF for cooperation in energy, environment-related technologies and industrial technologies	Vietnam	New Energy and Industrial Technology Development Organization	NATIF
69	MOU on starting cooperation on system collaboration for digitalization of the trade procedures	Vietnam	TradeWaltz	FPT Information System corporation FPT Japan Holdings
70	MOU for jointly studying further promotion of a blended finance scheme, utilizing private financing, to accelerate the development of developing countries	ASEAN	Nippon Export and Investment Insurance (NEXI)	Japan International Coooeration Agency（JICA）
71	Cooperation on research and policy advocacy activities in the field of digital innovation and sustainable economy	ASEAN	Economic Research Institute for ASEAN and East Asia (ERIA)	Institut Teknologi Bandung Universiti Teknologi Malaysia De La Salle University



Some critical reflections on Japan's (METI's) GX policy and diplomacy

Japan's GX and Challenges

- Mainstreaming renewables (RE) and address energy security
  - Nuclear targets remain the same: 20-22% in 2030.
  - No ratchetting up renewables' targets: 36%–38% by 2030
    - "RePower EU": RE 40% → 45% by 2030
    - Germany: RE 65% → 80% by 2030
- Promoting development and construction of next-generation innovative reactor (on the site of decommissioned nuclear power plant).
  - They may be commercialized in the 2030s and will not contribute to the 2030 GHG reduction goal.
- Longer life for nuclear power: beyond 60 or longer
- A fuel levy and an emission trading system (ETS)

Hydrogen/ammonia co-firing thermal power plants

- Promoting hydrogen and ammonium as a breakthrough to realizing carbon neutrality and energy security (Cabinet Secretariat 2023, p. 8).
  - METI's Strategic Energy Plan anticipates that hydrogen/ammonia co-firing thermal power plants will only represent 1% of total power generation in 2030 (ANRE 2021, p. 68, 70, pp. 73–74).
- Coal phaseout of inefficient coal power plants, but no mentioning target years for the phasing-out of all coal power plants.
- Regarding CCS, there is no explicit schedule for its commercialization.
  - The GX Basic Policy only states that by "2030, the business environment will be ready for the start of CCS projects" (Cabinet Secretariat, p. 13).

Abated coal-fired plants in Japan are non-solution.

- According to the IEA's Net Zero scenario, developed countries should phase out unabated coal-fired power plants by 2030 (IEA 2023).
  - This IEA's scenario refers to the IPCC's Sixth Assessment Report's standard for abated coal-fired power generation: 90% decarbonization.
- Japan's Strategic Energy Plan's target is low at 20% co-firing of ammonia in coal-fired power plants by 2030 (Takase 2023).
  - Even though ammonia/hydrogen co-firing thermal power plants with CCS systems, METI's CCS target is to capture and store 6-12 million tons by 2030.
  - According to REI's Takase, one GW class coal-fired power plants emit around 5 million tons of CO_2 (Takase 2023). There are over 50 GW capacity of coal-fired power plants in Japan (50 x 5 = 250 Mt > 6-12 Mt).
- Steel, oil refining, and chemical plants, emit CO_2 in addition to electricity generation.

Asia Zero Emission Community Initiative

- In May 2021, the Japanese government announced the Asia Energy Transition Initiative (AETI), aiming at the provision of a roadmap towards decarbonization, exporting Japanese technology, and systems and knowhow to the ASEAN neighbors (METI 2021).
  - With US$10 billion in financial support for renewables, energy efficiency, and cleaner fuel sources, Japan announced projects in Thailand, Vietnam, Indonesia, and Malaysia, and more.
  - The two trillion yen (about $14 billion) Green Innovation Fund announced as a part of the Green Growth Strategy to develop renewable energy technology, mobility, storage batteries, and ammonia and hydrogen could be transferred across Asia (Reuter n.d.).

The Asian Green Growth Partnership Ministerial (AGGPM) & The Asia Zero Emissions Community (AZEC)

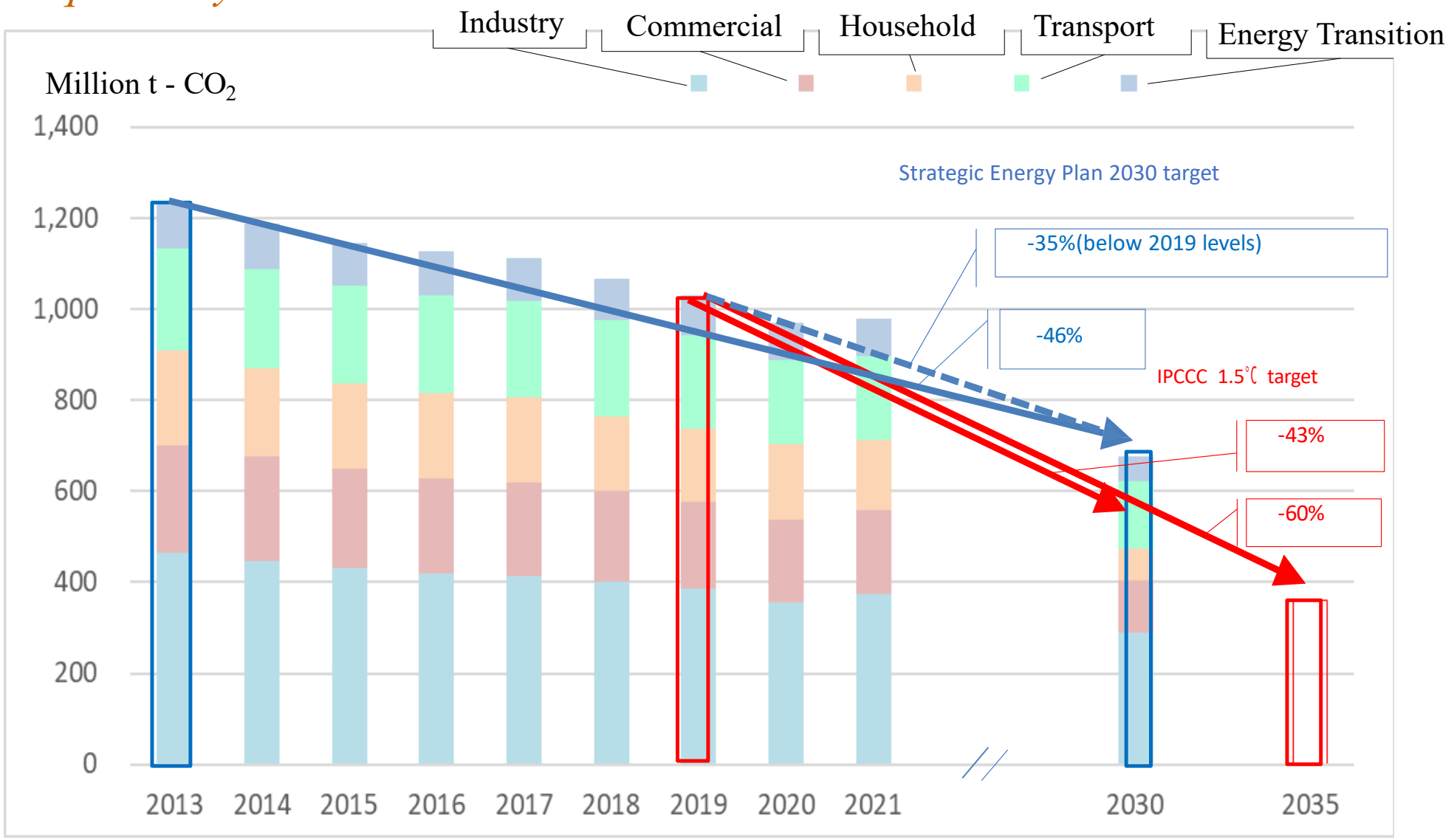
- In April 2022, Japan signed 10 agreements at the Asian Green Growth Partnership Ministerial (AGGPM) public-private forum.
  - A multi-year project on offshore wind power development in Vietnam between RENOVA, a Japanese renewable energy company, and PetroVietnam Technical Services Corporation (PTSC).
  - Another project: The utilization of ammonia and hydrogen between Japanese ITOCHU Corporation and Malaysia's Malakoff Corporation Berhad (Reuter n.d.).
- In December 2023, at COP28, Japan's P.M. Kishida mentioned the Asia Zero Emissions Community (AZEC) initiative for Southeast Asia (METI 2023) to seek regional cooperation through hydrogen and ammonia co-firing technology.
  - Japan received the *Fossil of Day Award:* "to lock in fossil fuel-based energy across the continent … delaying the transition from fossil fuels to renewables, adding hurdles to achieving the global goal of tripling renewables" (CAN 2023).

G7 Summit and A Renewed Mid-term Commitment

- G7 Hiroshima Summit on climate change:
  - Endorsed reducing global GHG emissions by around 43% by 2030 and 60% by 2035, relative to the 2019 level, in light of IPCC AR6's findings.

    (Para 18 in G7 Hiroshima Leaders' Communiqué, May 20, 2023)

2030 Targets in the Strategic Energy Plan and CO_2 emission reduction levels required by the IPCC

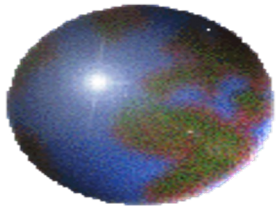


Source) Created by REI from Agency for Natural Resources and Energy (ANRE) "Comprehensive Energy Statistics Time Series Tables" and "Energy Supply and Demand Outlook for 2030 (Related Data)" (Reprinted from REI, "Proposal for the 2035 Energy Mix (First Edition)Toward Decarbonizing Electricity with Renewable Energy," May 2023, p.43). The author slightly modified it.

Apulia G7 Leaders' Communiqué, 15 June 2024

- The G7 leaders reaffirm their commitment to phase out existing unabated coal power generation in energy systems during the first half of the 2030s … (p. 16).
  - Consistent with the IEA's Net-zero Roadmap Report indicated the necessity of phasing out coal by 2035.
- Global renewable tripling target
- Global energy efficiency doubling target
- Noted some members' recognition of nuclear energy as a key component of "clean/zero emissions" and the global declaration to triple nuclear energy by 2050 launched during COP28

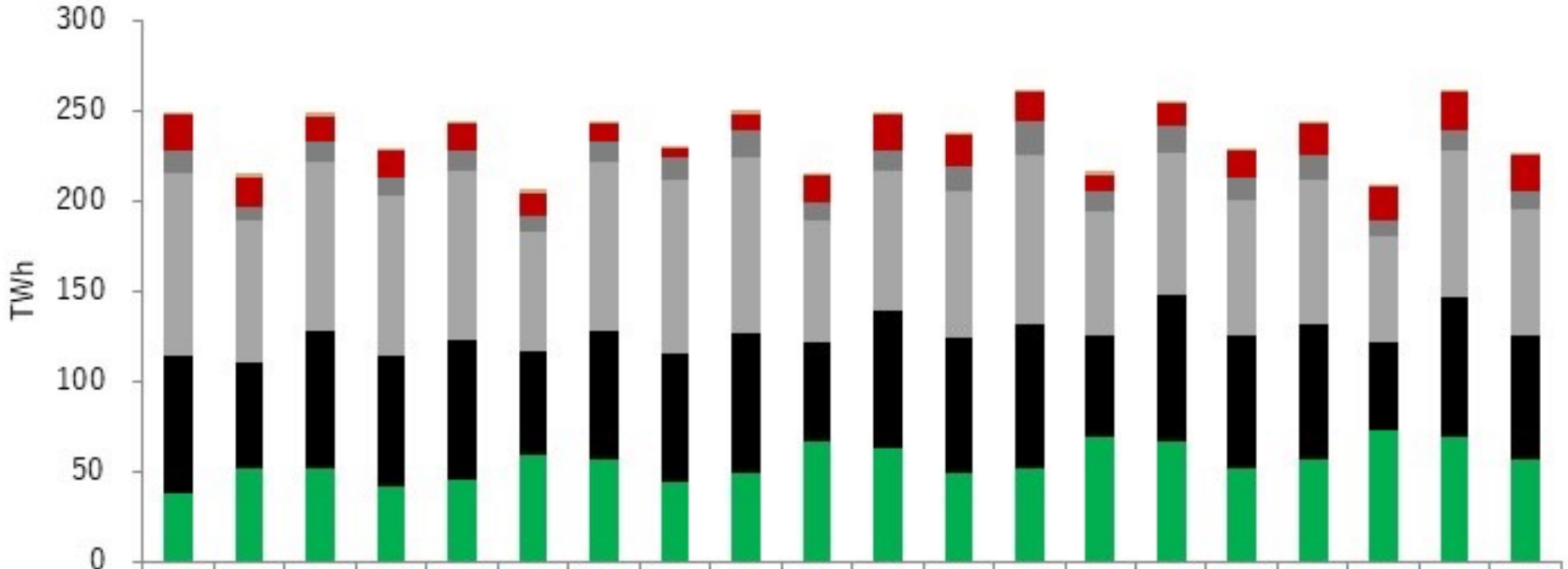
Source: G7 Italia, 2024 https://www.g7italy.it/en/documents/



GX potential and limitation

Trends of Total Electricity Production

Updated: 3 April 2024

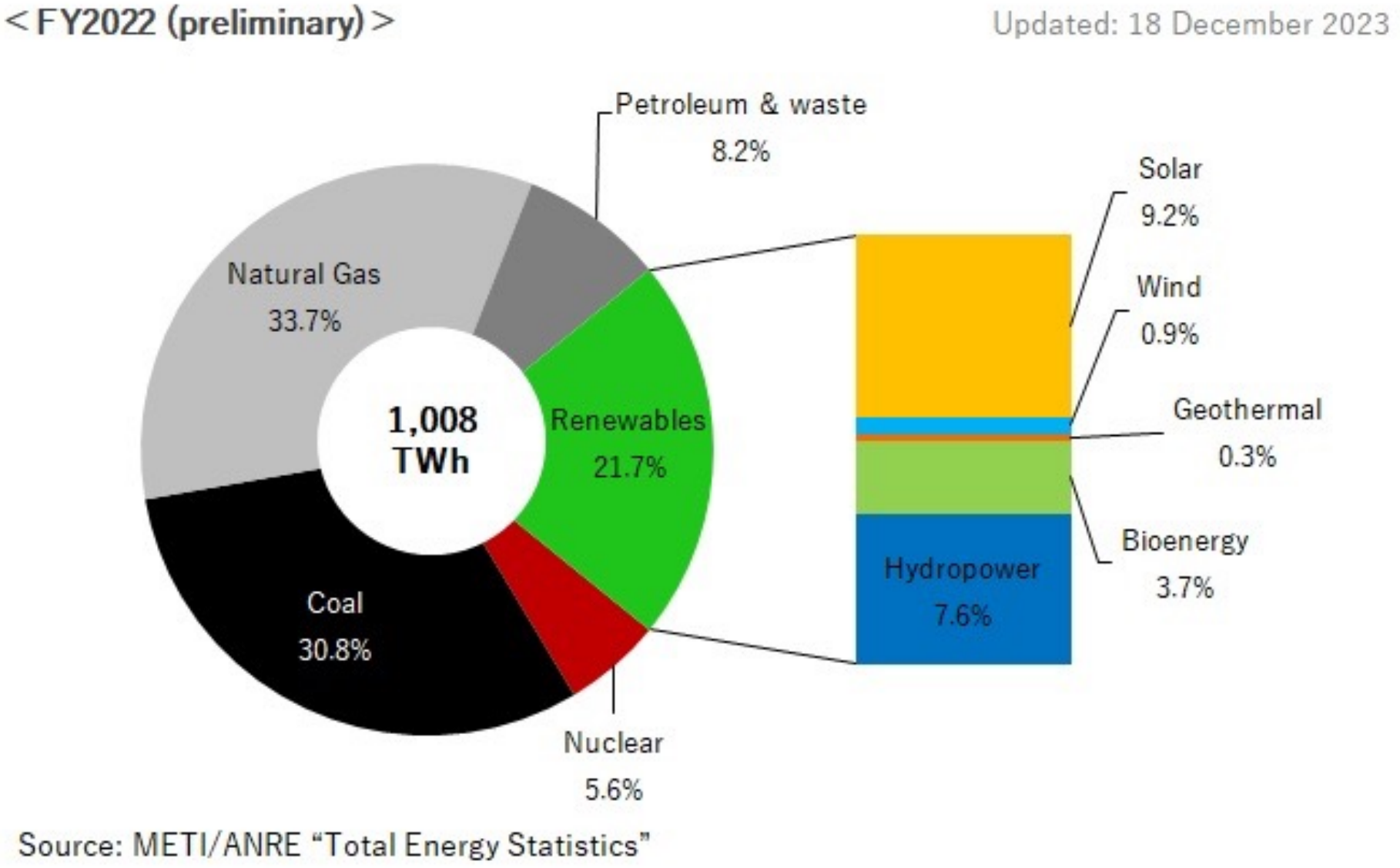


	Q1 2019	Q2 2019	Q3 2019	Q4 2019	Q1 2020	Q2 2020	Q3 2020	Q4 2020	Q1 2021	Q2 2021	Q3 2021	Q4 2021	Q1 2022	Q2 2022	Q3 2022	Q4 2022	Q1 2023	Q2 2023	Q3 2023	Q4 2023
Waste	2	2	2	2	2	2	2	2	2	2	2	2	1	2	2	2	2	2	2	2
Nuclear	20	16	14	16	15	13	10	5	9	15	19	18	16	9	13	14	17	19	21	20
Oil & others	12	9	12	9	11	9	11	12	15	10	12	14	19	11	15	13	14	8	12	10
Gas	102	78	94	89	94	67	94	97	98	68	77	81	94	70	79	75	79	59	81	70
Coal	77	59	76	73	78	57	72	72	78	56	76	75	81	55	80	74	76	48	77	69
Renewables	37	52	52	42	45	59	57	44	49	66	64	49	51	70	67	52	56	73	70	56
Total	252	218	252	232	247	207	245	231	250	216	249	239	261	220	259	232	242	210	262	227

Source: By REI, from figures based on METI/ANRE "Monthly Report on Electricity Statistics"

Retrieved from https://www.renewable-ei.org/en/statistics/energy/?cat=electricity#quarterly (Accessed on 23 May 2024)

Electricity Generation Mix

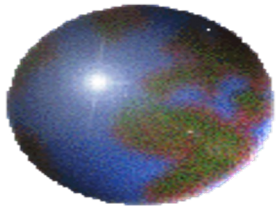


Retrieved from https://www.renewable-ei.org/en/statistics/energy/?cat=electricity#quarterly (Accessed on 23 May 2024)

Share of Renewables in Electricity Generation

Source: METI/ANRE "Total Energy Statistics"

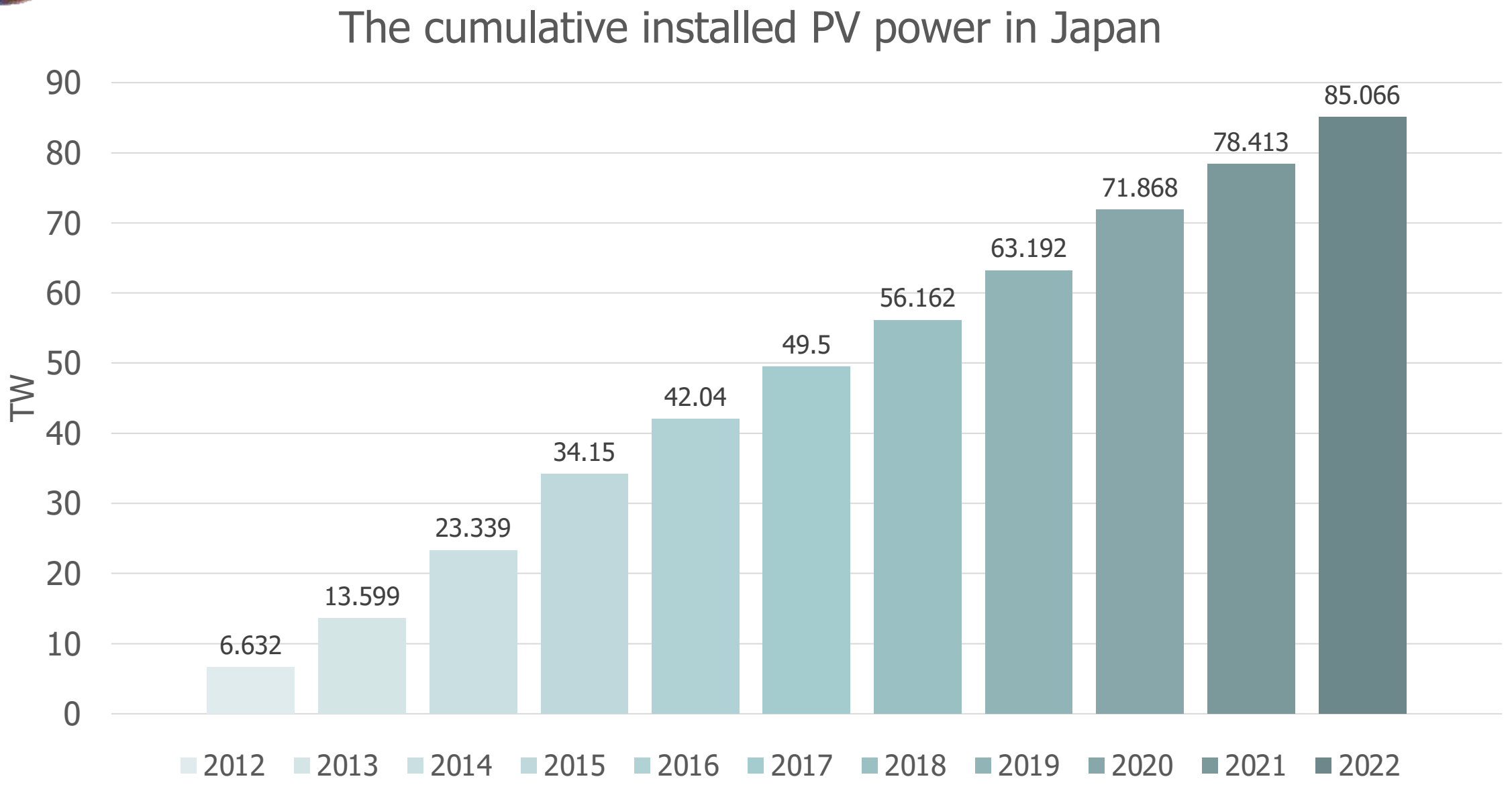
Retrieved from https://www.renewable-ei.org/en/statistics/energy/?cat=electricity#quarterly (Accessed on 23 May 2024)



RE potential: Solar and Wind

Japan's solar power

Japan's PV power capacity



Created by the author based on the date from IEA, "National Survey Report of PV Power Applications in JAPAN 2022," p. 7.

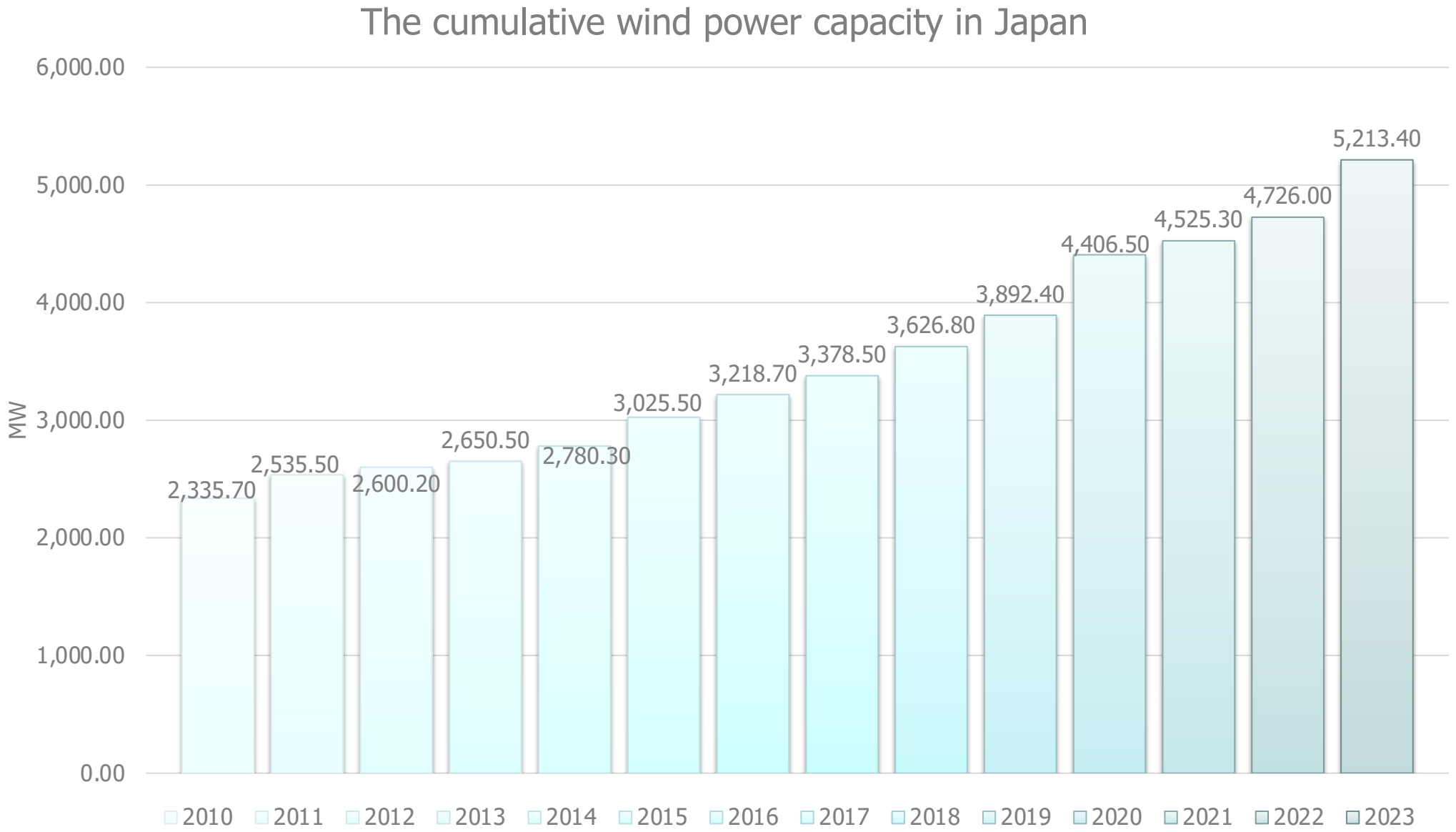
The total estimated solar power potential in Japan

- The total estimated solar power potential from buildings: public agencies, hospitals, schools, single-family houses, factories and warehouses, other buildings, and railway stations
  - Installed capacity: 455,205 MW (455 GW)
  - Total annual generation: 598,532 GWh (598.5 TWh)
- From lands: landfill/general waste sites, arable land/rice fields & fields, abandoned or overgrown farmland/reusable or un-reusable
  - Installed capacity: 1,009,836 MW (1,009.8 GW)
  - Total annual generation: 1,277,355 GWh (1,277 TWh)
- The Total:
  - The total installed capacity: 1,464.8 GW
  - The total annual generation: 1,875.5 TWh [= 2.3 times larger than the electricity consumption in 2023 (= 802 TWh)]

- Source: Ministry of the Environment, The Renewable Energy Potential System,
- https://www.renewable-energy-potential.env.go.jp/RenewableEnergy/index.html (Accessed on 24May 2024)

Japan's wind power

Japan's wind power capacity

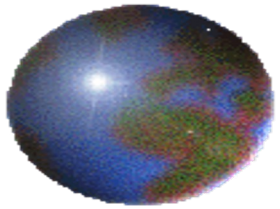


Created by the author based on the date from the Japan Wind Power Association (JWPA) , "dounyuujisseki2023graph_hp用" (https://jwpa.jp/information/8034/)

The total estimated wind power potential in Japan

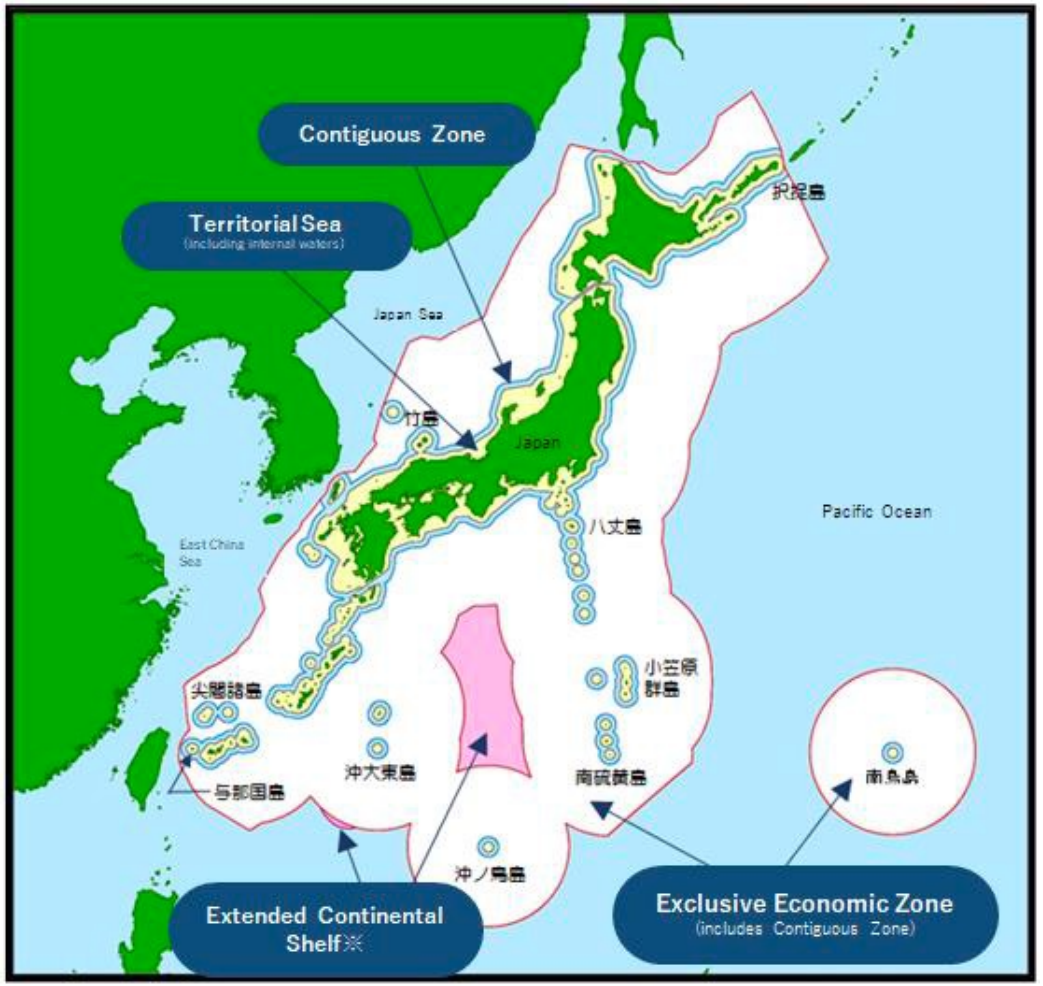
- The total estimated wind power potential on land:
  - Installed capacity: 483,733 MW
  - Total annual generation: 1, 262,473 GWh (1,262.473 TWh)
- Offshore wind power potential:
  - Seabed-mounted offshore wind power:
    - Installed capacity: 337,343 MW
    - Total annual generation: 1,009,064 GWh (1,009.064 TWh)
  - Floating offshore wind power:
    - Installed capacity: 782,882 MW
    - Total annual generation: 2,451,600 GWh (2,451.6 TWh)

- Source: Ministry of the Environment, The Renewable Energy Potential System,
- https://www.renewable-energy-potential.env.go.jp/RenewableEnergy/index.html (Accessed on 24May 2024)



Offshore wind power potential

Japan's territorial sea and EEZ



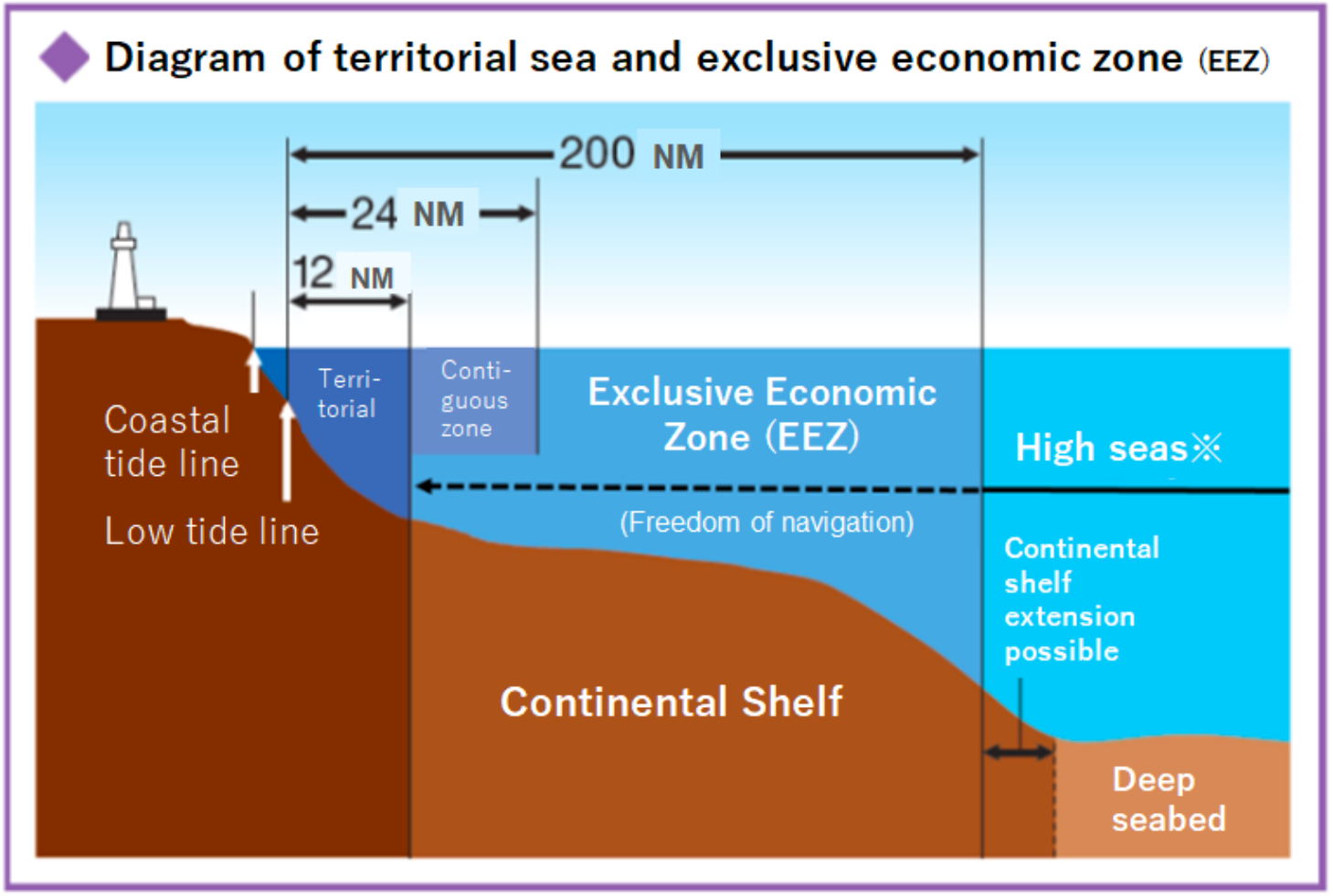


Figure: Conceptual Diagram of Japan's Territorial Sea, and Terminology Related to Territorial Sea
Source: Japan Coast Guard, Jurisdictional marine zone information

Japan's Offshore Wind Potential: Calculation Conditions and Results

自然エネルギー財団 RENEWABLE ENERGY INSTITUTE

Potential values vary depending on the assumption of the annual average wind speed, the water depth, and the sea surface area.

By water depth, the fixed-bottom type is for water depths of less than 50 m, the semi-submersible floating type is mainly used for water depths of 50m or more but less than 100 m, and various types of floating type technologies are used for water depths of 50m or more but less than 200m and 50m or more but less than 300 m.

In the case of water depths of less than 200 m or 300 m, the potential increases by about 1.4 times when the contiguous zone within EEZ is added to the area only in the territorial sea and the potential increases by about 2.0 times when the entire EEZ is added.

However, since the increase in water depth and distance from shore increases construction and installation costs, from the viewpoint of business feasibility, the following criteria were set as the basic requirements: for the fixed-bottom type, annual wind speed of 7.5 m/s or higher and territorial sea only; for the floating type, annual wind speed of 8.0m/s or higher, territorial sea plus the contiguous zone in EEZ, and water depth of 50m or higher but less than 200m.。

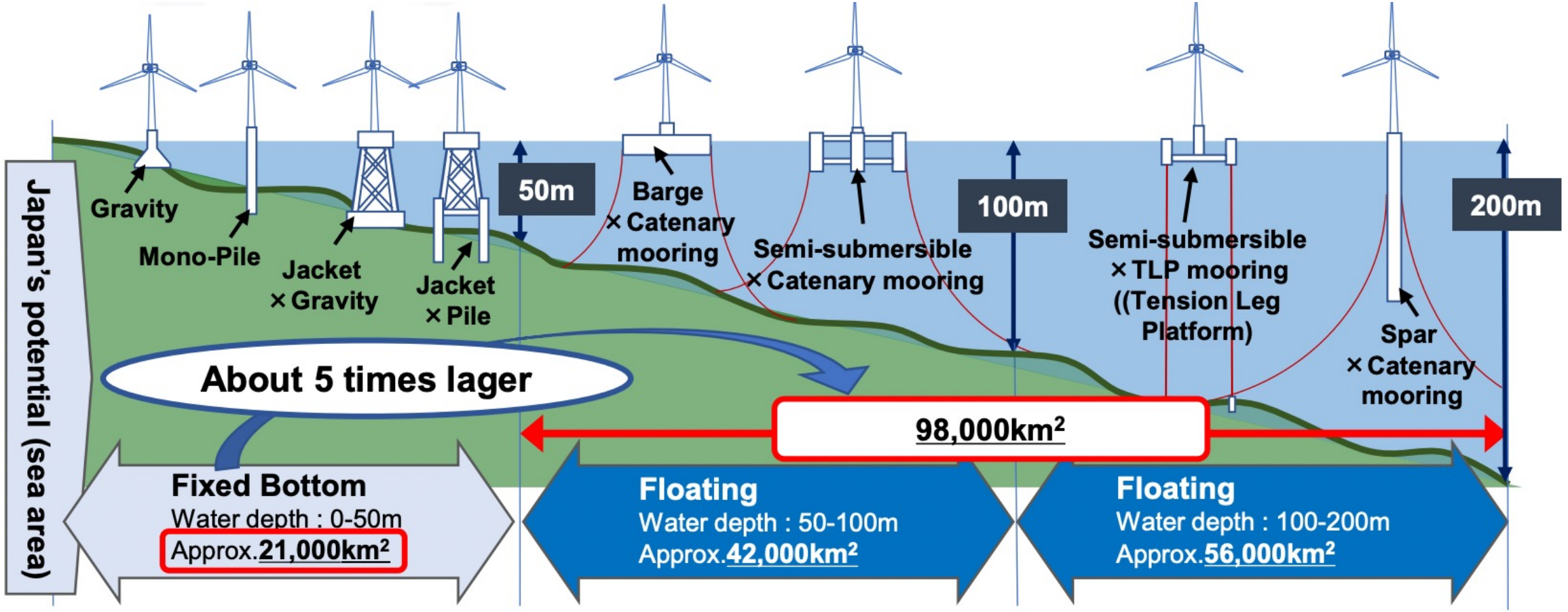
In that case, a potential of 176 GW was obtained for the fixed-bottom type and 542 GW for the floating type. Furthermore, the study also examined water depths of 50 m or more but less than 300 m, resulting in a potential of 952 GW for the territorial sea plus entire EEZ. Details are given below.

Unit：GW	Fixed-bottom Water depth：less than 50m			Floating - 1 Water depth：50m or more, less than 100m			Floating - 2 Water depth：50m or more, less than 200m			Floating -3 Water depth：50m or more, less than 300m		
	Territorial Sea	Territorial Sea + Contiguous Zone	Territorial Sea + EEZ	Territorial Sea	Territorial Sea + Contiguous Zone	Territorial Sea + EEZ	Territorial Sea	Territorial Sea + Contiguous Zone	Territorial Sea + EEZ	Territorial Sea	Territorial Sea + Contiguous Zone	Territorial Sea + EEZ
Annual average wind speed 7.5m/s or higher	176	180	180	351	377	381	747	1,066	1,281	897	1,321	1,621
Annual average wind speed 8.0m/s or higher	81	85	85	165	180	184	381	542	733	470	690	952
Annual average wind speed 8.5m/s or higher	24	26	26	50	58	61	127	178	229	160	236	300

Table 1: Offshore Wind Potential Results for Japan
Source: Created by Japan Renewable Energy Institute

Reprinted from Renewable Energy Institute, “Japan's Offshore Wind Power Potential: Territorial Sea and Exclusive Economic Zone.” November 2023, p. 4.

Offshore Wind Power Foundations Type and Potential(Area) in Japan



※1 The sea area is estimated based on the offshore distance of less than 30km, excluding social constraints, and an annual average wind speed of 7m/s or higher.
※2 The position shown in the figure for the floating type is not the applicable range or the optimal water depth.

Source: Offshore Wind Power Foundations type and Potential(Area) in Japan, NEDO (New Energy and Industrial Technology Development Organization), Nov-8-2022, https://jwpa.jp/pdf/20221108_NEDO_offshorewind_activities.pdf, p.7.

The Renewable Energy Sea Area Utilization Act

- Act on Promoting the Utilization of Sea Areas for the Development of Marine Renewable Energy Power Generation Facilities (The Renewable Energy Sea Area Utilization Act), enacted in 2018.
  - 10 promotion zones were selected, and 17 sea areas are in the preparatory stage for designation.
  - Round 1 for the total of 1.7 GW in four areas was completed in 2021; a floating wind power project is scheduled in 2026, and fixed-bottom projects in 2028-2030.
  - Round 2 for the total of 1.8 GW in four areas, three of which developers were selected in December 2023, the remaining one is expected to be selected.
  - Round 3 for the total of 1 GW in two areas.
    - Nine promising zones and eight zones at a preparation stage.

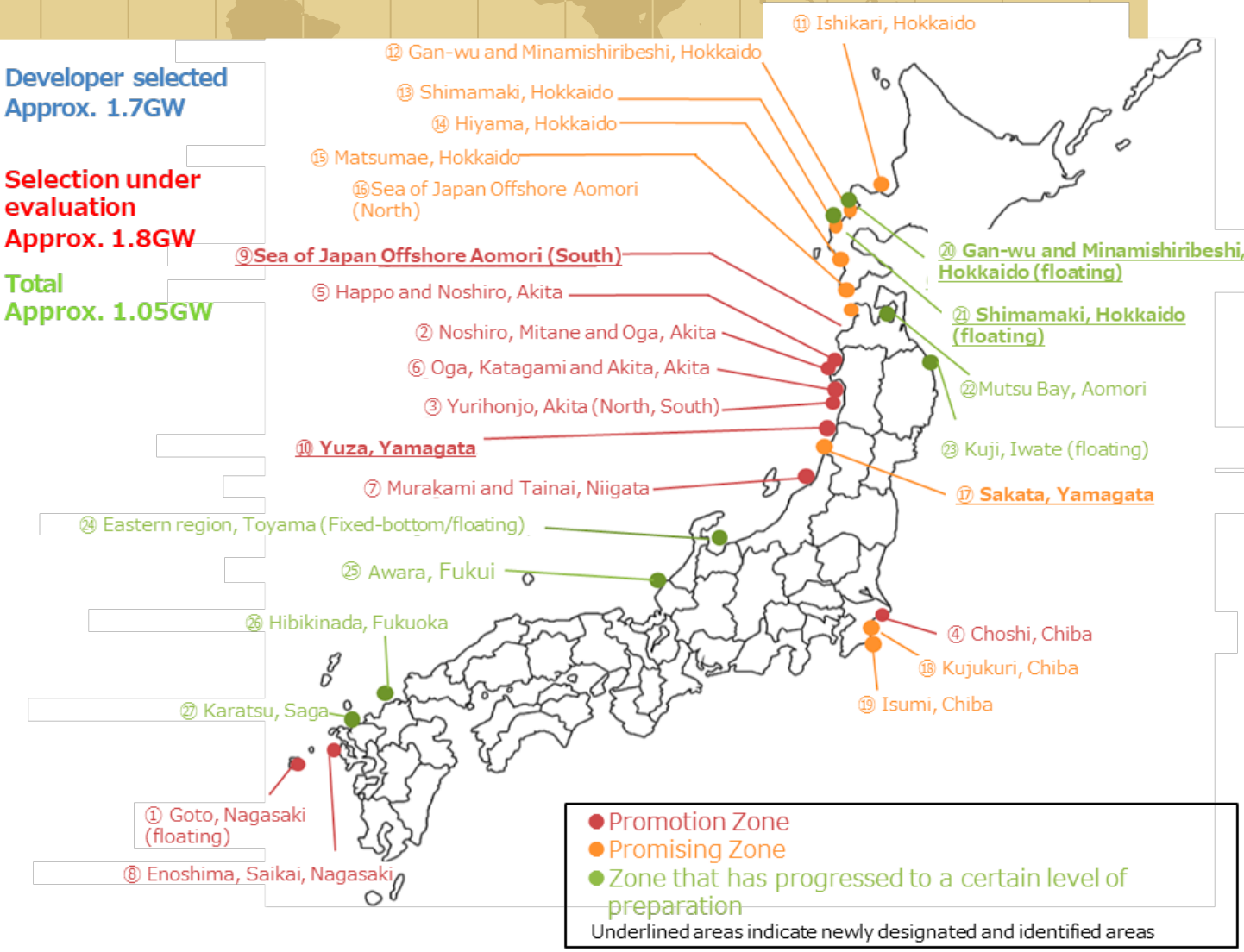
Offshore wind promotion zones, planning zones, etc.

Zones		MW
Promotion	① Goto, Nagasaki (floating)	17
	② Noshiro, Mitane and Oga, Akita	494
	③ Yurihonjo, Akita	845
	④ Choshi, Chiba	403
	⑤ Happo and Noshiro, Akita	360
	⑥ Oga, Katagami and Akita, Akita	340
	⑦ Murakami and Tainai, Niigata	350,700
	⑧ Enoshima, Saikai, Nagasaki	420
	⑨ Sea of Japan Offshore Aomori (South)	**600**
	⑩ Yuza, Yamagata	**450**
Promising	⑪ Ishikari, Hokkaido	910～1140
	⑫ Gan-wu and Minamishiribeshi, Hokkaido	560～710
	⑬ Shimamaki, Hokkaido	440～560
	⑭ Hiyama, Hokkaido	910～1140
	⑮ Matsumae, Hokkaido	250～320
	⑯ Sea of Japan Offshore Aomori (North)	300
	⑰ Sakata, Yamagata	**500**
	⑱ Kujukuri, Chiba	400
	⑲ Isumi, Chiba	410
Preparation	**⑳ Gan-wu and Minamishiribeshi, Hokkaido (floating)**	
	㉑ Shimamaki, Hokkaido (floating)	
	㉒ Mutsu Bay, Aomori	
	㉓ Kuji, Iwate (floating)	
	㉔ Eastern region, Toyama (Fixed-bottom/floating)	
	㉕ Awara, Fukui	
	㉖ Hibikinada, Fukuoka	
	㉗ Karatsu, Saga	

Developer selected
Approx. 1.7GW

Selection under evaluation
Approx. 1.8GW

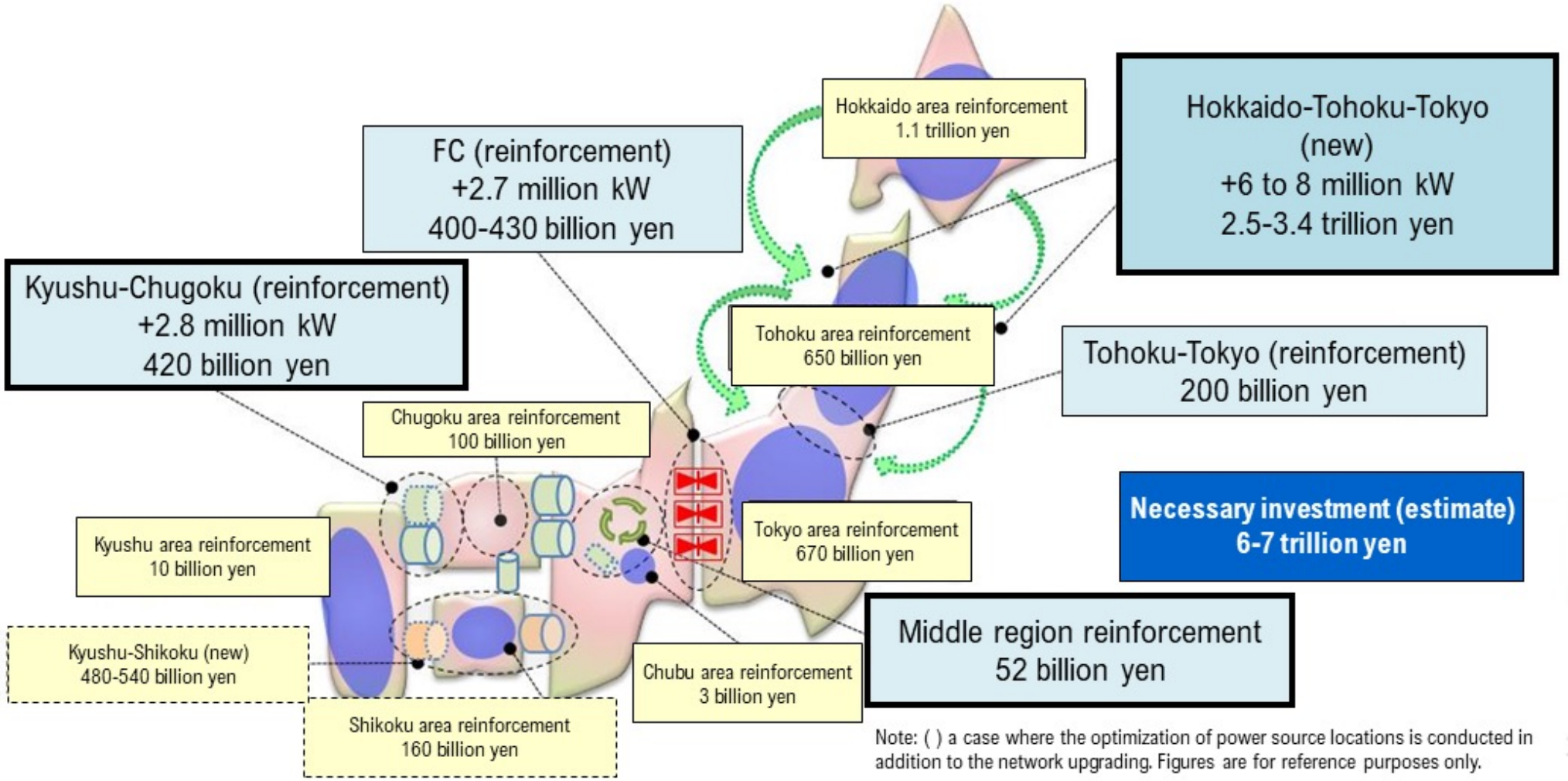
Total
Approx. 1.05GW



*Regarding the description of capacity, for projects after the developer selection, the capacity indicated is based on the selected project plan. For others, the indicated capacity is either the secured grid capacity or the estimated capacity calculated in the survey project.

- Source: Agency for Natural Resources and Energy (ANRE), "Guidelines for public tender for exclusive occupancy and use based on the Renewable Energy Sea Area Utilization Act," Procurement Price Calculation Committee (87th meeting, held on November 14, 2023) Document 1 (in Japanese). Translated into English by Renewable Energy Institute (Reprinted from REI, "Realizing a Centralized System to Accelerate Offshore Wind Development," p. 8).

Upgrading nationwide power transmission networks (long-term prospect for formulating a master plan (draft))



Source: METI, Japan's energy policy toward achieving GX (Part 1): Decarbonization will be advanced on the premise of securing a stable supply of energy (in provisional translation), 22 March 2023, https://www.enecho.meti.go.jp/en/category/special/article/detail_178.html (Accessed on 30 May 2024).

REI's proposal for accelerating wind power development: A centralized system

- The centralized system is a system in which the national government takes the initiative in setting up a framework for development.
  - Governmental responsibilities for: project development and regional cooperation, site survey, grid securing, and environmental impact assessment

A Draft Operation Policy

- In November 2023, the Draft Operation Policy for the Centralized System for Offshore Wind Power Generation was presented.
  - The draft proposal: the government's role is limited to promoting understanding and providing support to local governments. …

    e.g., Project development will continue to be a bottom-up process

  - Large-scale development is under consideration far offshore in territorial waters or in the Exclusive Economic Zones (EEZs) with a view to the eventual introduction of floating offshore wind power. It goes beyond local governments' jurisdiction.

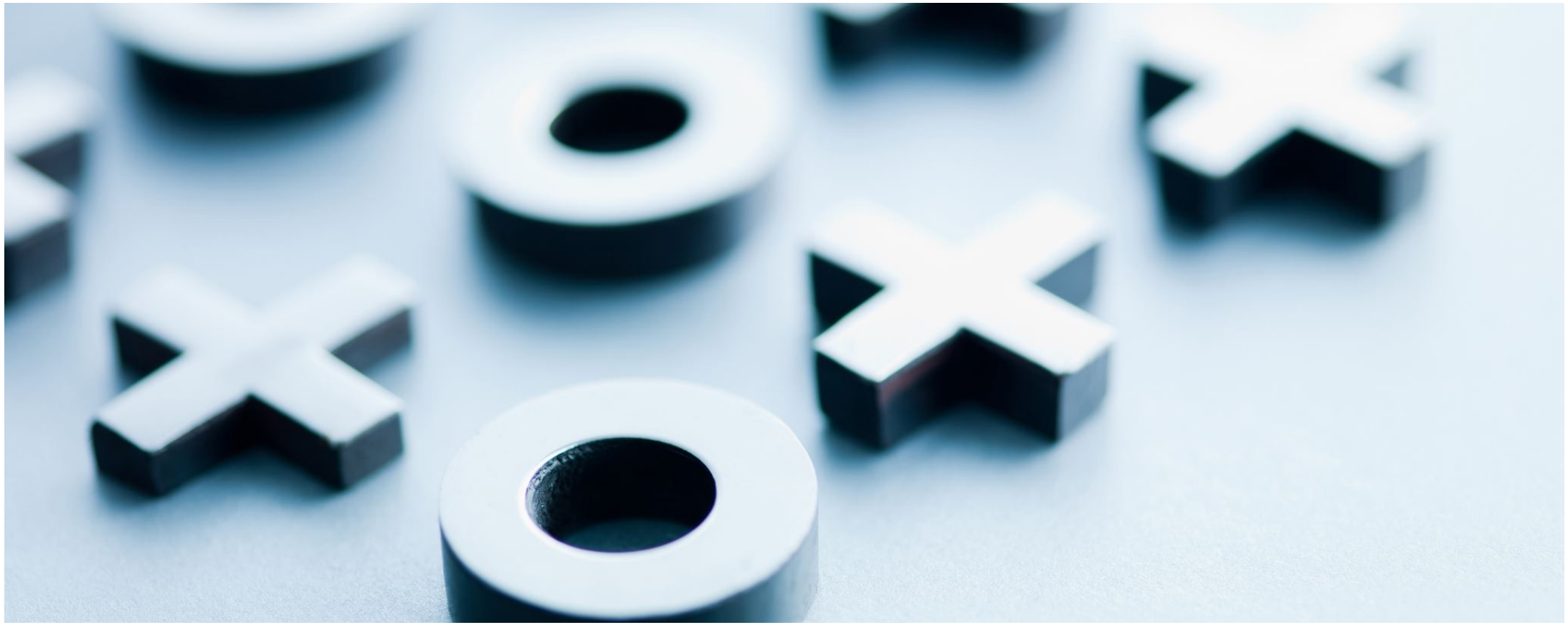
REI's key points of proposed centralized system

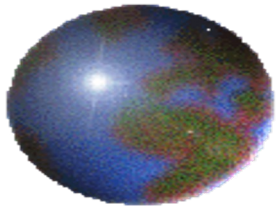
- REI's points of the centralized system to accelerate the offshore wind power in Japan:
  - In setting a long-term goal, the national government:

1) coordinates with local stakeholders and designates zones for offshore development,
2) compiles information necessary for development in advance, including wind conditions, seabed conditions, environmental impact, and infrastructure development, and
3) completes the grid connection and permitting processes before conducting public tender.

REI, "Realizing a Centralized System to Accelerate Offshore Wind Development," 28 February 2024, https://www.renewable-ei.org/en/activities/reports/20240228.php

The end of the presentation: Q&A





An Argument

Analysis of Japan's RE laggard

Context for Japan's climate and energy policy

- The context: A Techno-Institutional Complex (TIC) consisting of energy, manufacture and transport industries fueled by fossil fuels (Unruh 2000: 818).

Techno-institutional lock-in hinders the emergence of alternative technological solutions (Foster 1986; Lovins 1997; Unruh 2000)

Context for Japan's climate and energy policy-2

- "Lock-in" situations that are difficult to reverse.
- Vested interests' resistance to change driven by new industries
- Japan's "carbon lock-in" where powerful vested interests oppose ambitious climate change and energy transition.

Politics of vested interests

- A vested interest group opposes a deep and rapid climate change policy and energy transition.
  - The incumbent or the "iron triangle": The ruling party politicians, power companies, energy-intensive industries, and labor unions, Japan Business Federation (Keidanren), and METI/ANRE (Stokes 2020; Tsunekawa 2010: 115-121).

- Japan's TIC is embedded in extreme import dependent energy insecurity.
  - Historical roots of Japan's energy security focus = two oil crises in the 1970s pushing for diversification from oil through coal, nuclear and natural gas, combined with an emphasis on increased energy efficiencies.
  - With the emergence global environmental concerns in the 1980s/90s, Japanese policy-makers framed national energy strategy as 3E+S – energy security, efficiency, environment and safety (ANRE 2018).
- Energy security framing manifests as a major obstacle for alternative development pathways incorporating renewables as a key to CO_2 emissions reduction (or vice versa).

- A cross-sectoral opposition within the ruling party and the opposition party to ambitious climate change policies and rapid energy transition = "double representation of carbon polluters" (Mildenberger 2020).
  - The Federation of Electric Power Companies of Japan (close to LDP & METI)
  - The Federation of Electric Power Industry Workers Union of Japan = Democratic Party of Japan's (DPJ's) power base (DPJ split into the Constitutional Democratic Party of Japan and National Democratic Party)

- Japan's bureaucratic politics, where the economy ministry consistently exerts greater influence over climate/energy policy than the environment ministry.
  - The METI the Agency of Natural Resources and Energy (ANRE) > The Ministry of the Environment (MOE)

The Argument: Politics of vested interests with historical institutionalist perspectives

- The combination of politics of vested interest (Geels 2014; Mildenberger 2020; Moe 2010, 2012; Olson 1982; Stokes 2020; Tsunekawa 2010) with historical institutionalists' perspectives (Hacker 1998, 2002; Pierson 2000, 2004) for the analysis of Japan's national climate and energy policy.

Japan’s GX remains halfway, maintaining the nuclear target intact and relatively low RE targets.

HOW TO EXPLAIN IT? THE TENACITY OF VESTED INTEREST, INERTIA, STRUCTURAL IMPEDIMENT, OR WHAT?

Table 1. Strategic Policy Committee Deliberations

No. Meeting, Date		48th (8/4/21)	10/22/21	49th(9/28/22)	50th (9/15/22)	51st (11/15/22)	52nd (12/16/22)	2/10/23	5/12/23	53rd (6/28/23)
Chair	**Shiraishi** Takashi (Non-expert, Scholar)	○	Cabinet Decision on the Sixth Strategic Energy Plan	○	○	○	○	Cabinet: Basic Policy for Realization of Green Transformation	The Parliament passed the Bill on Power Sources for Green Transformation and Decarbonization	○
Members	**Akimoto** Keigo (Expert)	S.Q.		S.Q.	S.Q.	S.Q.	S.Q.			
	Ito Mami (Non-expert, Industry)	Neut.		Neut.	Neut.	Neut.	Neut.			Neut.
	Endo Noriko (Expert)				S.Q.	S.Q.	S.Q.			S.Q.
	Okina Yuri (Non-, Finance & Welfare)	Neut.		Neut.	Neut.	Neut.	Neut.			
	Kashiwagi Takao (Expert)	S.Q.								
	Kikkawa Takeo (Expert)	Rev. S.Q.		Rev. S.Q.	Rev. S.Q.	Rev. S.Q.	Rev. S.Q.			
	Kudo Teiko (Non-, Finance)	S.Q.		S.Q.	S.Q.	S.Q.	S.Q.			S.Q.
	Kobayashi Izumi (Non-, Business)	Neut.			**Khono** Yasuko (Non-, NGO) Neut.	**Khono**, Neut.	**Khono**, Neut.			**Khono**, Neut.
	Sakita Yuko (Non-, NGO)	S.Q.								
	Sawada Jun (Non-, Business)	S.Q.		S.Q.	S.Q.	S.Q.	S.Q.			S.Q.
	Sugimoto Tatusji (Non-, Fukui Gov.)	S.Q.		S.Q.	S.Q.	S.Q.	S.Q.			S.Q.
	Sumi Shuzo (Non-, Business)	S.Q.		S.Q.	S.Q.	S.Q.	S.Q.			S.Q.
	Takamura Yukari (Expert, Scholar)	RE		RE	RE	RE	RE			RE
	Takeda Yoko (Non-, Researcher)	Neut.		Neut.	Neut.	Neut.	Neut.			Neut.
	Tanabe Shinichi (Non-, Scholar)	Neut.		Neut.	Neut.	Neut.	Neut.			Neut.
	Terashima Jitsuro (Non-, Researcher)	S.Q.		**Teraasawa** Tatsuya (Expert, Thinktank) S.Q.	**Teraasawa,** S.Q.	**Terasawa**, S.Q.	**Terasawa**, S.Q.			**Terasawa**, S.Q.
	Toyoda Masakazu (Expert, Thinktank)	S.Q.								
	Hashimoto Eiji (Non-, Industry)	S.Q.		S.Q.	S.Q.	S.Q.	S.Q.			S.Q.
	Masuda Hiroya (Non-, Multi-roles)	S.Q.								
	Matsumura Toshihiro (Non-, Scholar)	S.Q.		S.Q.	S.Q.	S.Q.	S.Q.			S.Q.
	Mizumoto Nobuko (Non-, Industry)	S.Q.		S.Q.	S.Q.	S.Q.	S.Q.			S.Q.
	Murakami Chisato (Non-, NGO)	Neut./RE		Neut./RE	Neut./RE	Neut./RE	Neut./RE			Neut./RE
	Yamauchi Hirotaka (Non, Scholar)	Weak S.Q.		Weak S.Q.	Weak S.Q.	Weak S.Q.	Weak S.Q.			Weak S.Q.
	Yamaguchi Akira (Expert, Scholar)	S.Q.		S.Q.	S.Q.	S.Q.	S.Q.			S.Q.

Note: "S.Q." stands for status quo, Rev. S.Q., for a revisionist S.Q., "Neut." for neutral, and "RE" for renewables. On average, S.Q. is over 60%.

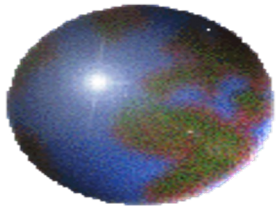
Table 2. The Kickoff for the Seventh Strategic Energy Plan:
The members of the 55th Strategic Policy Committee meeting (5 May 2024)

No. Meeting, Date		55th (5/5/24)	X Day
Chair	**Sumi** Shuzo (Non-expert, Business leader)	○	Cabinet Decision on the Seventh Strategic Energy Plan
Members	**Ito** Mami (Non-expert, Industry)	Neut.	
	Endo Noriko (Expert)	S.Q.	
	Kudo Teiko (Non-, Finance)	S.Q.	
	Kurosaki Ken (Expert: Nuclear)	S.Q.	
	Khono Yasuko (Non-, NGO)	Neut.	
	Kobori Hideki (Non-, Business leader)	Neut./RE	
	Sawada Jun (Non-, Business)	S.Q.	
	Sugimoto Tatusji (Non-, Fukui Gov.)	S.Q.	
	Takamura Yukari (Expert, Scholar)	RE	
	Takeda Yoko (Non-, Researcher)	Neut.	
	Tanabe Shinichi (Non-, Scholar)	Neut.	
	Teraasawa Tatsuya (Expert, Thinktank)	S.Q	
	Hashimoto Eiji (Non-, Industry)	S.Q.	
	Murakami Chisato (Non-, NGO)	Neut./RE	
	Yamauchi Hirotaka (Non, Scholar)	Weak S.Q.	

The total: 16

Further research

- To confirm the tentative stance of committee members on energy options (Table 1&2) through the content analysis of their statements during the committee deliberations.
- Then, it conducts a text analysis about the overall arguments for policy deliberations thru M.Q., etc.
- The analysis of Diet deliberations on the GX bill

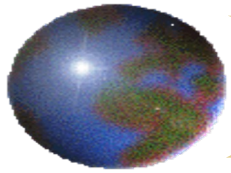


Thank you very much for your attention!

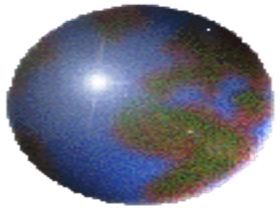
h-ohta@waseda.jp

References

- Aklin Michael and Johannes Urpelainen. 2018 *Renewables: The Politics of a Global Energy Transition*. Cambridge, MA: The MIT Press.
- Geels, Frank W. 2014. "Regime Resistance against Low-Carbon Transitions: Introducing Politics and Power into the Multi-level Perspective," *Theory, Culture & Society*, 31 (5), 21–40.
- Gourevitch, Peter A. 1978. "The Second Image Reversed: The International Sources of Domestic Politics," *International Organization* 32 (4) , 881-912.
- Keidanren. 2019. Rebuilding Japan's Electricity System – Electricity Policy to Realize Society 5.0. Accessible online: http://www.keidanren.or.jp/en/policy/2019/031_outline.pdf
- METI. 2022. On the Materialization of Policy Initiatives in Realizing GX (in Japanese), The Sub-committee for Promoting Green Transformation. 14 December. https://www.meti.go.jp/shingikai/sankoshin/sangyo_gijutsu/green_transformation/index.html (accessed 3 May 2023).
- Mildenberger, Matto. 2020. *Carbon Captured: How Business and Labor Control Climate Politics*. Cambridge, MA: The MIT Press.
- Milner, Helen V. 1997. *Interests, Institutions, and Information: Domestic Politics and International Relations*, Princeton: Princeton University Press.
- Moe, Espen. 2010. "Energy, Industry and Politics: Energy, Vested Interests, and Long-term Economic Growth and Development," *Energy*, 35 (4), 1730-40.
- Moe, Espen. 2012. "Vested Interests, Energy Efficiency and Renewables in Japan," Energy Policy 40 (C), 260-273.
- Ohta, Hiroshi. 2021. "Japan's Policy on Net Carbon Neutrality by 2050," *East Asian Policy*, 13 (1), pp. 19-32.
- Olson, Mancur. 1982. *The Rise and Decline of Nations: Economic Growth, Stagflation, and Social Rigidities*. New Haven: Yale University Press.
- Pierson, Paul. 2000. "Increasing Returns, Path Dependence, and the Study of Politics," *American Political Science Review*, 94 (2), 251-67.
- Pierson, Paul. 2004. *Politics in Time: History, Institutions, and Social Analysis*. Princeton: Princeton University Press.
- Putnam, Robert, D. 1988. "Diplomacy and Domestic Politics: The Logic of Two-Level Games," *International Organization*, 44 (3), 427-460.
- Stokes, Cardamore Leah. 2020. *Short Circuiting Policy: Interest Groups and the Battle over Clean Energy and Climate Policy in the American States*, Oxford: Oxford University Press.
- Tsunekawa, Keiichi. 2010. "Kiseikanwa-no seijikatei: Naniga kawattanoka" In Kozomondai to kiseikanwa, Baburu/defureki-no Nihonkeizai to keizaiseisaku Dai 7 kan under the supervision of the Economic and Social Research Institute of the Cabinet Office (ESRI) and edited by Jyuro Teranishi, 77-147. Tokyo: Keio University Press.
- Unruh, Gregory C. 2000. "Understanding Carbon Lock-in," *Energy Policy*, 28, 817-830.



APPENDIX I



Exemplary Cases of Japan-Australian Cooperation toward AZEC

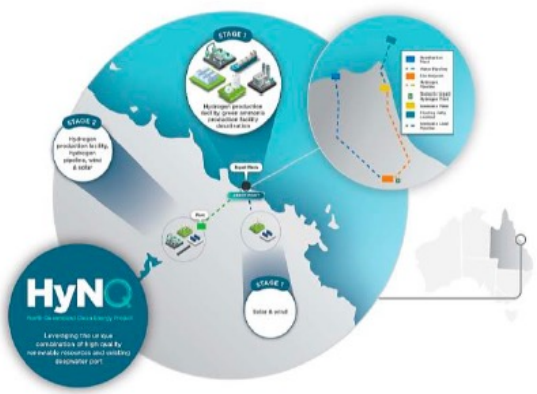
Source: ANRE, “MOUs towards AZEC leaders meeting,” December 2023.

HyNQ North Queensland Clean Energy Project: IHI to Join Japanese and Australian Green Ammonia Production and Export Joint Venture

- **Cooperation outline** : IHI's Australian subsidiary, IHI Engineering Australia Pty. Ltd., is a joint development partner in this project, which will produce and export 500,000 metric tons per year of green ammonia at the Abbot Point port in North Queensland.
- **Purpose** : To establish a stable ammonia value chain to accelerate decarbonization worldwide, as IHI will be a significant offtaker of the green ammonia produced in this project for distribution.
- **Other points** : The project is composed of highly credible partners including Energy Estate Pty Ltd, an Australian renewable energy developer, CS Energy, a Queensland government-owned power company, and Idemitsu Renewable Development Australia Pty Ltd.
- **URL** : IHI Unit to Join Japanese and Australian Green Ammonia Production and Export Joint Venture | 2023FY | News Articles | IHI Corporation

<Abbot Point port in North Queensland>

<Map and project site>



MOU with the Clean Energy Finance Corporation (CEFC) of Australia (October 2023)

- **Outline** : Building a cooperation framework in hydrogen, renewable energy and electricity grid sector with the CEFC, the governmental financial institution of Australia which provides financing toward energy transition of Australia.
- **Purpose and objective** : Aiming to accelerate participation of Japanese companies in hydrogen-related projects in Australia and development of hydrogen supply chains.
- **URL :** JBIC Signs MOU with the Clean Energy Finance Corporation of Australia | JBIC Japan Bank for International Cooperation

signing ceremony

MOU to contribute to Japanese investments towards projects on hydrogen, ammonia and CCS in the State of New South Wales, Australia

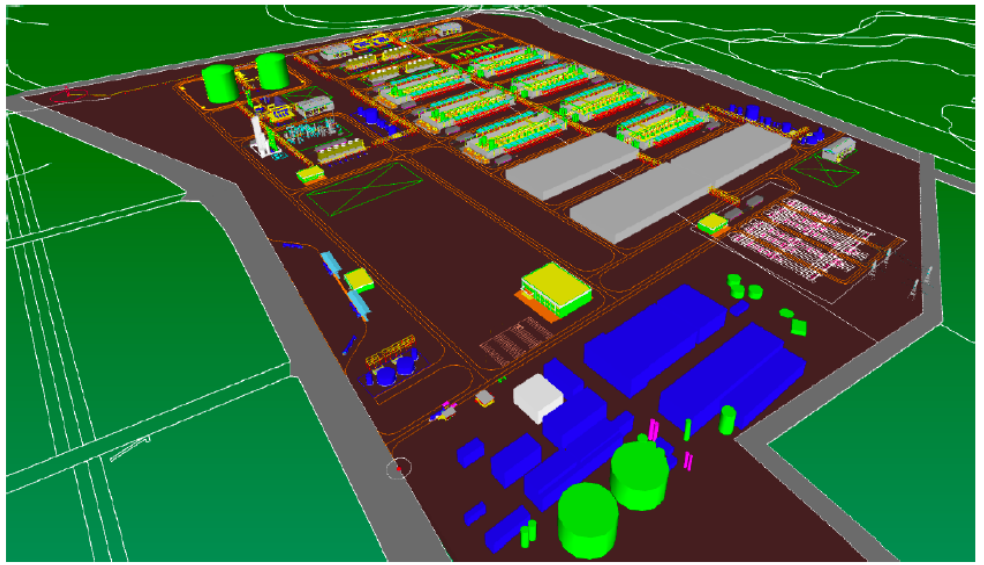
- **Cooperation outline** : JOGMEC and the NSW Government have recently renewed their Memorandum of Understanding (MOU) to add hydrogen, ammonia and CCS for an agenda for collaboration on top of coal, metals and oil/natural gas. The objective of this renewal is to contribute to the decarbonization of industries in NSW state and Japan.
- **Purpose or objectives of MOU** : The signed MOU is to promote trade and investment in NSW state by Japanese companies and to deepen the relationship between the NSW Government and JOGMEC.

JOGMEC ⟷ NSW GOVERNMENT

Cooperation to promote Japanese trade and investment in projects on conventional energy and metal adding hydrogen, ammonia, and CCS in regard to decarbonization.

MOU for Feasibility Study of Commercial-scale Hydrogen Supply in Gladstone

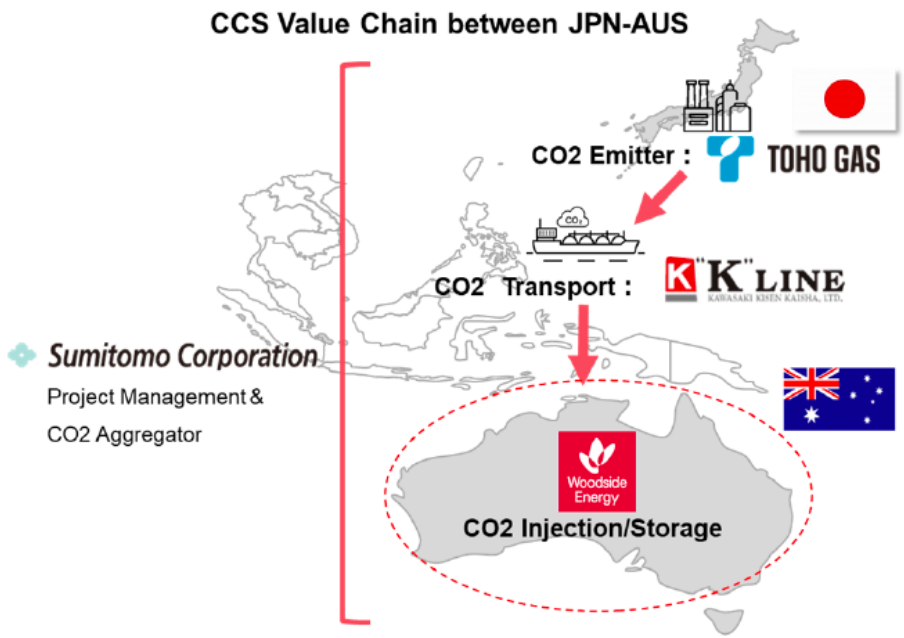
- **Cooperation outline:** Sumitomo Corporation and Rio Tinto have signed an MOU for the Feasibility Study of Commercial-scale Hydrogen Supply for alumina refining operations in Gladstone.
- **Purpose or objectives of MOU:** A pilot project to trial using hydrogen to replace natural gas in Rio Tinto's alumina refining process is underway. This MOU complements the ongoing pilot project, and Sumitomo Corporation and Rio Tinto will work together on a detailed F/S of the commercial and technical aspects of hydrogen supply to Rio Tinto refinery operations across Gladstone.

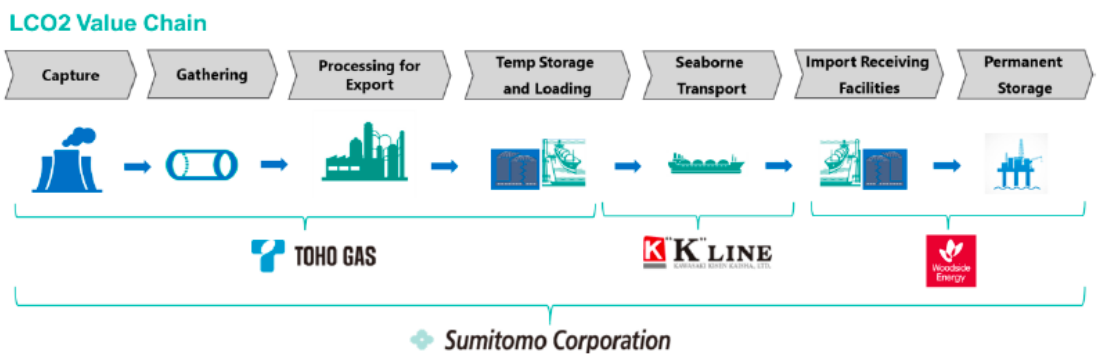


▲Image of Large-scale Hydrogen Plant

MOU for Feasibility Study to Establish a Japan-Australia CCS Value Chain

- **Cooperation Outline:** This study is to investigate the feasibility of establishing an entire CCS value chain among the four companies, whereby CO2 emissions from various industries and companies in the Chubu region, Japan, are to be captured/accumulated, and liquefied by using such technology as CO2 separation and capture using unutilized LNG Cryogenic Energy being developed by Toho Gas and transported to Australia by liquefied CO2 carriers for injection/storage at Australian storage site.
- **Purpose or Objective of MOU:** In this MOU, the four companies will identify issues in building a CCS business between Japan and Australia, and will provide recommendations for promoting the introduction of CCS. In addition, Japanese and Australian companies will jointly build a CCS business model and realize a decarbonized society throughout the Chubu region. By expanding this business model to other regions, we aim to make efforts to contribute to carbon neutrality in Japan.

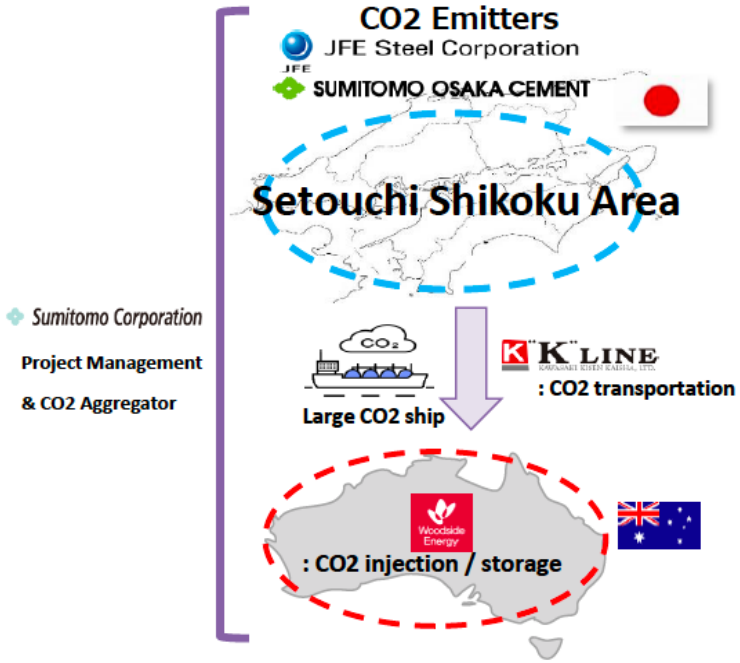


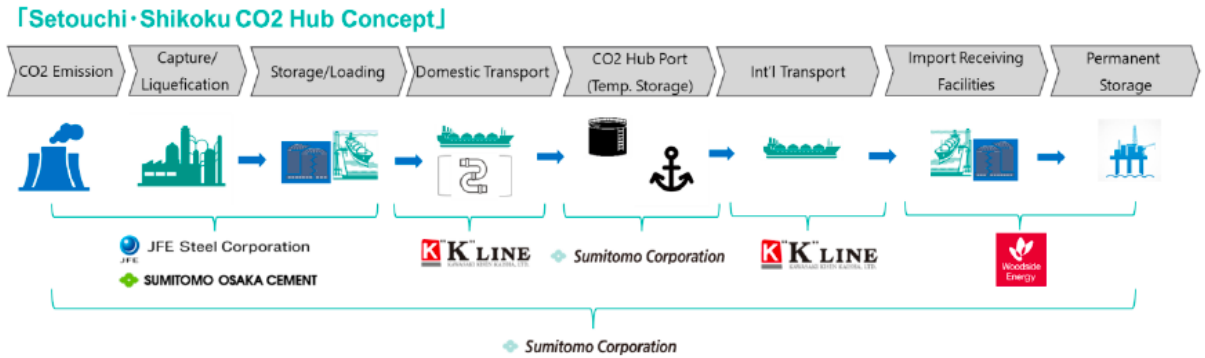


MOU for Feasibility Study to Realize "Setouchi / Shikoku CO2 Hub Concept"

JFE Steel Corporation
SUMITOMO OSAKA CEMENT
Sumitomo Corporation
K LINE
Woodside Energy

- **Cooperation Outline:** Five companies will conduct a business feasibility study to aim for building an entire Japan-Australia CCS value chains with aggregating CO2 emitters in Setouchi and Shikoku regions. CO2 is collected by a small-size vessel from emitters scattered in multiple areas in Setouchi and Shikoku regions and stored temporarily at a hub port. Such CO2 is subsequently transported to Australia by a large-size vessel and sequestrated at a storage site in Australia.
- **Purpose or Objective of MOU:** Through this MOU, we will carry out a business feasibility study for the realization of this Setouchi / Shikoku CO2 Hub concept . By collectively handling CO2 emitted from multiple regions, industries, and companies in the Setouchi and Shikoku regions, we aim to scale up and reduce costs, and work together to build a CCS value chain that would be difficult for individual companies to achieve.





Japan Beyond Coal

- 181 coal plants in Japan (as of 2020)
  - Under operation (164)
  - Under planning and construction (8)
  - Mothballed/Long-term suspension (3)
  - Pending projects (0)
  - Canceled (4)
  - Retired (2)

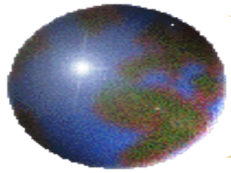
https://beyond-coal.jp/

Coal power plants as stranded assets

- Carbon Tracker's report:

"The economic viability of new and existing coal in Japan could be severely undermined by cheap renewables and, without policy reform, could result in US$71 billion of stranded assets."

- Carbon Tracker, "Land of the Rising Sun and Offshore Wind," 6 October 2019. https://www.carbontracker.org/reports/land-of-the-rising-sun/

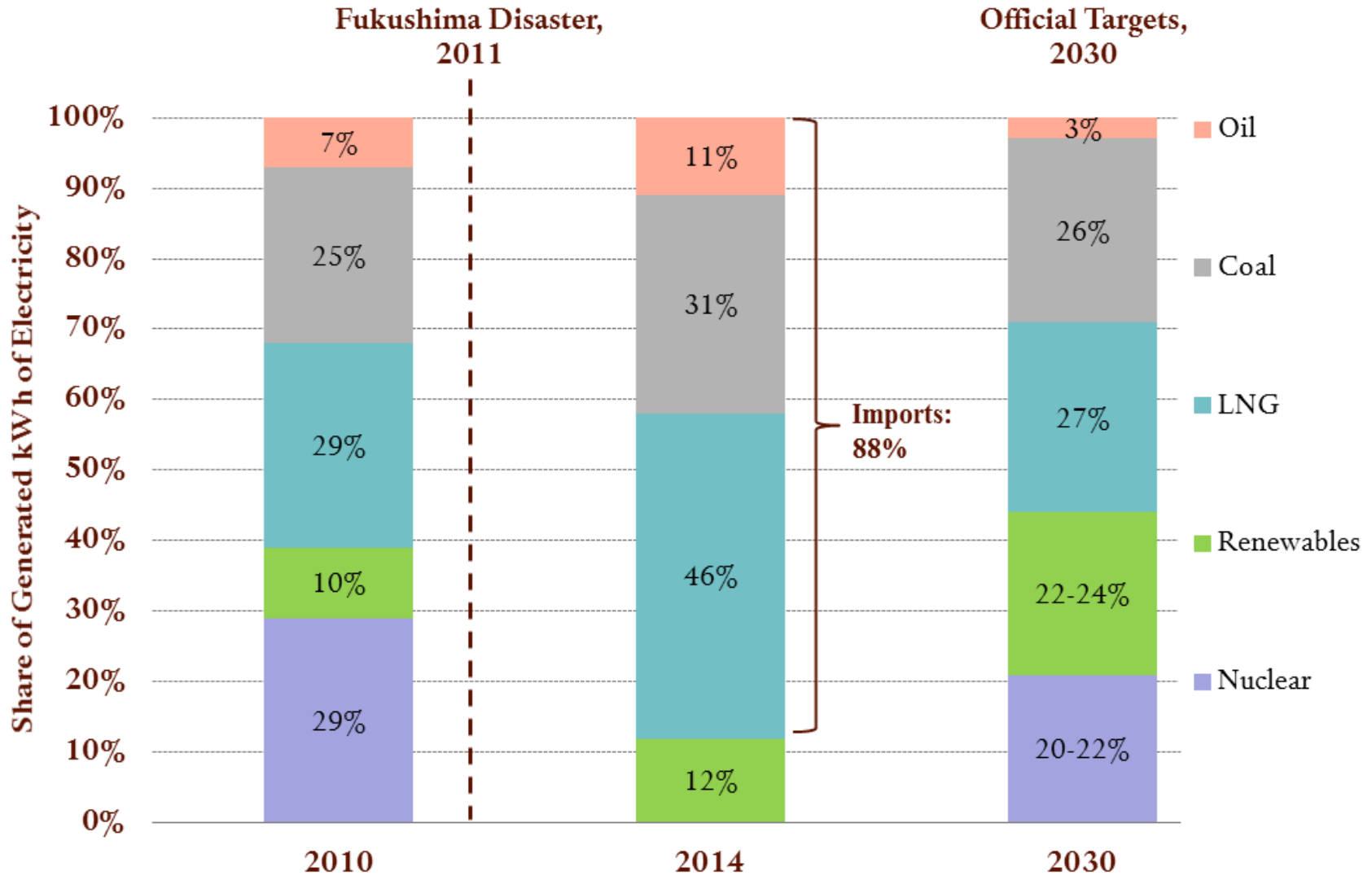


APPENDIX II

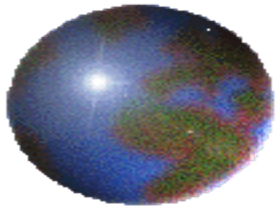
Japan's greenhouse gas (GHG) emissions reductions targets at Paris climate conference (COP21)

- Japan's mid-and long-term GHG emissions reduction targets at a 26% reduction from 2013 levels by 2030 and 80% by 2050

Figure 1: Japan's Recent Electricity Mix and Targets for 2030



Source: Institute of Energy Economics, Japan



Carbon neutrality 2050

COP26, Glasgow, Scotland, Oct-Nov 2021

Japan's new NDC is 46% (50% aspirational) reduction from 2013 levels by 2030 and net carbon neutrality by 2050.

Where did this decision come from?

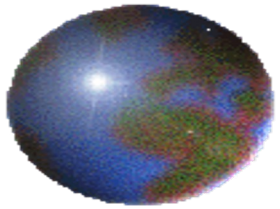
Source: UNFCCC Photo Desk UNFCCC flicker https://www.flickr.com/photos/unfccc/sets/

A puzzle

- *Why the former Prime Minister Yoshihide Suga, rather abruptly, declared Japan would seek net carbon neutrality by 2050 in his first general policy speech at the Diet on 26 October 2020.*

The images above from LDP's web site. https://www.jimin.jp/member/100464.html

- Suga appeared indifferent to climate change policy and decarbonization when serving the Abe government as chief cabinet secretary.
- He supported the export of Japanese coal-fired power plants, stating that they are energy efficient.



External Pressures?

Leaders' Summit on Climate

The White House, "Leaders Summit on Climate Summary of Proceedings," 23 April 2021. https://www.whitehouse.gov/briefing-room/statements-releases/2021/04/23/leaders-summit-on-climate-summary-of-proceedings/

- Leaders' Summit on Climate under the Major Economies Forum (MEF) on Energy and Climate hosted by US President Joe Biden on 22-23 April 2021
  - Japan's new pledge of cutting GHG emissions 46% below 2013 levels by 2030, with an aspirational target of 50% reduction
  - US pledge of a 50-52% reduction below 2005 levels in 2030 and net-zero economy by 2050
  - China's commitment to peaking out emissions by 2030 and carbon neutral by 2060
  - India's declaration of its target of 450 GW of renewable energy by 2030
  - EU: 55% below 1990 levels by 2030 and climate-neutral by 2050
  - UK: a 78% GHG reduction below 1990 levels by 2035

The interactions between int'l and domestic factors

Japanese businesses and industries pressure the government

- On 16 Sep. 2020, European Commission President Ursula von der Leyen declared to reduce GHG emissions by at least 55% by 2030.
  - The European Green Deal
- On 23 Sep 2020, CA governor issued an executive order requiring sales of all new passenger vehicles to be zero-emission by 2035.
- Global competition over the electrification of mobility, energy transition, technological breakthroughs has become intense.
- While Japanese companies press the government to promote green recovery, they began taking actions.
  - E.g., Mitsubishi Shoji and Chubu Electric Power Corporation acquired the largest Dutch power company *Eneco*

cached.imagescaler.hbpl.co.uk

Divestment movements, ESG investment, TCFD, & RE100

TCFD TASK FORCE ON CLIMATE-RELATED FINANCIAL DISCLOSURES

RE100 CLIMATE GROUP | CDP

Every corporate should now commit to 100% renewable electricity.
Join us.

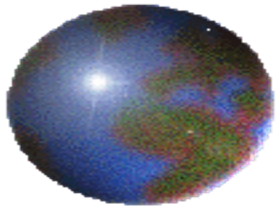
- A divestment movement and climate risk disclosure
  - 14 trillion USD worth of endowments and portfolios divested in part or whole from fossil fuel investment.
  - International coal market's divestment has occurred in Japanese industries.
  - Most of the big Japanese companies have become members of the UN Task Force on Climate-related Financial Disclosure (TCFD).
  - RE100 also influences Japanese companies' behaviors.

Why Suga Pledged to Pursue the 2050 Net Carbon Neutrality?

Can *Gaiatsu* or foreign pressures explain Suga's decision on carbon neutrality policy?

- Intangible international pressures:
  - e.g., NGOs resort to the "name and shame" tactics:
- Domestic supporters – MOE, environmental NGOs, and eco-industries – pressured the Suga administration.

Japan given 2nd "Fossil" award over no change in coal push
KYODO NEWS KYODO NEWS - Dec 12, 2019
https://english.kyodonews.net/news/2019/12/0c381e715a51-japan-given-2nd-fossil-award-over-no-change-in-coal-push.html



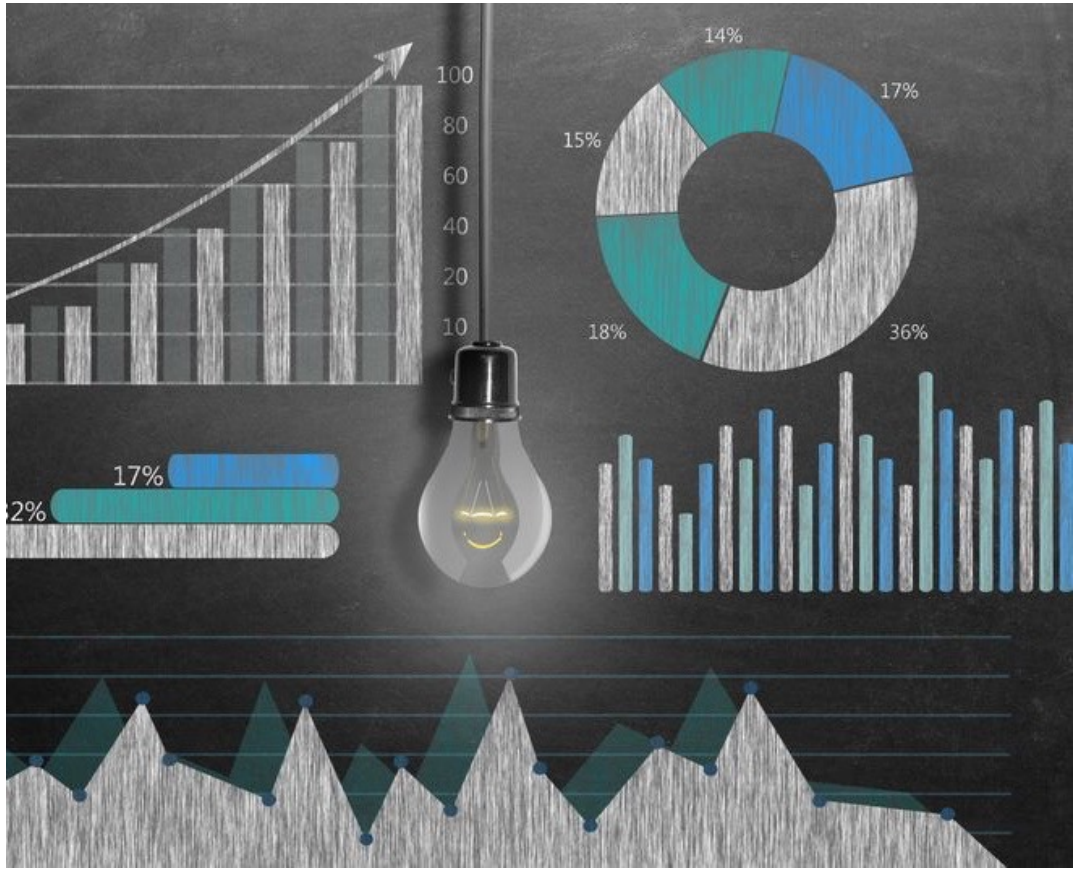
Domestic pressures?

Domestic factors:
On the timing of Suga's decision

- The interactions between various external and domestic factors or the "second image reversed" (Gourevitch 1978; Putnam 1988; Milner 1997)
  - One item of the LDP-Komeito policy agreement, signed 15 Sep. 2020, is to accelerate climate change policy.
  - Policy brokers or entrepreneurs: Taro Kono, Administrative Reform Minister and Shinjiro Koizumi, Environment Minister?
    - Hiromichi Mizuno, a special advisor to METI, co-chair of One Planet Working Group, focusing on the implementation of TCFD recommendations and etcetera.

The images above from LDP's web site.
https://www.jimin.jp/english/

- METI's "Strategic Energy Plan" of July 2018:
  - Phasing out of inefficient coal power plants;
  - Mainstreaming renewables and the challenges towards decarbonization by 2050.
- METI's policy paper in July 2019 began to mention carbon neutrality 2050



Before Suga's 2050 net carbon neutrality, it was almost an established policy direction.