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Discrepancy in Japan's Energy and Climate Policies

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Discrepancy in Japan's Energy and Climate Policies[1]

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Abstract

This paper assesses whether Japan's energy and climate policies are aligned by examining its narratives in major energy and climate policy documents announced before and after the Kyoto Protocol came into effect. The study aims to shed light on the country's recent regressive position compared to other climate and energy policy-leading countries. There is a focus on the government's attitudes and policies regarding nuclear power, renewable energy, and coal. The results show that although these policies are essentially aligned in terms of renewable energy and nuclear power, but they are inconsistent in terms of coal. The policy examination indicates that the conventional energy security and economic efficiency are dominant factors in Japan's energy policy; whereas climate change, although an important concern, does not predominate in energy planning. This implies that Japan needs to coordinate its energy and climate policies more than ever before to restore its leading position in dealing with the climate issues.

Keywords: energy policy, climate policy, nuclear power, coal, renewable energy, Japan

JEL Classification: Q48, Q58

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1. Introduction

Dealing with climate change is not a new issue, but there have been growing international concerns regarding how to manage this change. The European Union and 188 other nation states are party to the Paris Agreement (as of February 2020),[4] effective November 2016, showing a global consensus for dealing with global warming collectively. The term "climate emergency," Oxford Dictionary's 2019 word of the year, was initiated by a network of grassroots climate groups and activists in Australia; as of March 2020, a climate emergency was declared in 28 countries, covering 1,468 jurisdictions.[5] Furthermore, recent reports published by the United Nations Environment Programme (UNEP) and climate research institutes have unequivocally stated the necessity to strengthen the measures to reduce greenhouse gas (GHG) emissions and called for a quick phase out of coal-fired thermal power (Climate Analytics, 2019; UNEP, 2019). As energy production and consumption contributes the most to global warming,[6] decarbonizing the energy sector by aligning energy and climate policies in a country is essential to solve this "wicked problem" (Levin, Cashore, Bernstein, & Auld, 2012; Rittel & Webber, 1973).

Japan proved its leadership by forming the Kyoto Protocol in 1997 and achieved its commitment of 6% GHG reduction below the 1990 level during the first commitment period (2008–2012) (MOE, 2014). The introduction of a feed-in tariff (FIT) in 2012 led to the rapid growth of solar photovoltaic (PV) installations and Japan became the third largest country to have a cumulative installed capacity of solar PV (as of 2018) (ISEP, 2019). Renewable energy (RE) accounted for 16% of the total power generation in the fiscal year 2017, showing a significant increase from 9.5% in 2010 (i.e., before the Fukushima disaster) (ANRE, 2020).

Despite these efforts, international criticisms of Japan's energy and climate policies have been increasing. The United Nations rejected Prime Minister Shinzo Abe's request to make a speech at the

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[4] https://treaties.un.org/pages/ViewDetails.aspx?src=TREATY&mtdsg_no=XXVII-7-d&chapter=27&clang=_en

[5] https://climateemergencydeclaration.org/climate-emergency-declarations-cover-15-million-citizens/

https://www.cedamia.org/ced-timeline/

https://www.usatoday.com/story/news/nation/2019/11/21/climate-emergency-oxford-dictionarys-word-year/4263945002/

[6] https://www.unenvironment.org/explore-topics/energy/why-does-energy-matter

Climate Action Summit in 2019 for lack of apparent ambition[7] and the Climate Action Tracker rated Japan's efforts as "highly insufficient."[8] These examples indicate Japan's recent regressive position in global climate negotiations. To what extent is Japan's climate policy lagging to warrant such criticism?

In Japan, carbon dioxide derived from energy accounts for approximately 90% of GHGs (ANRE, 2003). Historically, low energy self-sufficiency, high energy costs, and vulnerability to international energy situations have caused Japan to emphasize energy security by seeking a stable supply and adopting economic efficiency. To address global warming concerns, Japan pursued an energy strategy of increasing the share of low-carbon nuclear power in its electricity mix. However, the Fukushima nuclear disaster in 2011 had a critical impact on Japan's energy supply and forced a reexamination of the nation's policies. The suspension of nuclear power plants led to an increasing reliance on fossil fuels and decreased energy self-sufficiency, creating a challenge for Japan's climate change policy, which warranted a shift to low-carbon energy sources. Has the Fukushima nuclear accident temporarily derailed Japan's climate policy or do we have to address deeper structural issues?

This paper sheds light on this question by investigating the degree of alignment between Japan's energy and climate policies. It analyzes the development of and narratives in relevant government documents over the past two decades. More specifically, we focus on the government's attitudes and policies toward nuclear power, RE, and coal technologies in these documents. Nuclear power and RE are low-carbon technologies, presenting an opportunity for GHG emission reduction, and coal as an energy source has the highest carbon intensity. These three energy sources have been at the center of the climate change debate. We also examine energy transition, and the arguments surrounding Japan's domestic context and global position. We provide insights into how Japan is currently trapped in a "climate inferior position."

The basic conclusion is that a lack of alignment between energy and climate policies already existed before the Fukushima nuclear accident but has been exacerbated since. Thus, the climate change factor, being insufficiently integrated into energy policies, has meant that Japan is currently

[7] https://www.japantimes.co.jp/news/2019/11/29/national/japans-promotion-coal-fired-power-plants-leads-u-n-rejecting-abes-request-address-september-climate-summit/

https://www.telegraph.co.uk/global-health/climate-and-people/australia-us-japan-banned-speaking-uns-flagship-climate-summit/

[8] https://climateactiontracker.org/countries/japan/

under criticism. Previous literature has focused on the politics of Japan's energy policy and climate policy combined (e.g., Watanabe, 2015; DeWit and Iida, 2011) or emphasized the study of climate change policy-making (e.g., Kameyama, 2017; Schreurs, 2003). Others have reviewed energy and climate policy developments in specific periods (e.g., Kuramochi, 2015). Our paper differs from these studies by providing policy analysis to shed light on why Japan is internationally criticized for its energy and climate policies.

The remaining part of this paper is organized as follows. In Section 2, we explain the methods used in this study. In Section 3, we outline the formation of Japan's energy policy, and how it became associated with climate change mitigation and necessary CO_2 reduction. In Section 4, we compare energy and climate policies. In Section 5, we present the results and discussion based on our survey and the comparison. In Section 6, we conclude with the findings and implications of this study.

2. Method

This paper examines how discrepancies were occurring in Japan's policy shifts on energy and climate change during the past two decades. To assess the degree of alignment between energy and climate policies, we draw on the conceptual policy mix framework developed by Rogge and Reichardt (2016) who break policies down into a "policy strategy" consisting of "objectives," and "principal plans." In these, specific "instruments" can be found together with the associated goals. According to four characteristics, including consistency of elements, coherence of process, credibility, and comprehensiveness, the policy mix framework assesses whether or not the policies align.

After presenting a brief summary of the historical development of energy and climate policies in Japan, we analyze the Strategic Energy Plans (SEPs)[9] and the climate strategy documents announced before and after the Kyoto Protocol as the "principal plans" in the "policy strategy" and compare the "goals" for different "instruments" (i.e., the three energy sources). The four "characteristics" are taken into account to evaluate the discrepancies between energy and climate policy plans.

Based on the Basic Act on Energy Policy, the Government of Japan (GOJ) formulated the SEPs in 2003, 2007, 2010, 2014, and 2018. During these periods, the GOJ issued several climate strategies

[9] SEP can also be translated as Basic Energy Plan. As it is translated as SEP in recent Japanese official documents, we have used this translation in this paper.

such as the Kyoto Protocol Target Achievement Plan (KPTAP) in 2005, the revised KPTAP in 2008, the Global Warming Prevention Plan (GWPP) in 2016, and the Long-term Strategy under the Paris Agreement (LSPA) in 2019. We examine shifts in narratives regarding nuclear power, RE, and coal technologies, set up in the SEPs and the climate strategy documents. In particular, we look at where the energy source stood in the energy mix, and what the policy direction was regarding the usage of the energy source. The comparison between the SEPs and the subsequent climate strategy documents is done in order to identify any discrepancies between energy policies and climate policies in Japan.

3. Energy and climate policies in Japan

3.1 The formation of energy policy

Although policies on energy and fuel were in place after World War II in Japan, no integral policy framework or organization existed that specialized in energy. In 1965, the Advisory Committee for Energy was established as a consulting unit for the minister of the Ministry of International Trade and Industry (MITI; later, the Ministry of Economy, Trade and Industry [METI]), and the "Long-term Energy Supply-demand Outlook" has been announced approximately every three years since 1967, revealing the main goals of Japan's energy policy (Fujime, 2000). Regarding nuclear power use, the fundamental guidelines and promotion measures were based on the "Nuclear Power Development and Utilization Long-term Basic Plan" formulated in 1956, subject to revision approximately every five years (ANRE, 2009).

The overall concrete framework for energy policy appeared after the oil crises that occurred in the 1970s. The Agency for Natural Resources and Energy (ANRE) was set up under MITI in 1973 to take charge of Japan's energy and natural resources policies. After World War II, the main source of Japan's energy consumption gradually shifted from coal to oil, with a peak of approximately 77% of the primary energy relying on oil before the 1973 oil crisis. This crisis had a significant impact on Japan's energy supply. In response, a stable supply of energy has been greatly accentuated in the country's energy policy planning (ANRE, 2017), which includes ensuring a stable oil supply, using oil efficiently, and diversifying energy sources (ANRE, 2018a). Research and development (R&D) into energy was also largely promoted during this period, such as the Moonlight Project that aimed to develop energy-saving technologies, and the Sunshine Project that worked on developing alternative technologies such as solar, geothermal, coal liquefaction, and hydrogen energy (ANRE,

2018a). Regarding the diversification of energy sources, LNG use was expanded and the use of nuclear power was largely facilitated under laws and related measures (i.e., *dengensanpo*) passed in 1974 (ANRE, 2009). The oil crisis placed Japan's energy policy on the path to ensuring a stable energy supply by diversifying energy sources and promoting nuclear power.

3.2 Linking energy policy with climate policy

Since the late 1980s, the climate change issue has been increasingly prominent in both international and Japanese domestic politics (Fujime, 2000). The adoption of the Kyoto Protocol in 1997 was considered an achievement for Japan in the arena of international politics (Hattori, 2018; Sawa & Kikukawa, 2004). It also brought awareness of and engagement with the global warming issue into Japan's society, industries, and NGOs (Kameyama, 2017). This international treaty was named after a city in Japan and the attention on the domestic front prompted an expectation of the adoption of related policies (Sawa & Kikukawa, 2004; Watanabe, 2015). However, the result of this protocol was considered unfairly onerous for Japan, which later affected the nation's guiding principle in international negotiations regarding climate change, in terms of seeking global participation to take action (Hattori, 2018).

After the Kyoto Protocol was adopted, the Global Warming Prevention Headquarters was established under the Cabinet in December 1997. Guidelines of Measures to Prevent Global Warming[10] and the Law Concerning the Promotion of Measures to Cope with Global Warming[11] were passed in 1998, before the Diet officially approved the protocol in June 2002. Concrete policies and measures regarding climate change involved coordination mainly between MITI (METI) and the Environmental Agency (EA) (later, the Ministry of Environment [MOE]). Thus, Japan's energy policy became linked to its climate policy.

3.3 Strategic Energy Plan

As already mentioned, Japan's energy policy mainly relied on the Long-term Energy Supply-demand

[10] Revised in March 2002.

[11] Revised in 2002, 2005, 2006, 2008, 2013, and 2016.

Outlook and the Nuclear Power Development and Utilization Long-term Basic Plan to constitute its policy framework, and an integral overall fundamental legal guideline was therefore needed. Considering this, the Basic Act on Energy Policy[12] was passed in 2002 to lay down a fundamental policy to "promote measures on energy supply and demand on a long-term, comprehensive and systematic basis" (Article 1). Three fundamental principles for energy policy were identified: securing a stable supply, environmental suitability, and utilization of market mechanisms (Articles 2–4). According to this Act, the GOJ should formulate a primary plan on energy supply and demand, i.e., SEP, and review it at least once every three years (Article 12). The first SEP was accordingly announced in 2003, and to date, it has been revised in 2007, 2010, 2014, and 2018. Regarding the principle of environmental suitability, the realization of energy supply and demand is required to meet the goal of preventing global warming and protecting the local environment. This formally indicates the importance of climate change in Japan's energy policy and the involvement and reflection of energy policy in the forthcoming climate policies.

3.4 Targets of Japan's GHG emission reduction

Japan's Prime Minister and the Cabinet are the main coordinators of climate policy. The change in prime ministers has led to fragmented and incoherent climate policies (Iguchi & Koga, 2015). This is reflected in the different strategies and goals adopted under different cabinets, as shown in Table 1. Japan's main commitments on CO_2 reduction were the 6% reduction goal (below the 1990 level) for the first commitment period (2008–2012) of the Kyoto Protocol and the recently submitted Intended Nationally Determined Contributions (INDC) of 26% reduction against the 2013 level (equivalent to 18% reduction against the 1990 level) by 2030 FY based on the Paris Agreement.

Bureaucrats in the ministries and governmental agencies, such as the MOE, the Ministry of the Economy, Trade and Industry (METI), and the Ministry of Foreign Affairs (MOFA) (Iguchi & Koga, 2015), are central to decision-making. Politicians involved and related interest groups such as the Federation of Economic Organization (*Keidanren*) are also engaged in the policy-formation process. The different opinions among ministries, such as the METI and MOE, have resulted in policies and law-making that present coordinated results (Iguchi & Koga, 2015; Nikkei, 2015; Watanabe, 2015).

[12] The full transcript of this Act can be retrieved from https://elaws.e-gov.go.jp/search/elawsSearch/elaws_search/lsg0500/detail?lawId=414AC1000000071

Table 1 Japan's targets in GHG emission reduction during different cabinets

Prime Minister	Term	Goal of Emission Reduction
[LDP] Hashimoto	January 1996 to July 1998	Kyoto Protocol: 6% reduction below the 1990 level during the first commitment period (2008–2012)
…	…	…
Abe (1st)	September 2006 to 2007	"Cool Earth 50": reduce half of the global GHG emissions by 2050
Fukuda	September 2007 to 2008	"Fukuda vision": to peak GHG emissions within 1–2 years; reduce 60% to 80% of GHG emissions by 2050 from now
Aso	September 2008 to 2009	15% reduction by 2020 compared to 2005
[DPJ] Hatoyama	September 2009 to June 2010	Reduction target of 25% against 1990 level by 2020, with the premise of all major economies participating in an effective international framework [COP15]
Kan	June 2010 to September 2011	(2011.3 Fukushima accident) Review and reevaluate Japan's energy policy → Reduce dependence on nuclear energy
Noda	September 2011 to December 2012	-- (July 2012 FIT introduced)
[LDP] Abe (2nd)	December 2012 to 2014	--

Abe (3rd)	December 2014 to November 2017	[Paris Agreement] INDC: Reduction target of 26% against 2013 level by 2030 FY (25.4% against 2005 level)
Abe (4th)	November 2017 to date	--

LDP: Liberal Democratic Party; DPJ: Democratic Party of Japan.

Sources: summarized mainly from Iguchi and Koga (2015), and others.

4. Comparison of Japan's energy and climate policies

4.1 The first SEP

The first SEP was formulated in October 2003 when Prime Minister Junichiro Koizumi held office (ANRE, 2003). The fundamental principles follow those proclaimed in the Basic Act on Energy Policy: securing a stable supply, environmental suitability, and utilization of market mechanisms (usually referred to as the "3Es," namely energy security, environment, and economic efficiency). Regarding environmental suitability, global warming countermeasures are emphasized, according to the Guidelines of Measures to Prevent Global Warming to promote the measures related to energy in tackling climate change. Nuclear power is positioned as a baseload power supply source (ベース電源) and is promoted as an excellent baseload power source in terms of global warming countermeasures (地球温暖化対策の面で優れた基幹電源).[13] RE[14] is considered the energy source that can best contribute to energy self-sufficiency and global warming countermeasures. However, because of its technical constraints and high cost, RE is positioned as a complementary energy source (補完的なエネルギー). The development, introduction, and use of nuclear power and RE are to be promoted steadily (着実に推進), including efforts to lower associated costs. Coal has the advantages

[13] In Japanese, ベース電源, 基幹電源, ベースロード電源 all refer to the concept of "baseload power" in English, and hence, in this paper we use "baseload power," instead of the term's literal translation, as this term is mentioned in policies.

[14] Renewables are categorized and known as "alternative energies" (literally meaning "new energies" in Japanese) in the first SEP.

of a stable supply and economic efficiency and, hence, will continue to be considered as an important energy source (今後も重要なエネルギー). Efforts will be made to develop and diffuse clean coal technology. It is argued that because Japan owns the most advanced coal technology, it has to provide clean coal technology to developing countries in Asia and further afield, which can contribute to solving global environmental problems and ensuring a stable supply for itself, and therefore should be promoted.

After the Kyoto Protocol entered into force in February 2005, the KPTAP was passed in April of the same year. Nuclear power and RE introduction should be promoted steadily (着実に進める) as an approach to reducing the per unit CO_2 emission in the energy supply. Nuclear power is taken as a baseload power source, and the public and private sectors should cooperate to promote it steadily (基幹電源として官民相協力して着実に推進). The introduction of RE should be promoted because of its positive contributions to global warming countermeasures and improvements in Japan's energy self-sufficiency. Regarding coal, replacement of aging coal-fired power generation with natural gas was promoted.

The measures to promote nuclear power and RE are identical (i.e., steady promotion) in both energy policy (SEP) and climate policy (KPTAP). Nevertheless, in regard to international cooperation and technological contributions, this does not indicate concrete technology options in climate policy, whereas a proactive attitude toward exporting coal overseas is indicated in energy policy. The energy policy mentioned the significance of coal technology, whereas this was not reflected in the climate policy.

4.2 The second SEP

The first review and revision of the SEP (the 2nd SEP) was announced in March 2007 under the office of Prime Minister Shinzo Abe during his first tenure (ANRE, 2007). Regarding nuclear power, the 2nd SEP was built on the Framework for Nuclear Energy Policy and the Nuclear Power Nation Project, passed in 2005 and 2006, respectively, aiming to provide ≥30–40% of the electricity generation from nuclear power. Considering these policies and the contribution to global warming countermeasures, the 2nd SEP named nuclear power as a baseload power supply source (基幹電源). It stressed that nuclear power should be actively promoted (積極的に推進), including the international expansion of the nuclear industry (overseas exports). The 2nd SEP also mentioned efforts to encourage international

consideration of the inclusion of nuclear power in the Clean Development Mechanism (CDM) scheme. On the contrary, RE, as a complementary power source (補完的なエネルギー), is to be pursued by steadily expanding its introduction (着実な導入拡大). The policy claims that RE must not only rely on the government's support for its market expansion. To fulfill this, the government should present a long-term outlook on RE expansion through agreeing goals of installation in RPS law[15] and KPTAP, etc. Regarding coal, the policy claims that it will continue to be an essential energy (今後とも不可欠なエネルギー) because of its stable supply, economic efficiency, and stable power generation. In addition, the development and diffusion of clean coal technology should be promoted more than ever before (従来にも増して推進). "Clean," in this case, refers to the integrated gasification combined cycle (IGCC), the integrated coal gasification fuel cell combined cycle (IGFC), and carbon dioxide capture and storage (CCS) to reduce emissions from coal-fired power generation. The 2nd SEP sought to diffuse clean coal technology in developing Asian countries with a rapidly increasing demand for coal.

As the first commitment period of the Kyoto Protocol (2008–2012) began, the KPTAP was revised completely in March 2008. Nuclear power was defined as being in a vital position (極めて重要な位置を占める) in terms of global warming countermeasures. As the only baseload power source among the clean energies in the current stage (基幹電源となり得る唯一のクリーンなエネルギー源), both public and private sectors should cooperate to promote it steadily (着実に推進). RE introduction should also be promoted steadily (着実に進める) with firm enforcement of RPS law to support these measures. A comprehensive discussion on the fundamental enhancement of RE policies should be conducted to promote RE introduction more reliably and cost-effectively. Regarding coal use, high-efficiency thermal power generation should be supported, including subsidies for replacing aging coal-fired power generation facilities with natural gas.

From the 1st to the 2nd SEP, Japan's energy policy evolved to become more active in promoting nuclear power. The 2nd SEP also indicated a more concrete measure regarding RE promotion. A comparison between the 2nd SEP and the revised KPTAP demonstrated that both policies stressed the requirement for concrete measures and goals for promoting RE and called for the inclusion of nuclear power into the CDM scheme. However, the 2nd SEP sought to promote nuclear power actively, whereas the climate policy still maintains a "steady promotion" attitude, although the Nuclear Power

[15] The official name of this law is the "Act on Special Measures Concerning New Energy Use by Operators of Electric Utilities."

Nation Project is also mentioned in the climate policy. Furthermore, as regards coal, the climate policy emphasizes the phasing out of aging coal-fired power generation with natural gas and supports the development of CCS and high-efficiency coal-fired power generation from a medium and long-term perspective, whereas the 2nd SEP positioned coal as an essential energy and adopted a proactive attitude toward developing clean coal technology.

4.3 The third SEP

Despite being a democracy, Japan has little experience in alternating parties in power. The LDP was in power from 1955 to 2009 (except for 11 months from 1993 to 1994). Subsequently, a call for change brought a different party, the Democratic Party of Japan (DPJ), into power in September 2009. The DPJ was actively involved in climate change policy (Kameyama, 2017; Park, Chen, & Lee, 2014). A goal of 25% reduction in GHG by 2020 was soon announced by Prime Minister Hatoyama. The ruling DPJ planned to use FIT, carbon tax, and cap and trading as their three policy measures, which constitute the global warming countermeasure basic bill, to achieve the goal of CO_2 reduction (Watanabe, 2015). However, the bill failed to pass in the Diet during Prime Minister Hatoyama's term in office.[16] The DPJ considered actively promoting and introducing nuclear power and RE to reduce CO_2. Under such circumstances, energy policy was further required to respond to climate policy. In addition, the 2008 Global Financial Crisis caused many governments to take the market and job opportunities in the environment and energy fields to revitalize economies, with the aim of triggering economic growth. This also led to Japan placing "Being an Environment and Energy Nation" in its new growth strategy in December 2009 (ANRE, 2010).

Thus, the 3rd SEP, announced in June 2010 (ANRE, 2010), presented a comprehensive adjustment of policy systems and contents. It announced that energy policy should be integrally promoted with an economic growth strategy and stated that it would maintain a close tie between energy policy and global warming countermeasures in Japan, which necessitated consistent efforts. The approach to managing both global warming and economic growth is to promote the development and diffusion of energy-saving and low-carbon technologies in Japan and their expansion internationally.

[16] Nevertheless, the FIT was introduced in July 2012, and the carbon tax (Tax for Climate Change Mitigation) was introduced in October 2012, though only a little tax was steadily imposed on fossil fuels.

Nuclear power and RE are thus pursued to maximize their deployment (最大限の導入を図る), with a goal of around 50% and 70% of nuclear power and RE in total power generation by 2020 and 2030, respectively. The 3rd SEP considers nuclear power as a baseload energy (基幹エネルギー) and pursues its active use and expansion (積極的な利用拡大を図る). The SEP has a goal of no less than 14 nuclear reactors to be newly constructed by 2030 and the export of nuclear power plants under public and private cooperation. Regarding RE, active use and the expansion of renewables is pursued (積極的な利用拡大を図る), with a goal of 10% in total primary energy supply by 2020. The FIT scheme is to be interpreted as a policy tool to facilitate RE diffusion. Regarding coal, it aims to increase the efficiency of thermal power generation by introducing and replacing with the latest equipment. It states that Japan should maintain its competitiveness and continue developing CCS, the IGCC, and Advanced-Ultra Super Critical Steam Condition (A-USC) technologies under public and private cooperation and promote high-efficiency coal-fired thermal power overseas.

The change in party and the global trend of green growth brought about a shift in energy policy goals. The aim became to integrate energy policy and climate policy more than ever. The approach was to actively promote non-fossil fuels, such as nuclear power and RE, by setting a bold goal of their share in power generation. The idea of business and economic rationality is strongly promoted in energy policy regarding not only its domestic promotion but also toward an overseas expansion of energy technologies. The manufacturing of energy technologies to support economic growth is planned to be triggered by the diffusion of energy technology, both domestically and abroad. In this process, public and private cooperation is promoted in which the GOJ plays a proactive role. Thus, RE and nuclear power are promoted more actively than previously. Regarding measures to promote RE, the GOJ considers shifting from RSP to FIT.

4.4 The fourth SEP

The Fukushima Daiichi Nuclear Disaster that resulted from the Great East Japan Earthquake in March 2011 caused Japan to reconsider its energy policy (Ueta, 2014). The nuclear disaster broke the “safety myth of the nuclear power plant” and forced the DPJ to change its plan of largely using nuclear power to reduce GHG. Prime Minister Kan stated that the government’s SEP should be re-examined from the start. The ruling DPJ set up the Energy and Environment Council under the National Policy Unit to formulate the Strategy for Innovative Energy and Environment by integrating the SEP, the Framework for Nuclear Energy Policy, and global warming countermeasures (Ueta, 2014). This

strategy states the phase out of nuclear power in the 2030s, but it was neither passed as the official policy goal in the cabinet meeting nor legalized because of opposition from the industry, concerns from the United States, and also because of the divided Diet (Kyodo, 2013; Nikkei, 2012).

The LDP returned to power in December 2012 and Prime Minister Abe soon announced a revision of the previous administration's energy and environmental strategy "on a zero basis," revealing the intention to relinquish the goal of phasing out nuclear power in the 2030s. Because of the Fukushima disaster, the government's attitude and policy toward nuclear power had become the focus of energy policy. Under such circumstances, the 4th SEP was announced in April 2014 (ANRE, 2014). Safety is thus emphasized, in addition to the 3Es, to constitute the four fundamental principles of SEP: 3Es plus S.

In the 4th SEP, nuclear power has been positioned as an important baseload power supply source (重要なベースロード電源). Prioritizing safety, the restart of nuclear power plants is promoted (原子力発電所の再稼働を進める) and nuclear power should be reduced as much as possible (可能な限り低減させる) by introducing energy-saving and RE and improving the efficiency of thermal power plants and others. Nuclear power policy is pursued, in terms of its rebuilding, on the basis of reflecting on the Fukushima nuclear disaster. RE has been defined as an important low-carbon domestic energy source whose introduction has to be accelerated (導入を最大限加速) in approximately three years from 2013. It aims to introduce RE to a level that is higher than those planned in previous SEPs, which means a goal of >13.5% by 2020 and 20% by 2030. FIT is stated as being indispensable, and there is a need to consider the economic burden on citizens. The goal of making RE independent from subsidy in the mid- and long-term are also emphasized. Coal is positioned as an important baseload power supply source (重要なベースロード電源). The tone maintains the line of replacing aging sources with high-efficiency coal-fired thermal technology and developing technologies such as the IGCC, while also promoting its exports to emerging and developing countries that depend largely on thermal power generation. The technology development plan aims to develop and commercialize high-efficiency coal-fired thermal technology such as the IGCC and to commercialize CCS in approximately 2020.

Due to the pressure to announce a GHG reduction target ahead of the climate summit in Paris at the end of 2015 (COP 21), the GOJ announced a long-term Energy Supply-Demand Outlook in July 2015. It set the basis for Japan's GHG reduction target. The outlook specified the principles: to improve the energy self-sufficiency rate to a level higher than that before the Great East Japan Earthquake (approximately 25%); to reduce electricity costs to lower than the current level; and to

set the GHG reduction targets comparable to those in Europe and the United States. The vision for the energy mix (the composition of power generation) in 2030 is 22–24% from RE, 20–22% from nuclear power, and 56% from fossil fuels (Figure 1). Thus, this outlook clearly states that Japan will return to including nuclear power as one of the main measures to reduce CO_2, which is set lower than it was before the Fukushima accident and lower than RE at only 2%. Soon after the outlook was announced, Japan submitted its INDC draft to the UN, which specified a reduction target of 26% against the 2013 level by FY 2030 (25.4% against the 2005 level), which is equivalent to an 18% reduction against the 1990 level.

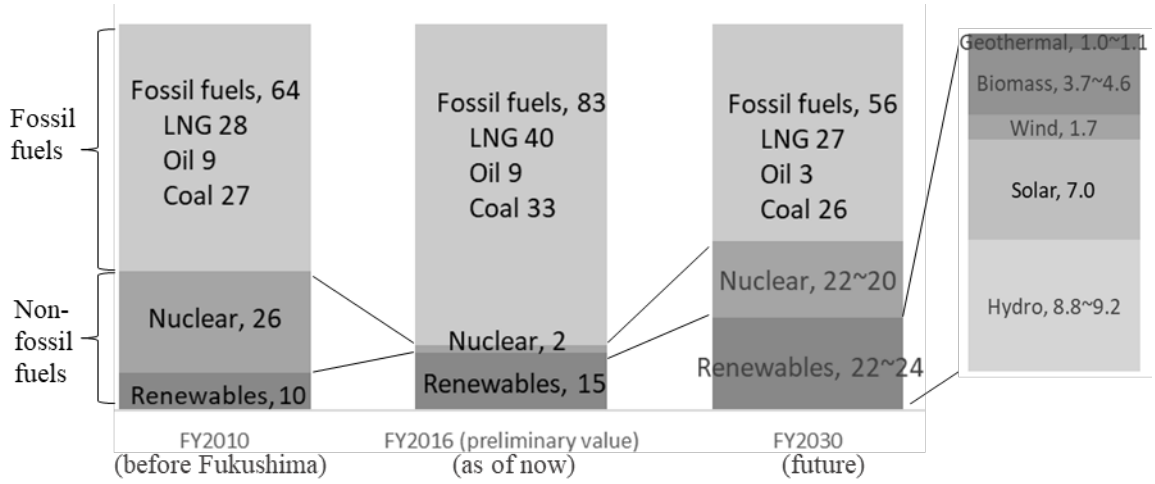

Figure 1 Outlook for the composition of power generation in 2030

(Unit: %) (Source: redone by the authors based on ANRE (2018c))

Japan formulated the GWPP in May 2016 as a comprehensive plan for global warming, responding to Japan's INDC and the Paris Agreement adopted in COP 21. The GWPP further set the long-term GHG reduction goal to 80% by 2050. Nuclear power is considered as a low-carbon baseload power supply source and needs to be used with confirmed safety. As RE is formulated to expand its introduction to the maximum (最大限の導入拡大) while realizing a reduction in the public burden (i.e., FIT, energy cost), an appropriate operation and review of the FIT scheme is necessary. Regarding coal, improvements in the efficiency of thermal power generation are emphasized, which includes introducing state-of-the-art thermal power generation technology and promoting CCS

according to SEP in terms of policy measures.

The 4th SEP announced after the Fukushima nuclear disaster is largely adjusted from the previous SEPs. However, although the GOJ stated a restructuring of its nuclear power policy, it reverted to choosing nuclear power as an indispensable source of energy, positioning it as an important baseload energy source. Nonetheless, this is also the first time Japan indicated reducing nuclear power use in its energy policy. The plan to export nuclear power has also been toned down. FIT is enforced under a call for promoting RE, which was planned in the 3rd SEP, although the circumstances surrounding it were different, namely from the global warming countermeasures and green growth that incentivize its diffusion to a readjustment of the comprehensive energy policy because of the impact of the Fukushima disaster.

The climate policy (GWPP) is essentially aligned with the 4th SEP for planning energy use. The proactive introduction of RE since July 2012 has resulted in remarkable growth of solar PV installation, but issues such as the high cost and operation of electrical systems have also surfaced. This has been presented through energy and climate policy. At the same time, although the operation of nuclear power plants under confirmed safety is mentioned in both energy and climate policies, the GWPP has not stated a reduction in the use of nuclear power, different from the 4th SEP. This is considered to relate to the energy mix announced in 2015 that formulated a goal of 20–22% of nuclear power by 2030 and also to a GHG reduction commitment. The toning down of exporting nuclear power technology in the 4th SEP also appears in the GWPP, causing it to emphasize exporting RE, energy-saving technologies, and others, a shift from the 2008 revised KPTAP.

4.5 The fifth SEP

To review the 4th SEP that formulated the vision for 2030 and to respond to the changing situations surrounding energies worldwide, comprising competition among technologies due to decarbonization and the effect of the Paris Agreement, geopolitical risks amplified due to technological changes, and competition between countries and companies, there is a need for a long-term vision for 2050. Consequently, the 5th SEP announced in July 2018 expands the “3Es + S” principle to a “sophisticated 3Es + S” (ANRE, 2018b). Its goals include the following: “1) achieve safety first through innovation via technological and governance innovation; 2) secure diversification of energy choices to enhance technological self-sufficiency in addition to resource self-sufficiency

and minimize various risks; 3) undertake decarbonization; and 4) aim to strengthen the competitiveness of Japanese industry in addition to limiting the burden on the Japanese public."

The planning of energies in the 5th SEP addressed the energy mix for 2030 formulated in the 2015 Outlook and the energy scenario for decarbonization and energy transition to achieve an 80% reduction in GHG by 2050. Nuclear power was positioned as an important baseload power source, with safety being the priority when restarting the operation of the nuclear power plants. It also indicates a reduction in the dependence on nuclear power as much as possible by introducing energy-saving and RE and improving the efficiency of thermal power plants and others. For the long-term 2050 vision, nuclear power is positioned as one of the options for decarbonization. In terms of exports, the 5th SEP does not express a clearly proactive attitude but emphasizes that Japan can contribute through its experience and technology. The 5th SEP aims to promote RE as a major power supply (主力電源化) that can be economically independent and decarbonizing by 2050, with the foundation set toward this goal by 2030, including reducing the cost, overcoming electrical system restraints, and ensuring that thermal power is maintained to support it. Coal is still seen as an important baseload power (重要なベースロード電源) and will remain important because of RE's large introduction that needs coal-thermal power to adjust the power output appropriately. In terms of the 2030 vision, the GOJ encourages private sectors to develop coal energy independently and use highly efficient thermal power generation wherein the IGCC, the IGFC, and CCUS need to be realized. For exports, thermal power generation equipment whose technology is not inferior to USC will be supported. Toward the long-term 2050 vision, the 5th SEP stated that fossil fuel is still predicted as the main (主力) primary energy supply during energy transition; hence, the GOJ will work on strengthening resource diplomacy, shifting to LNG, and phasing out insufficient coal-fired thermal generation.

The LSPA was formulated in June 2019 for submission to the UN as required in the Paris Agreement. The visions are declared as "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 toward the reduction of GHG emissions by 80% by 2050," and "realizing 'a virtuous cycle of environment and growth' toward the vision with business-led disruptive innovation." Regarding policy measures, to achieve energy transition and decarbonization, all energy options are to be explored, which indicates following the energy mix and the 5th SEP formulated previously. Therefore, it states a need to reduce dependence on nuclear power as much as possible with the proviso of RE expansion and to promote RE as a major power source that is economically independent. Regarding coal, the LSPA declares the need to reduce CO_2 emissions from thermal power in line with

the long-term goal set out in the Paris Agreement and to lessen dependence on thermal power generation as far as is achievable by measures comprising phasing out inefficient coal-fired power generation. The diffusion and commercialization of CCS and CCU are pursued, as are their exports overseas.

From the 4th to the 5th SEP, the GOJ expanded its energy planning to a vision of 2050 and the realization of the 2030 energy mix. This is also a response to the competition in energy technologies under the changing global energy state of affairs and the Paris Agreement. In addition to resource self-sufficiency, a new idea, namely technology self-sufficiency, has been conceived under such circumstances. A necessity to retain all technology options is emphasized during energy transition. Nuclear power remains as an important baseload power source on which dependency is to be reduced, but the GOJ further clearly states that nuclear power is an option for realizing decarbonization in the 5th SEP. Regardless, this is the first instance where RE has been identified as a major supply of power; however, because of this measure, coal is highlighted as the baseload power supply for deploying RE.

A comparison between the 5th SEP and the LSPA showed that the climate policy (LSPA) has followed the energy policy in terms of nuclear power and RE. However, a difference is evident in terms of coal. Although both policies mentioned phasing out aging coal power plants, the LSPA specified reducing coal dependence as much as possible, whereas the 5th SEP considered fossil fuels as the main energy source during energy transition and promoted the independent development of fossil fuels. This misalignment could be attributed to the LSPA's attempt to maintain alignment with the Paris Agreement and the move to phase out coal in several advanced countries. However, the LSPA did not further specify a clear deadline for coal phase out; instead, it proclaimed the desire to accomplish a decarbonized society as early as possible in the second half of this century. This is similar to the wording in the Paris Agreement. Moreover, rather than promoting the high efficiency of coal-thermal power, the diffusion of CCS and CCU is stressed more in the LSPA. Regarding the export of Japan's energy technology, the LSPA proclaims that exporting the energy infrastructure will be consistent with the Paris Agreement. This will contribute to a global reduction in CO_2 emission, in which a shift to the use of cleaner gas and RE technologies will be supported and applicable, and CCS and CCU will be considered. The 5th SEP still supports the export of coal technology, although this is subject to the recipient countries' requests for their exports and there is a precondition to export facilities that are equivalent to at least the world's most advanced USC power plants.

5. Results and discussion

The comparison between energy and climate policies (Table 2) reveals that Japan has made progress in including global warming countermeasures in its energy policies while dealing with energy supply limitations, security considerations, and adjustments resulting from changes in international energy and technology developments. This presents a picture of an energy policy that responds to Japan's thinking, historical experience, and technology advantages, bearing in mind concerns regarding climate change. These factors consequently influence the planning and adjustment of Japan's energy and technology measures. Conversely, climate policies follow the energy policies. The energy policy measures and narratives of energy policies, particularly in RE and nuclear power, have been reflected in climate policy, illustrating the alignment of the two forms. This could be attributed to targets as regards CO_2 reduction and the large dependence on energy policy planning.

If the SEPs and main climate policies are placed in chronological order, some inconsistencies exist. For example, the 4th SEP (2014) proclaimed a reduction in the dependency on nuclear power as much as possible because of the impact of the Fukushima disaster, but the subsequent climate policy GWPP (2016) stated the need to use nuclear power with confirmed safety, without saying "reducing the dependency" on it. This appears as a more proactive attitude toward nuclear power taken in climate policy rather than in its energy counterpart. Nevertheless, if we considered the 2015 Long-term Energy Supply-demand Outlook announced in between, which declared a goal of 20–30% nuclear power in power generation in 2030, it is clear that the climate policy is following the principle stated in the energy policy.

However, a misalignment exists and, in some cases, this has a considerable effect. Regarding nuclear power, there is sometimes an even more "pragmatic" attitude in climate policy rather than in energy policy. For example, the 2nd SEP (2007) prescribed the active promotion of nuclear power whereas the later KATAP (2008 revised) pursued a steady promotion. This could have resulted from the difficulty of newly constructed nuclear power plants in Japan that caused climate policy to adopt a more conservative attitude toward the use of nuclear power (see Watanabe (2015) for a related discussion).

Furthermore, a more critical discord is evident in the measures and attitudes of these two policies as regards the use of coal technology. Compared with energy policy that considers domestic demand, energy planning, Japan's advanced coal technologies, and the export of clean coal technology, climate policy remains in line on shifting to LNG, phasing out inefficient coal-fired power

generation, and promoting technologies such as CCS. Under the Paris Agreement and in line with global trends, the LSPA (2019) announced reducing the dependency on thermal power as much as possible, which demonstrates a remarkably different stance from the 5th SEP, which stated that coal-fired power remains important because of the broad introduction of RE. However, the goal of the LSPA is to achieve a decarbonized society in the second half of this century, which is not as clear as that of some advanced countries that have specified the deadlines for abolishing coal. This is considered a concern for the domestic industry and economic needs (Kyodo, 2019a, 2019b). Energy and climate strategy documents have shown signs of misalignment over time with differing goals for coal power as an instrument in Japan's energy and climate policies.

Altogether, energy policy mainly reflects Japan's domestic needs, national interests, policy planning, and concerns for the industries. This forms the basis of how to achieve the CO_2 reduction target. In contrast, climate policy needs to respond first and foremost to global warming concerns and pressure from international negotiations and competition regarding climate change, while also coordinating with energy policy and concerns regarding economic aspects, including domestic industries. Essentially, energy policy is in the predominant position, incorporating considerations regarding global warming countermeasures, whereas climate policy, in principle, follows energy policies, with adjustments made to avoid deviations from its implementation and philosophy of concern for global warming. The climate change factor, although listed as one of the "Es" (namely, environment), does not dominate or outweigh the other two "Es"—conventional thinking regarding energy security and economic efficiency—in Japan's energy policy, resulting in the discrepancy between Japan's energy and climate policies, particularly with regard to its coal use.

6. Conclusion

In this study, we examined whether Japan's energy and climate policies align to provide insights into difficulties faced in this regard. We reviewed and compared the development and narratives in Japan's SEPs and climate policies over the past two decades, with a focus on nuclear power, RE, and coal technologies. The results revealed a misalignment in Japan's policy measures toward coal, indicating that climate change does not predominate in Japan's energy planning. This resulted in a discrepancy in energy and climate policies that ultimately dragged down Japan's performance in overcoming climate change.

The policy framework and principles of the oil crisis experience affect Japan's energy policy even to date. The Fukushima disaster heavily impacted Japan's energy use and policy, which forced the nation to make adjustments. In addition to the impact of the Fukushima disaster, the international negotiations on climate change urged Japan to speed up the decision-making regarding its energy planning. However, because of the delay in deciding the direction of and implementing a more ambitious energy transition plan that could coordinate energy and climate policies effectively, the country failed to take a lead role in recent climate change negotiations. Japan was formerly an "advanced country in environmental pollution" during its period of rapid economic growth, then evolved as an "advanced country in environmental technologies." Thus, it is an immediate issue for Japan to respond to the increasing importance of its climate policy and the long-term goal of decarbonization, and to adjust its energy policy to better align with its climate policy. A clear discrepancy exists between the energy and climate policies and Japan needs to take further measures to reduce this.

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Table 2 Narratives of the three energy technologies in SEPs and climate polices

Policies	1st SEP	KPTAP	2nd SEP	Revised KPTAP	3rd SEP	4th SEP	GWPP	5th SEP	LSPA
Time of issue	October 2003	April 2005	March 2007	March 2008	June 2010	April 2014	May 2016	July 2018	June 2019
Nuclear power	• Excellent baseload power source in terms of global warming countermeasures • Promote steadily	• Baseload power source • Promote steadily	• Baseload power source • Actively promote	• Important • Only baseload power source among the clean energies • Promote steadily	• Maximize deployment • Baseload energy • Active use and expansion	• Important baseload power source • Reduce as much as possible by introducing RE, energy-saving technologies, and efficient thermal power	• Low-carbon baseload power source	• Important baseload power source • Reduce as much as possible by introducing RE, energy-saving technologies, and efficient thermal power • (Toward 2050) option for decarbonization	• Reduce as much as possible under the condition of RE expansion
RE	• Complementary energy source • Promote steadily	• Promote steadily	• Complementary power source • Expand its introduction steadily	• Promote steadily	• Pursue to maximize their deployment • Active use and expansion of REs	• Important low-carbon domestic energy source • Accelerate introduction of RE in about three years	• Expand its introduction to maximum	• Promote RE as a major power supply	• Promote RE as a major power source
Coal	• An important energy source • Development and diffusion of clean coal technology	• Promote replacement of aging coal-fired power generation with natural gas	• An essential energy • Promote development and diffusion of clean coal technology more than ever before	• Support high-efficiency thermal power generation • Aging coal → natural gas	• Increase the efficiency of thermal power generation by replacing with the latest equipment	• Important baseload power source • Replacing the aging ones with highly efficient coal technology	• Improve the efficiency of thermal power generation	• Important baseload power • Remain important due to large introduction of RE • (Toward 2050) Fossil fuel remains the main primary energy • Shift to LNG and phase out insufficient coal	• Reduce CO_2 from thermal power in line with Paris Agreement • Reduce thermal power generation as much as possible by phasing out inefficient coal, etc.

(Source: summarized by the authors)