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Japan's Climate and Energy Policy and the Status of Coal Power

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1. Climate and Energy Policies

(1) Policy Structure

The foundation of Japan's energy policies is defined by the "Basic Energy Plan (energy plan)" under the Ministry of Economy, Trade and Industry (METI)'s Basic Energy Policy Law. The plan is revised every three year. In line with the plan, the Long-Term Energy Supply and Demand Outlook (outlook)", which quantitatively determines future energy mix while considering each sector's energy efficiency, is decided by the committee of METI. Although it's called an "outlook", it bears features of "national targets" which will be a basis of budgetary measures and policy directions. Climate policies, on the other hand, are determined by the "Plan for Global Warning Countermeasures (climate plan)" under the Ministry of the Environment (MoE)'s Climate Change Prevention Law. This is also revised every three year.

The energy plan and the climate plan is respectively considered through separate process and the results of which is not necessarily be released at the same time. However, since approximately 90% of Japan's total greenhouse gas emissions originate from energy related activities, the nature and foundation of the climate policies is substantially determined when energy policies are decided. In addition, it is customary for the climate policies to only conform to energy policies. It has been argued for a long time that integration of climate and energy policies is inevitable, but it's not yet realized.

(2) Current Policies

(a) Energy Policies

The current energy plan was revised under the current administration led by Prime Minister Abe in 2014. Prior to this, the former administration of the Democratic Party of Japan (DPJ) decided a policy to phase out nuclear power in 2030's, reflecting strong public opinion in response to the Fukushima Dai-ichi nuclear accident. Though, the energy plan reversed the decision and reassessed nuclear power and coal thermal power as "important baseload electricity". It was followed by the decision on electricity mix for 2030 in the new outlook. From Figure 1, it seems like the government is undergoing an energy shift with the reduction in the proportion of nuclear power and the increase in renewables. However, it doesn't proof Japan's energy transition. Firstly, fossil fuel dependence has reached levels similar to that of 10 year average before Fukushima, apart from the reduction of oil-fired plants, which the only old plants are remaining. In 2015, nations adopted the Paris Agreement and agree to reduce greenhouse gas emissions to virtually zero by the second half of this century. As decarbonisation has become more and more essential, it is a problem that fossil fuel dependency by 2030 have largely remained unchanged. Secondly, 20-22% of nuclear power poses a crucial feasibility question. To meet this given target (assuming 70% capacity factor), roughly 37GW of nuclear capacity is necessary. However, at this point in time, 14 reactors have declared intent to decommission, including those in Fukushima. In addition, the current nuclear capacity of 40GW must fall by half to 20GW by 2030 if the 40 years unit lifetime based on the government provision is applied[1]. This means, without prolonging the unit lifetime or building new reactors, it's impossible to meet the target. Furthermore, only two reactors are in operations with the rest dormant. What's more, the strong public opposition to restart reactors renders the target even more unrealistic.

On the other hand, the long-awaited feed-in tariff system introduced in July 2012 demonstrated a success in adopting solar power. It drove an increase in the share of renewables from 10% in FY2010 to 15% in FY2015 (from 1% to 4.7%, excluding large hydro) in electricity generation. However, 2030 target of renewables is a level that can be easily met with the existing plans by renewable energy developers. Taking rapid installations in recent years and demand for energy transition into

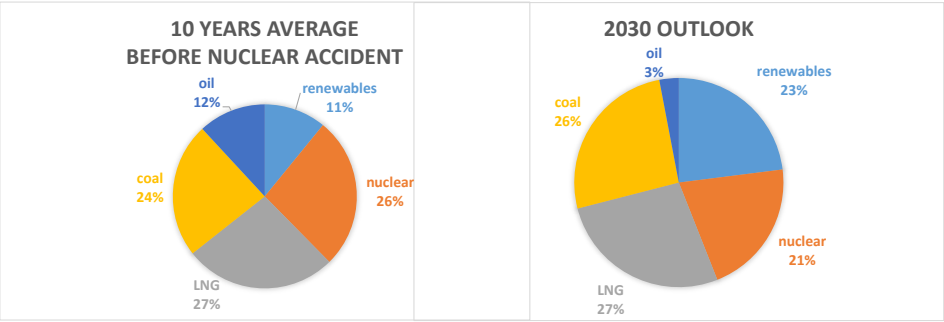

Figure 1 2030 Electricity Mix Outlook (Source : Agency of Natural Resource and Energy)

account, this target is too low.

Overall, 2030 electricity mix should be seen that the government is intended to return the energy system as much the same as before the nuclear accidents.

(b) Climate Policy

The government approved the new climate plan in May 2016 after the historic Paris Agreement was adopted. In fact, there hasn't been no such a "climate plan" since 1st commitment period of the Kyoto Protocol was over in 2012 because the country opted not to participate in the Kyoto Protocol's 2nd commitment period so as to not have subject to international climate obligation. Three years lack of the national framework to tackle with climate change put the climate issue very low profile in Japanese politics. While the new plan followed by the Paris Agreement includes a long term target to reduce GHG by 80% by 2050, it entirely reflected the energy policy and its energy mix. It also set a 26% GHG reduction target for 2030 from FY2013, which is actually equivalent to 18% reductions from the level of FY1990. Various reports and analysis, such as Climate Action Tracker, pointed out that the target fails to meet international standards compared to Japan's fair share. But, the government didn't consider raising its ambition at all. Additionally, as a measure to meet the target, the government decided to allow industry sector to continue their voluntary actions and didn't take any additional measures, such as pricing on carbon or regulations to improve energy efficiency etc. It has been proved that climate policy in last decades doesn't demonstrate that its greenhouse gas reduction is not sufficient, but the new plan remains unaltered and authorized the continuation of existing policies. This is inadequate as a response to the Paris Agreement and by no means consistent with the Japan's long term target of 80% reduction by 2050. This places a heavy burden on the next generation.

2. Massive Coal Power Increase

(1) Existing coal power

Power sector is the biggest source of Japan's greenhouse gas emissions, which accounts for 34% in FY2014, and coal power is responsible for approximately 20% of the total CO_2 emissions. Japan has continued to construct new coal plants even after 1990 and has been operating the plants with high capacity factor. Consequently, the proportion of coal power in electricity generation has increased dramatically, from 9.7% in 1990 to 18.4% in 2000, 25.0% in 2010, and 31.0% in 2014. Due to the increase in coal power alone, Japan's CO_2 emissions have increased by 13% compared to 1990 level.

There are currently 94 coal power plants, approximately 42GW, owned by 10 major utilities and wholesales power utilities[2]. There are many units operating longer than 40 years, but the capacity per unit of those is small. In contrast, newly developed capacity per units is large and many. 80% of total capacity are operating less than 30 years, and 55% of them operates less than 20 years（Table 1）. It's believed that these plants will continue to operate over the next few decades.

Table 1 Existing coal power (capacity and number)

operation years	operation start year	capacity（GW）	No. of units
40 ~	～1975	3.54GW	18
30～39	1976～1985	4.89GW	12
20～29	1986～1995	10.47GW	19
~ 20	1996～	22.95GW	45
（Total）		**41.85GW**	**94**

Source：『電気事業便覧』

(2) New coal power plans

Announcements to build new coal power have dramatically increased since the second half of 2013. As of now, the plans have a capacity of 22.5GW (for 47 units) in total. This includes small scale plants less than 150MW that the Environmental Impact Assessment (EIA) is not required (Table2)[3]. 9 units out of them are replacement to the old ones, but the capacity will expand from 1500MW to 2300MW due to scale up of the units size. Even if all of old plants operating for more than 30 years (8430MW) were to be shut down, a capacity would exceed 14.07GW compared to the current level.

If all of these are built, additional CO_2 emissions per year will be 135Mt- CO_2. This amount equals roughly 10% of total GHG emissions in FY2014. And if these new plants operate for 40 years until 2050, the emissions from new coal power will lock-in the half of the estimated total GHG emissions (250Mt-CO_2) under the target of 80% reduction (compared to 1990).

Progress of these new plans have quickened and as of May, 3,170MW has already started construction, and 15.05GW is undergoing the process of EIA. Coal power developers are not only utility and wholesale electricity utility, but also companies from different business sectors, such as iron and steel, trade, gas, paper & pulp, etc. Many of these companies started or plan to start electricity sales due to the fully liberalized electricity market from April 2016.

(3) Coal-related Policy Developments

There are political contexts to accelerate such massive new coal power plans. Several policies changes have been made after nuclear accidents. First one is the decision to acceleration

of EIA procedures for coal power. As a part of the industry deregulation policy, the government decided to shorten the required period of whole EIA process and sent green light to allow replacement from old coal power. Second one is newly introduced bidding system for construction of new thermal power. To reduce electricity costs, new thermal power development are required to go through bidding system by utilities. This decision paves the way for low-cost coal than gas. Third one is an agreement by MoE and METI, which asked power sectors to establish a framework to reduce CO_2 emission voluntarily.

After these policy changes were made, a number of new projects were announced. Especially first 2 coal projects through bidding by Tokyo Electric Power Company (TEPCO) in July 2013 became a trigger for the many following projects.

The scale of the current plans is so significant as it exceeds the proportion of coal power (26%) of the government's 2030 electricity mix. METI, even though they supports and promotes coal use and the construction, has decided to introduce new policy measures in 2016. Their first measure is a revision of efficiency standards for new thermal power plants. The Ultra Super Critical (USC) plants (generation efficiency: >42.0%, HHV) is set for coal power and Combined Cycle Gas Generation level (generation efficiency: >50.5% HHV) for LNG. However, the projects already undergoing through the bidding process or the EIA process will be excluded, therefore most of the new plans will not be affected by these new standards. The other measure is to set benchmark standards for existing plants. There are two indicators: generation efficiency for each electricity source (Coal 41%, Gas 48%, Oil 39%) and combined efficiency for all thermal power (44.3%). To meet the standards, companies that have many coal plants have to increase their LNG proportion or decrease their utilization rate for coal power. This could bring reduce coal power to some extent. However, the standards themselves are voluntary, not mandatory, and data, such as generation efficiency or capacity factors, which is needed to assess company performance, will not be disclosed. Thus, the effectiveness of these measures is very unclear. And, at any rate, the 2030 target of coal share is so high, these measures are anyway inadequate even if they are fully implemented.

MoE once revealed a clear position to challenge the new plants in regards to inconsistencies with the national GHG emission target for 2030. The Environment Minister submitted his/her opinion not to accept the projects 5 times during the EIA process in 2015. However, in February 2016, MoE changed their position and accepted proposals for the construction of new plants with some conditions. The MoE explained the reasons for acceptance because METI will introduce new measures and MoE will assess the progress by receiving information from METI on policy implementation.

Overall, it is fair to say that the government has yet to set policies and measures to restrict new coal power development, accelerate the shutdown of existing coal plants and reduction of coal power's capacity factor. Especially a situation where a nuclear restart is extremely uncertain, a likely scenario would be a massive development of new coal power and starting operations above the 2030 target level. Recently, it became well known that the new coal power construction is not consistent with meeting the global average temperature limit of 1.5℃ to 2℃, making it clear that investment has to shift clear away from coal. In addition, in regards to Japan's new plans, an increase in health impacts and risks of stranded assets has been pointed out. Political risk is also high if Japan continues its position against the international trend towards decarbonisation.

Therefore, it is urgent in Japan to integrate of climate and energy policies, especially policies for coal power, and to shift towards renewables.

1) Takahashi, H. (2014)「原子力 20-22%は現実的なのか？」 http://renewable-ei.org/column/column_20150521.php
2) In addition, there are a number of industry-owned coal power facilities.

～ Kiko Netwrok Activities ～

← Kiko Network regularly watches the development of new plans for coal thermal power projects and updates their status regularly. Detailed data on these projects can be downloaded (excel format).

http://sekitan.jp/plant-map

http://sekitan.jp/anticoalman/

Table 2　New coal power plans(English is available at, sekitan.jp/plant–map/)

地域	発電所名	企業名／運営会社	親会社／出資者等	設備容量（万kW）	運転開始予定	アセスメント	アセス状況	発電技術（注1）	CO2排出(万t-CO2/年)（注2）
北海道	釧路火力発電所	㈱ 釧路火力発電所	釧路コールマイン㈱、 F-Power㈱、IDIインフラストラクチャーズ㈱、太平洋興発㈱	11.2	2019	地方条例	実施中	CFB	67.2
東北	発電所名不明	前田建設工業㈱		10	不明	不明	公式発表なし	不明	60
秋田	秋田港発電所(仮) 2号機	関電エネルギーソリューション	関西電力	65	2024年6月	国	実施中	USC	390
秋田	能代3号機	東北電力		60	2020年6月	アセスなし	建設中	USC	314
秋田	日本製紙秋田工場発電所	日本製紙		11.2	2018年11月	地方条例	実施中	PC	76.3
秋田	秋田港発電所(仮) 1号機	関電エネルギーソリューション	関西電力	65	2024年3月	国	実施中	USC	390
宮城	仙台パワーステーション	仙台パワーステーション	関電エネルギーソリューション、伊藤忠エネクス	11.2	2017年10月	アセスなし	建設中	不明	67.2
宮城	石巻雲雀野発電所1号	日本製紙石巻エネルギーセンター㈱	日本製紙（70%）、三菱商事（30%）	14.9	2018年3月	アセスなし	建設中	不明	89.4
福島	大型石炭ガス化複合発電設備実証計画（勿来）	常磐共同火力	福島復興電源コンソーシアム、東京電力、三菱重工業、三菱商事、三菱電機、常磐共同火力	54	2020年代初頭（予定）	国	実施中	IGCC	262
福島	大型石炭ガス化複合発電設備実証計画（広野）	東京電力	福島復興電源コンソーシアム、東京電力、三菱重工業、三菱商事、三菱電機、常磐共同火力	54	2020年代初頭	国	実施中	IGCC	262
福島	相馬中核工業団地内発電所	相馬共同自家発開発合同会社		11.2	2018年3月	地方条例	実施中	PC	67.2
福島	いわきエネルギーパーク	（株）エイブル		11.2	2018年4月	地方条例	実施中	PC	67.2
福島	発電所名不明	相馬共同火力発電	東京電力、中部電力、東北電力	100	不明	不明	公式発表なし	不明	600
福島	エム・セテック相馬工場内発電所	オリックス㈱		11.2	2018年度	地方条例	建設中	PC	67.2
茨城	鹿島火力発電所2号機	鹿島パワー	電源開発、新日鐵住金	65	2020年7月	国	実施中	USC	343.9
茨城	発電所名不明	（かみすパワー）	丸紅、関西電力（関電エネルギーソリューション）	11.2	2018年	不明	公式発表なし	不明	60
茨城	常陸那珂共同火力発電所1号機	常陸那珂ジェネレーション	東京電力、中部電力	65	2021年前半	国	実施中	USC	390
千葉	市原火力発電所	市原火力発電合同会社	関電エネルギーソリューション（Kenes）、東燃ゼネラル石油	100	2024年	国	実施中	USC	600
千葉	発電所名不明	中国電力		100	2020年前後	不明	公式発表なし	不明	600
千葉	千葉袖ケ浦火力発電所1号機（仮）	千葉袖ケ浦エナジー	九州電力、出光興産、東京ガス	100	2025年	国	実施中	USC	600
千葉	千葉袖ケ浦火力発電所2号機（仮）	千葉袖ケ浦エナジー	九州電力、出光興産、東京ガス	100	2026年	国	実施中	USC	600
千葉	発電所名不明	関西電力		100	不明	不明	公式発表なし	不明	600
神奈川	横須賀火力発電所	東京電力		100	2020年	不明	公式発表なし	USC	600
静岡	鈴川エネルギーセンター	鈴川エネルギーセンター	日本製紙（20%）、三菱商事（70%）、中部電力（10%）	10	2016年9月	アセスなし	建設中	PC	60
愛知	発電所名不明	名南共同エネルギー㈱	名港海運（49.75%）、西華産業（49.75%）、日本エネルギーパートナーズ（0.5%）	3.1	2018年1月	アセスなし	計画中	PC	18.7
愛知	武豊火力発電所 5号機	中部電力		107	2022年3月	国	実施中	USC	642
愛知	名古屋第2発電所	中山名古屋共同発電	ガスアンドパワー（95%）、中山製鋼所（5%）、大阪ガス	11	2016年度下期	アセスなし	建設中	汽力	66
三重	発電所名不明	MC川尻エネルギーサービス㈱	三菱商事	11.2	2019年	地方条例	実施中	PC	67.2
兵庫	赤穂発電所（現・1号機）	関西電力		60	2020年	地方条例	実施中	SC	335
兵庫	高砂新2号機	電源開発		60	2027年度	国	実施中	USC	360
兵庫	高砂発電所新1号機	電源開発		60	2021年度	国	実施中	USC	360
兵庫	神戸製鉄所火力発電所（仮）新設1号	神戸製鋼所		65	2021年度	国	実施中	USC	390
兵庫	神戸製鉄所火力発電所（仮）新設2号	神戸製鋼所		65	2022年度	国	実施中	USC	390
兵庫	赤穂発電所（現・2号機）	関西電力		60	2020年	地方条例	実施中	SC	335
島根	三隅発電所2号機	中国電力		100	2022年11月	国	実施中	USC	600
岡山	水島エネルギーセンター	水島エネルギーセンター	関電エネルギーソリューション、三菱商事、三菱化学	11	2017年夏	アセスなし	建設中	不明	66
広島	石炭ガス化燃料電池複合発電実証事業	大崎クールジェン（株）	中国電力（株）、電源開発（株）	16.6	2017年3月	国	建設中	IGCC	70.6
広島	竹原発電所新1号機	電源開発		60	2020年6月	国	建設中	USC	316
広島	海田バイオマス混焼発電所	広島ガス㈱		11.2	2019年	地方条例	実施中	CFB	67.2
山口	西沖の山発電所（仮）2号機	山口宇部パワー㈱	電源開発、大阪ガス、宇部興産	60	2025年	国	実施中	USC	360
山口	発電所名不明	エア・ウォーター＆エネルギア・パワー山口㈱	中国電力、 エア・ウォーター㈱	11.2	2018年	地方条例	実施中	CFB	67.2
山口	西沖の山発電所（仮）1号機	山口宇部パワー㈱	電源開発、大阪ガス、宇部興産	60	2023年	国	実施中	USC	360
愛媛	西条発電所新1号機	四国電力		50	Mar-23	国	実施中	USC	300
福岡	発電所名不明	響灘エネルギーパーク合同会社	オリックス㈱、 ホクザイ運輸	11.2	2017年度	地方条例	完了	PC	67.2
福岡	響灘火力発電所（仮）	（株）響灘火力発電所	（株）IDIインフラストラクチャーズ	11.2	不明	地方条例	実施中	PC	67.2
長崎	松浦発電所2号機	九州電力		100	2020年6月	アセスなし	建設中	USC	600
宮崎	発電所名不明	旭化成ケミカルズ		6	2018年3月	アセスなし	計画中	汽力	36

（注 1）CFB=循環流動層ボイラー，PC=微粉炭ボイラー，SC=超臨界圧，USC=超々臨界圧，IGCC=石炭ガス化複合発電
（注 2）環境アセスメント書に記載がない場合は推計値

Source：Japan Coal Plant Tracker（http://sekitan.jp/plant-map/）