CLIMATE ANALYTICS

SCIENCE BASED COAL PHASE-OUT TIMELINE FOR JAPAN

IMPLICATIONS FOR POLICYMAKERS AND INVESTORS

MAY 2018

EXECUTIVE SUMMARY

In collaboration with

RENEWABLE ENERGY INSTITUTE

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INTRODUCTION

The Paris Agreement temperature goal is hold the global average temperature rise well below 2 degrees Celsius above pre-industrial levels and pursue efforts to limit this to 1.5 degrees Celsius. To achieve this goal globally aggregated zero greenhouse gas emissions need to be reached in the second half of this century.

This requires a rapid decarbonisation of the global power sector, and especially of coal generation, which accounts for about 40% of global electricity emissions and is the most carbon-intensive source of electricity generation.

In Japan, about 90% of greenhouse gas (GHG) emissions come from energy-related sources, and electricity generation contributes to about 40% of its CO2 emissions. In 2016, more than half of the electricity emissions in Japan came from coal, which is equivalent to about 20% of total GHG, making it a major contributor to climate change.

Currently, in addition to the 45 GW of coal power generation capacity, Japan has plans to construct about 18 GW of new and additional coal power plants, of which 5 GW are already under construction.

To achieve the Paris Agreement goal and its national commitments, addressing emissions from coal should be the primary focus for Japan.

1 COAL EMISSIONS IN LINE WITH THE PARIS AGREEMENT

To identify an emissions budget for coal power plants in Japan, the Paris Agreement temperature goal needs to be translated into emissions pathways for sectors that are consistent with this agreement at the national level.

An important and useful source for this date are Integrated Assessment Models (IAMs) scenarios, which identify economically and technologically feasible emissions pathways consistent with a given climate target, while minimising global costs.

We have used an available scenario that approximates the Paris Agreement temperature goal (holds warming below 2°C with 85% probability, or greater, and with a more than 50% chance of remaining below 1.5°C by 2100), and derived cost-optimal pathways for electricity generation from unabated coal plants, globally, and for Japan.

The cost-optimal emissions pathway shows that coal power plant emissions need to decrease steeply in the coming years and be mostly phased out by 2030 in Japan. Globally, emissions of unabated coal need to be phased out at the latest by 2050 to remain in line with the Paris Agreement.

2 COAL EMISSIONS IN JAPAN - EMISSIONS FROM THE CURRENT AND PLANNED CAPACITY

To estimate the emissions from coal-fired power plants for the existing 45 GW of capacity as well as the planned additional 18 GW of plants in Japan, we have made some business as usual assumptions - a unit lifetime of 40 years and a capacity factor (utilization rate) linearly decreasing from current levels of 76% to 56% in 2026 based on previous literature estimates.

Under business as usual, there is a huge gap between the current and planned emissions from coal generation in Japan and the Paris Agreement budget for the period 2018-2050. The Paris Agreement budget would be exceeded about three times if all the planned power plants were to be built.

Alternative scenarios where only half or a quarter of the planned coal power plants are built to replace old and less-efficient capacity (which we assumed are retired after reaching the average lifetime of 40 years) still result in emissions far exceeding a Paris Agreement budget for coal.

Even the lifetime emissions from Japan's existing coal capacity (without considering planned additions) significantly exceed the Paris emissions budget if these plants are operated until the end of their technical lifetime. The age distribution of Japanese coal capacity shows that coal would continue to be a part of the electricity mix until at least 2060.

In order to achieve the Paris Agreement's long-term temperature goal, Japan will need to implement early retirement of currently-operating power plants and/or dramatically reduce their utilisation rate. Any additional coal capacity will only increase the difference between committed emissions and cost-optimal pathways consistent with the Paris Agreement, regardless of the assumptions made.

3 IMPLICATIONS OF THE ANALYSIS RESULTS TO BUSINESSES AND TO COAL REGULATIONS IN JAPAN POLICYMAKERS

Japan needs to start discussions on a coal phase-out policy now.

The current emissions reduction target - based on the energy mix in 2030 - is not in line with what is required under the Paris Agreement.

Moreover, current plans for coal generation capacity are inconsistent not only with a Paris Agreement compatible cost-optimal strategy but also with its own nationally determined targets for electricity generation as well as emissions reductions.

Current policies to address emissions from coal generation, such as an efficiency standard of 42% or voluntary action cannot limit new coal generation capacity without a binding reduction target for the sector and give a wrong incentive for renewal, which strengthens the dependency on coal.

Sending a clear signal for a decarbonised future now may lead to an expansion of investment in the entire economy and avoid additional expenditure on coal generation capacity, as Japanese firms are increasing their cash holdings and manufacture equipment is becoming old and requires renewal.

When starting a public discussion on coal phase-out, it would be a constructive step for Japan to assess the costs associated with phasing out coal and compare them with the associated benefits such as climate protection, air quality improvements, reduction of fuel cost and energy dependency.

NEW COAL CAPACITY INVESTORS

The top ten new coal capacity investors in Japan are J-Power, Chugoku Electric, JERA, Kyushu Electric, Kobe Steel, Chubu Electric, KENES (100%Kansai Electric), Marubeni, Mitsubishi Corporation and Tokyo Gas.

Significant reputational and climate risks are a growing concern for global investors, which own a 30% share in listed companies in Japan and have already started to divest from some of these top ten investors in coal capacity.

Changes in the regulatory environment represent a significant latent risk for coal investors in Japan, given the international commitments the country acquired under the Paris Agreement, which are required to be revised and strengthened every five years.

Even if the Japanese government were to continue to support efficient coal in the future, current energy supply and demand trends are not favouring new coal capacity. The electricity demand decreased by almost 10% in just five years from 2010 while the renewable energy share increased about 5%, pushing down the average capacity factor of thermal power plants.

In addition to decreasing energy demand, the biggest challenge new thermal capacity will face is the drastic cost decline of renewables and storage technology. BNEF estimates that for Japan a new utility scale solar PV will be cheaper than combined cycle gas turbines in less than five years and cheaper than coal in 2024.

Under those circumstances, the economic viability of all the new coal capacity currently planned to come online as late as 2027 is highly questionable, and investors risk not being able to fully amortizing their investment nor generating the revenue they expect.

ENERGY USERS

Japanese companies such as Aeon, Askul, Fujitsu, Fujifilm, Kirin, Panasonic, Ricoh, Sekisui House, Sony etc. are increasingly committing to international initiatives such as RE100 and Science Based Target (SBT). For these companies, any coal-fired power generation in Japan beyond the Paris Agreement can undermine the achievement of their commitments.

Moreover, Japanese companies risk losing competitiveness in the global market because of slow domestic deployment of renewables and expansion of carbon intensive energy sources such as coal power generation.

> More than 100 Japanese factories in Apple's supply chain are required to set emissions reduction targets and they are encouraged to improve energy efficiency and procure renewable energy. In 2017, 756 audits were conducted, and supplier performance has been evaluated.

> Top foreign investors in Japan such as Black Rock, Baillie Gifford, Vanguard Group, Norges Bank Investment Management, UBS Asset Management, Axa Investment Managers, are becoming more sensitive about how climate-related risk affects the business, and some have already divested from companies on whose business relies on coal.

The establishment of Renewable Energy Users Network (RE-Users) is a clear signal from the electricity users' about the need to shift away from fossil fuels.

4 COAL PHASE-OUT POLICIES

Lessons on policies leading to an effective coal phase-out can be gained from international experiences. Countries such as Austria, Canada, Finland, UK, Italy, the Netherlands, France, and other members of the "Powering Past Coal Alliance," have already set a clear timeline for coal phase-out.

Market-based policy instruments such as carbon pricing are one option for discouraging coal use. In Japan, a Carbon Pricing Consideration Committee has discussed potential effective new policies.

Regulatory approaches can also be an effective tool to enable coal phase-out: strict air pollution or CO2 emissions standards can make a new coal-fired power plant uneconomic or make modernisation - or shut down - of existing plants necessary. Such effective standards can be observed in several jurisdictions such as UK, Canada and in the EU.

Another important development that has pushed coal out of the market internationally is the increasing renewable power generation - the result of both policy and market forces - that has resulted in a dramatic reduction of costs of renewable energy and storage technologies.

International experience shows that managing the impact on workers, coal owners, industry and energy users, as well as communicating the benefits and co-benefits of coal phase-out can increase the success and political acceptability of coal phase-out policies and instruments.

In countries like UK, Canada and US, benefits are officially investigated, quantitatively assessed and compared to the cost of phasing out coal, which has historically resulted in the implementation of stricter environmental standards.

CONCLUSION

The Paris Agreement sets a clear, science based pathway to decarbonisation globally. For Japan, in common with most countries, the consequences includes rapid decarbonisation of the power sector, with coal-fired power plants leading the way and need to be mostly phased out by 2030.

Additional coal plants are completely inconsistent with the Paris Agreement and the discussion should now be on how to phase out existing coal-fired power plants in orderly manner.

Most countries which have set a phase-out timeline have set it between 2020-2030, which gives an indication of the urgency of starting a national conversation on the future role of coal in Japan.

Phasing out most of the coal generation that supplies about 30% of Japan's electricity now in less than 15 years needs a rapid but feasibly and likely beneficial shift in climate and energy policy in Japan. An extension of the current standards and voluntary action will not address the problem.

A clear policy signal and structured phase-out plan will benefit the public and industry in many ways, and will also be beneficial for coal related businesses, workers, owners and investors to make a sound transition.

As of April 2018, most of Japan's proposed new 43 coal plants are in the Environmental Impact Assessment process required before securing funds to operate after 2020. The timing to send the right policy signal for investment is now.

To achieve the Paris Agreement's temperature goal Japan will need to progressively increase its national emissions commitments (NDC) under this Agreement which will not be possible event with existing coal capacity, hence addressing emissions from coal should be a primary focus for Japan's climate and energy policy.