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Discursive resistance to phasing out coal-fired electricity: Narratives in Japan's coal regime

Gregory Trencher[a,*], Noel Healy[b], Koichi Hasegawa[c], Jusen Asuka[d]

[a] Graduate School of Environmental Studies, Tohoku University, Miyagi Prefecture, Japan
[b] Department of Geography, Salem State University, Massachusetts, USA
[c] Center for Northeast Asian Studies, Tohoku University, Miyagi Prefecture, Japan
[d] Graduate School of Arts and Letters, Tohoku University, Miyagi Prefecture, Japan

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ABSTRACT

Achieving temperature targets under the Paris Agreement requires urgent measures to curb construction of coal-fired power plants (CFPPs) and expediate the retirement of existing assets. As the world's fourth largest coal consumer, Japan's efforts to reduce coal usage are critical for international climate mitigation. Policies introduced after the Fukushima nuclear disaster have led to a rapid increase in solar. However deregulation of the electricity market has also prompted a rush of new CFPP constructions by new market entrants and incumbent utilities. In parallel, Japanese state agencies and industry are actively exporting CFPP technologies to developing countries. Although these domestic and international actions harbour serious consequences for global climate mitigation efforts, greater understanding of the factors driving Japan's coal dependency is needed to limit further lock-in of future carbon emissions. Filling this gap, this study critically examines narratives employed by actors in government and industry to sustain Japan's domestic and international coal industry. Our analysis shows how Japan's fossil fuel regime is employing recurring narratives to promote continuation of the current coal-based energy system and to mobilise further investments in high-efficiency coal power technologies. We conclude by recommending various policy pathways and institutional reform measures aimed at encouraging wider diffusion of renewable electricity sources while reducing coal dependency.

1. Introduction

As the largest source of anthropogenic greenhouse gas (GHG) emissions, coal combustion is the single most significant contributor to climate change (Global Carbon Project, 2018). With the lion's share resulting from electricity generation, slight annual fluctuations in coal consumption can completely erase emissions reductions gained globally from new renewable installations (Tollefson, 2018). To achieve either the 1.5 °C or 2.0 °C targets under the Paris Agreement without unproven negative emission technologies, massive and rapid cuts in coal-fired electricity are required by 2030, before a virtual phase-out by around 2050 (IPCC, 2018; Nace, 2018; Parra et al., 2018). Thus, while greater efforts are required to accelerate the deployment of renewables and non-emitting electricity technologies (Rockström et al., 2017), the effectiveness of global climate mitigation ultimately hinges on reducing the global share of coal-fired electricity. Coal-fired power plants (CFPPs) typically operate for around 30–40 years. Given this risk of locking-in future carbon emissions (Erickson et al., 2015), it is imperative to halt new construction while encouraging early retirement of existing units (Benn et al., 2018; Edenhofer et al., 2018; Garg and Steckel, 2017).

Moving in this direction, 30 nations including the U.K, Canada, France and Mexico have committed to phasing out coal-fired electricity through the Powering Past Coal Alliance formed at the 2017 United Nations Framework Convention on Climate Change meeting (COP 23) in Bonn. This sparked greater interest in the diffusion of anti-fossil fuel norms in climate governance (Green, 2018a, b) and policy tools that nations might employ to transition beyond coal (Sartor, 2018; Vögele et al., 2018; Benn et al., 2018; Rogge and Johnstone, 2017). However, given that Powering Past Coal Alliance signatory nations only represent a tiny portion of global consumption, achieving Paris Agreement goals requires more aggressive measures to reduce coal dependence. Globally, some 575GW of CFPPs are under construction or planning, mostly concentrated in developing countries and Asia (Shearer et al., 2019). Coupled with existing CFPPs, this pipeline risks consuming the majority of the remaining carbon budget that meeting the Paris Agreement

* Corresponding author.
E-mail address: g-trencher@tohoku.ac.jp (G. Trencher).

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Table 1
Current and planned coal-fired powerplants[a] as of June 15, 2019 Data: Japan Coal Plant Tracker (2019)

	Capacity (MW)	No. of plants
Existing fleet (constructed pre-2012)		
Operating	43,416	109
New pipeline (planned post-2012)		
Operating	2,300	13
Under construction	9,381	17
Assessment complete	1,300	2
Under assessment	1,200	3
Under planning	2,000	2
Cancelled	7,030	13
Total post-2012 pipeline (exc. cancelled)	16,293	37

[a] Includes both commercial power plants and inhouse industrial generators.

temperature targets would require (Edenhofer et al., 2018). Meanwhile, the anti-fossil fuel movement's organising principle and moral imperative to 'keep it in the ground' (Mangat et al., 2018; Healy and Barry, 2017) is yet to effect major changes in the coal extraction policies of large coal producers like the U.S. and Australia (Blondeel and Van de Graaf, 2018), Russia (Martus, 2018) and Poland (Kuchler and Bridge, 2018).

Japan's domestic and overseas coal industry is crucial to the global shift beyond coal (Zhao and Alexandroff, 2019). With coal currently making up around 28% of electricity production (ISEP, 2019), Japan is the world's fourth largest coal consumer (120 million tonnes in 2017) and third biggest importer (BP, 2018). Lacking domestic coal reserves, Japanese firms invest heavily in overseas extraction. Moreover, Japan's domestic CFPP fleet is countering trends in industrialised nations by undergoing extensive upgrading and expansion (Normile, 2018; Webb and Parra, 2018). Since 2012, a pipeline of 50 projects totalling 23 GW (see Table 1) has emerged. While media has recently reported a suite of cancellations (Buckley and Nicholas, 2018; Potter, 2019), some 9.4 GW of CFPPs are under construction, with a further 4.5 GW under planning or assessment (Japan Coal Plant Tracker, 2019). With a host of small and quick-to-build plants characterising this post-Fukushima rollout, in total 30 projects are either newly completed and operating or still under construction.

Although this pipeline initially emerged to cope with electricity shortfalls after the Fukushima nuclear disaster triggered the stoppage of all domestic reactors, government policy is a major driver. For example, liberalisation of the retail electricity market in 2016 proceeded without legally binding carbon regulations. Meanwhile, national policy promotes coal as a reliable and cheap baseload power, projecting a 26% share of coal-fired electricity generation in 2030 (ANRE, 2018c). Public finance is also assisting Japanese firms to draw upon domestic expertise and export CFPP technologies to developing countries. Japan is the second largest financer of international coal power development after China (Chen and Schmidt, 2017; Zhao and Alexandroff, 2019). Although international NGOs and think tanks have examined Japan's flourishing coal industry (Parra et al., 2018; Chen and Schmidt, 2017; Webb and Parra, 2018; Tanner, 2018; Jaiqiao et al., 2018), academic studies are notably lacking, with most post-Fukushima scholarship focused on nuclear or renewables policy (Huenteler et al., 2012; Cherp et al., 2017; Moe, 2012b; Kuramochi, 2015; Vivoda, 2012; Skea et al., 2013; Chapman and Itaoka, 2018).

The momentum to sustain Japan's coal industry runs counter to the logic that importing countries without large coal deposits should experience the greatest ease in transitioning to a coal-free energy system (Zhao and Alexandroff, 2019). As such, Japan's situation points to a need to understand the positions and economic rationale of incumbent actors—or regimes—comprised of politically powerful industry and government players that support and profit from continued fossil fuel usage (Geels, 2014; Hess, 2014; Vögele et al., 2018; Leipprand and Flachsland, 2018; Downie, 2017; Brown and Spiegel, 2019). In using the term 'regime', we refer to the government agencies and industry organisations that make up fossil-fuel based energy systems alongside infrastructure, technological development, policies, institutions, practices, norms and financial flows (Newell and Johnstone, 2018; Bosman et al., 2014). This perspective is especially relevant given that numerous scholars of Japanese energy policy have emphasised that vested interests in incumbent coalitions of industry and government players have and continue to oppose the widespread diffusion of renewables while supporting centralised coal and nuclear power (Moe, 2012b; Kingston, 2019, 2012; Valentine and Sovacool, 2019; Tanner, 2018).

In order to sustain centralised, fossil fuel energy systems and counter threats posed by alternatives such as distributed renewable energy production, regime actors often employ multiple defence strategies. These can include political lobbying, participation in government committees, media advocacy, information dissemination and investment in current or preferred technologies (Smink et al., 2015; Newell and Johnstone, 2018). Of these strategies, scholarship has emphasised the critical role played by discourse and narratives (Bosman et al., 2014; Roberts, 2017; Malone et al., 2017; Brown and Spiegel, 2019). Narratives can be crudely conceived as recurring stories in political debates. These are important tools of resistance since they influence the trajectory of a socio-technical system by describing or framing a problem, laying out consequences and suggesting desirable solutions in accord with the interests of certain actors (Hermwille, 2016; Moezzi et al., 2017; Augenstein and Palzkill, 2016). Thus, identifying and dissecting the narratives that create path dependency and sustain fossil fuel energy systems is essential for revealing logic or misrepresented claims that require intervention with factual correction, policy or institutional reform.

In this context, this study analyses recurring narratives employed by pro-coal fossil fuel regime actors in Japan (henceforth 'coal regime actors') to promote coal-fired power and sustain associated coal industries. Data are derived from 30 interviews with coal regime actors, anti-coal stakeholders and renewables or independent experts in addition to grey and scientific literature. In the following section, after briefly describing the theory guiding this study, we provide an overview of relevant coal regime actors in Japan and the national energy policy landscape. After outlining our methods, Section 4 presents four pro-coal narratives before critically examining these in Section 5. We conclude by suggesting several policy and institutional reform pathways for decreasing Japan's future dependency on coal.

2. Background

2.1. Narratives as drivers of socio-technical change

As recurring storylines or messages, narratives are powerful tools for energy regime actors. Narratives can be deployed to present a selected and filtered interpretation of reality, which can be diffused to the public, policymakers and other market actors (Curran, 2012). By problematising sometimes complex issues in a compelling or simplified way, narratives can legitimise or build consensus around one course of action while discrediting another. In turn, this can alter mass perceptions about specific energy technologies (Valentine and Sovacool, 2019). The literature highlights three key ways in which narratives, when pinned to specific objectives, can either drive or prevent socio-technical change in energy systems.

The first concerns the goal of resisting change and promoting stability and public support for sustaining or investing further in fossil-fuel energy systems (Geels, 2014; Newell and Johnstone, 2018). Such ambitions are visible in the manufactured claims of fossil fuel companies and associated think thanks about a lack of consensus in climate science (Supran and Oreskes, 2017; Oreskes and Eric, 2010) as well as 'clean coal' narratives, which play down the climate and health consequences of coal combustion (Curran, 2012). A second objective may involve efforts to diffuse new or existing technologies (Malone et al., 2017).

Narratives serving this purpose often push a discourse of necessity or inevitability. For example, narratives underpinning attempts to diffuse hydrogen and related fuel-cell technologies often claim hydrogen is the only realistic way of providing large-scale, long-term storage and long-distance electrified mobility (Trencher and Van der heijden, 2019; Sovacool and Brossmann, 2010). Similarly, discursive strategies to garnish support for carbon capture and storage often claim that, since fossil fuel dependency cannot be reduced in the near future, sustainable ways of using coal must be developed and diffused (Asayama and Ishii, 2017). Finally, a third purpose concerns the use of narratives by competitors or opposing social movements to weaken or destroy the legitimacy, power and stability of incumbent regimes. Mangat et al. (2018) demonstrate how the divestment movement seeks to weaken fossil fuel companies and disrupt supporting financial flows by framing them as a common enemy. Meanwhile Roberts (2017) demonstrates how a 'negative storyline' that portrayed U.S. railroad companies as abusive monopolists triggered their demise and the transition to an automobile society.

By focusing especially on the first two objectives, this study seeks to further empirical understanding into how fossil fuel regime actors employ narratives to delay transitions to sustainable energy systems while mustering support for the continued development and diffusion of fossil fuel technologies.

2.2. Key actors in Japan's coal regime and vested interests in energy policy

Japan's national energy policy is formulated by the Ministry of Economy, Trade and Industry (METI) and its in-house Agency for Natural Resources and Energy (ANRE). With a mission of furthering the development and interests of domestic industry, METI is known to prioritise economic feasibility over climate ambition when formulating energy policy (Kingston, 2019). METI promotes voluntary self-regulation over command-and-control policies and utilises tight relationships with industry to gain credibility in political debates (Moe, 2012). Although the Prime Minister holds power to choose ministry heads and dictate policy, historically, this position has rarely intervened on METI's energy and climate policy (Sofer, 2016). Furthermore, since its foundation in 1955 the currently reigning conservative party, the Democratic Liberal Party of Japan, has ceded only twice to the progressive Democratic Party. Japanese energy policy thus enjoys much political stability and rarely changes course in response to the election of a new prime minister (Moe, 2012).

Scholars (Moe, 2012b; Sklarew, 2018; DeWit and Iida, 2011) argue that vested economic interests and power structures in energy policy-making have significantly influenced the persistence of pro-nuclear and conservative renewable policies after the Fukushima disaster. For example, scholars have used conceptualisations of a 'nuclear village' (Kingston, 2012, 2019) and 'veto players' (Hyman, 2015) to reflect the extent to which common interests from politicians, bureaucrats, utilities, manufacturers and research institutions can coalesce to garnish political support for maintaining centralised electricity infrastructure over distributed renewable sources (Skea et al., 2013). While Japan may lack an equivalent 'coal village' in terms of scale and visibility, Tanner (2018) demonstrates that power structures and flows of money and personnel between industry and government have heavily influenced Japan's pro-coal energy policy.

Building off Tanner (2018), Table 2 summarises the main policy preferences, political influence and vested interests of both key actors in Japan's coal regime and stakeholders opposing coal or supporting renewables. One vocal regime actor is Keidanren (the Japan Business Federation). Being the chief representative of Japanese industry, Keidanren explicitly supports coal and holds significant influence over political decision-making. This is mainly through lobbying, policy advocacy, personnel exchanges with METI and participation in expert committees (*shingikai*) that advise policymaking (Moe, 2012b; Sofer, 2016). Keidanren is known to privilege the interests of large energy users such as electrical utilities, steel and cement makers (DeWit and Iida, 2011; Tanner, 2018), the same industries providing Keidanren with funding. Another regime actor, the Federation of Electrical Power Companies is also firmly opposed to carbon pricing and has voiced resistance towards large-scale diffusion of renewables alongside Keidanren. For instance, both have recently called for abandoning the feed-in-tariff scheme and emphasised the economic burden of higher electricity prices from renewables[1] (Keidanren, 2017; FEPCO, 2017c). Meanwhile, METI and the Prime Minister's Cabinet support both domestic coal usage and exporting CFPP technology to developing countries through international bodies such as the Japan Bank for International Cooperation and the Japan International Cooperation Agency. Conversely, although wielding little power over energy policy, the Ministry of the Environment and Ministry of Foreign Affairs are vocal critics of current pro-coal policies and avid advocates for renewables and carbon pricing (Toda and Kawamura, 2019; MOFA, 2018). Yet, in matters of coal policy, both ministries lack political and regulatory clout. Rather, objection to the domestic and international development of CFPPs is communicated via media briefings, policy recommendations and, in the case of MOE, formal statements criticising domestic projects undergoing Environmental Impact Assessments (EIA) and permitting, which is headed by METI.

Importantly, claims of vested interests dominating energy policy-making in Japan require a nuanced understanding. For example, recent scholarship (Kucharski and Unesaki, 2018) argues that historical conceptions of a 'triangle of politics, bureaucracy and industry' (Moe, 2012b: 262) are less relevant now that liberalisation of the electricity market is challenging the historical monopolies of regional utilities. Furthermore, many pro-coal business and government actors in Table 2 possess hedged interests and broad business activities that span nuclear, natural gas, hydro and renewables.[2] This said, Table 2 provides a useful heuristic for guiding our empirical analysis since it identifies regime actors and stakeholders either supporting or opposing coal and renewables, in addition to vested interests behind these positions.

2.3. National policy landscape

Table 3 summarises national policies with the most relevance to coal. The recently updated *Fifth Strategic Energy Plan*[3] (ANRE, 2018c) is highly influential as it shapes the degree of support for coal in other government policies. It positions coal as a cheap and reliable baseload power and outlines ambitions to modernise the domestic fleet by building new ultra-supercritical[4] plants and export this technology abroad. The *Long-Term Supply and Demand Outlook* (METI, 2015) also drives the domestic coal market. This forecasts, and thereby normalises, a 22–26% share of coal electricity for the year 2030 while extending conservative projections for renewable energy (see right of Table 4), most notably for wind (1.7%) and geothermal (~1%). Japan's

[1] While Keidanren has expressed critical views of renewables diffusion, they are not entirely opposed since they have also published views (Keidanren, 2018b) on least cost options for developing renewables as a major pillar of the electricity mix.

[2] For example, incumbent regional utilities such as *Tokyo Electric Power Company (TEPCO)* and *Kansai Electric Power Company (KEPCO)* are actively trying to expand renewables portfolios at home and abroad while still developing new CFPPs. Similarly, general trading companies (e.g. *Mitsui, Marubeni* etc.) and equipment manufacturers (e.g. *Toshiba* etc.) conduct business activities related to both renewables and coal.

[3] The title in this fifth version has been changed from *Basic Energy Plan* used in the fourth and previous versions.

[4] The high-efficiency in this technology is achieved by operating at higher temperatures and pressures than other technologies such as super-critical and sub-critical. In ultra-supercritical plants, the high temperature and high-pressure environment causes water to reach a 'supercritical' state that exhibits properties of both a gas and liquid.

Table 2
Policy preferences, stake and policy influence of coal regime actors and other stakeholders.
Source: Author's elaboration of work from Tanner (2018).

Actor	Policy preferences	Stake in coal-fired electricity	Policy influence
Industry			
Keidanren (Japan Business Federation)	• Supports coal, nuclear and renewables • Critical of the feed-in-tariff for renewables and carbon pricing	• Coal provides low-cost energy for heavy industry	• Influences policymaking via lobbying, policy advocacy and participation on government committees
Incumbent regional power utilities and Federation of Power Companies (FEPCO)	• Support coal and nuclear • Recent support for renewables (e.g. Tokyo Electric Power Company and Kansai Electric Power Company) • Critical of the feed-in-tariff for renewables and carbon pricing	• Construction and operation of new CFPPs domestically and internationally provide income from electricity sales	• Influence policymaking via lobbying (through Keidanren and FEPCO), participation in government committees, and drafting of electricity masterplans for developing countries
Plant manufacturers (e.g. Toshiba Power Systems, Mitsubishi Hitachi Power Systems)	• Support coal, nuclear and renewables	• Equipment sales, construction and engineering services for new domestic and international CFPPs generate profits	• Influence policymaking via participation on government committees deliberating energy policy
Large banks (e.g. Mizuho, Mitsubishi UFJ)	• Support coal, nuclear and renewables	• Financing or investing in companies conducting overseas and domestic CFPP development or coal mining generates profit from interest and returns	• Uncertain
Upstream developers and fuel suppliers (e.g. Mitsui Bussan, Mitsubishi Corporation and Marubeni)	• Support coal and renewables	• Investment in overseas and domestic CFPP development and coal mining generates income from returns and sales	• Uncertain
Bureaucracy			
Ministry of Trade, Economy and Industry (METI)	• Supports coal, nuclear and renewables • Critical of carbon pricing • Advocates voluntary frameworks for climate policy	• International exports of CFPPs contribute to economic development of domestic firms • Coal provides cheap and reliable baseload power for industry • Coal boosts energy security by diversifying energy sourcess	• Formulates national energy and climate policy • Sets energy priorities for other government agencies (JIBIC, NEDO, JICA etc.) • Controls the IEA process and permit issuing for new CFPPs
Ministry of Foreign Affairs (MOFA)	• Opposes CFPP construction domestically and internationally • Favours renewables and carbon pricing	• None	• Opposes CFPPs and advocates renewables via political statements, self-assembled expert committees and a 100% renewable energy procurement target (via RE100) for the Ministry
Ministry of Environment (MOE)	• Opposes CFPP construction domestically and internationally • Supports coal power if partnered with carbon, capture and storage (CCS) or carbon capture and utilisation (CCU) • Favours renewables and carbon pricing	• None	• Opposes CFPPs via political statements, formal statements during the EIA process, and advocacy for carbon pricing • Advocates renewables via a 100% renewable energy procurement target (via RE100) for the Ministry
Japan Oil, Gas and Metals National Corporation (JOGMEC)	• Supports overseas development of coal resources along with gas, oil and renewables	• Continued private investment in coal mining contributes to energy security and stability of supply	• Little influence as energy mandate shaped by METI and the Prime Minister's Cabinet
JICA (Japan International Cooperation Agency	• Supports coal, LNG and renewables	• International exports of CFPPs provide affordable electricity to host countries while contributing to economic development of domestic firms	• Little influence as energy mandate shaped by METI and the Prime Minister's Cabinet
JBIC (Japan Bank for International Cooperation)	• Supports coal, nuclear and renewables	• International exports of CFPPs contribute to economic development of domestic firms	• Little influence as energy mandate shaped by METI and the Prime Minister's Cabinet
Elected officials			
Prime Minister Abe Shinzo and cabinet	• Support coal, nuclear and renewables	• Coal provides, cheap, reliable baseload power for industry and boosts energy security • International exports of CFPPs contribute to economic development of domestic firms	• Prime Minister Abe Shinzo elects heads of ministries • Cabinet sets policy priorities for METI
Prefectural governors and city mayors	• Most support coal, nuclear and renewables • A few have voiced opposition to CFPP construction (e.g. the City of Sendai)	• Property taxes from new CFPP construction provide fiscal income	• Little influence as they lack legal power to stop construction of CFPPs. But can set air emission limits for SOx, NOx etc. that are stricter than national standards
Civic sector			
NGOs and think tanks (e.g. Kiko Network and Renewable Energy Institute)	• Oppose coal (and nuclear) and support more ambitious government targets for renewable electricity	• None	• Limited influence but active in policy advocacy and shaping public opinion about negative impacts of coal-fired electricity
New specialised renewables utilities			
E.g. SB Power and Shizen Energy	• Support more ambitious government targets for renewable electricity • Support policies such as feed-in-tariff and auctioning and regulatory reform to roll-back institutional hurdles holding back renewables diffusion	•None	• Actively creating greater market demand for renewable electricity • SB Power parent company Softbank established Renewable Energy Institute to produce policy relevant research and stimulate political debate on renewables diffusion and negative impacts of coal and nuclear power

Table 3
Key national policies with relevance to coal.

Policy name	Year implemented and *supervising government body*	Policy effect for coal-fired power and coal extraction	Key sources
Basic policies, laws and regulations			
Fifth Basic Energy Strategy	• 2018 • Agency for Natural Resources and Energy (ANRE)	• Positions coal as an important baseload power for economic and energy security reasons. This continues historical positions outlined in previous versions of the Basic Energy Strategy. • Calls for replacement of older, inefficient plants (i.e. supercritical or subcritical) with high-efficiency technology (i.e. ultra-supercritical or next-generation technologies like coal gasification). • Promotes continued research, demonstrations and commercialisation of Carbon Capture and Storage (CCS) and next-generation coal technologies.	(ANRE, 2018c, 2014)
Long-term Supply and Demand Outlook	• 2015 • Ministry for Economy, Trade and Industry (METI)	• Projects that coal will make up a 22–26% share of the national electricity mix in 2030, which effectively serves as a target.	METI (2015)
Environmental Impact Assessment Law (thresholds for CFPPs)	• 2012 (last modification) • Ministry for Economy, Trade and Industry (METI)	• Mandates a national-level Environmental Impact Assessment (EIA) for CFPP proposals above 150 MW but exempts all projects under 112.5 MW. • Projects between 112.5 and 150 MW are screened individually to determine EIA eligibility.	MOE (2012d)
Environmental Impact Assessment Law (streamlining for CFPP replacements)	• 2012 • Ministry of Environment (MOE)	• Simplifies scope of assessment criteria and shortens assessment period for replacements of existing thermal power plants (often by a few years).	MOE (2012a)
Auction system for new thermal power plants	• 2012 • Agency for Natural Resources and Energy (ANRE)	• Requires ten national utilities to utilise public tenders when building new thermal power plants. • Sets maximum tender price and requires projects above 600 MW to achieve annual utilisation rate of 70–80%. This effectively eliminates all options but coal.	METI (2016a)
Infra-systems Export Strategy	• 2018 • Prime Minister of Japan and his Cabinet (Kantei)	• Promotes overseas export of infrastructure (including power generation and high-efficiency coal technologies) to stimulate the Japanese economy. • Calls for promotion of CFPP exports at international summits (e.g. G7, G20, APEC, ASEAN). • Calls for government financial support for exports through the Ministry of Foreign Affairs, Japan Bank for International Cooperation (JBIC) and Nippon Export and Investment Insurance (NEXI) etc.	Kantei (2018)
Energy White Paper	• 2017 • Ministry for Economy, Trade and Industry (METI)	• Encourages expansion of new coal extraction projects abroad (especially outside of Australian and Indonesia) to diversify coal supply chains. • Pledges to reinforce relevant subsidies and government support from agencies (e.g. METI and JOGMEC). • Calls for Japanese ownership in foreign coal mines to the equivalent of 60% of domestic coal consumption.	ANRE (2017)
Bilateral agreements (e.g. Japan-United States Strategic Energy Partnership [JUSEP])	• 2017 • Agency for Natural Resources and Energy (ANRE)	• Pledges bi-lateral cooperation to spur the deployment of high-efficiency coal power technologies in developing Asia and Sub-Saharan Africa.	METI (2017a)
Financial incentives			
Upstream exploration and development subsidies	• Fixed each fiscal year • Japan, Oil, Gas and Metals National Corporation (JOGMEC)	• Various subsidies and public financing promote overseas coal mine exploration, feasibility studies and development. • Provide a total subsidy budget in FY2018 of roughly 33 billion yen (around US $30 million) plus unlimited budgets for equity capital financing and liability guarantees for loans.	JOGMEC (2017)
Research and demonstration subsidies for next-generation CFPPs and CCS/CCU	• Fixed each fiscal year • Ministry for Economy, Trade and Industry (METI) and New Energy and Industrial Technology Development Organisation (NEDO)	• Support R&D and demonstrations of next-generation coal technologies such as coal gasification and CCS.	METI (2018)
Disincentives and control measures			
Carbon tax (Global warming countermeasures tax)	• 2012 • Ministry of the Environment (MOE)	• Sets a tax against coal (JPY 760/tonne) equivalent to a carbon price of JPY 289 per tonne of CO_2.	MOE(2012c)
Energy Efficiency Law thermal efficiency benchmark	• 2018 • Ministry for Economy, Trade and Industry (METI)	• Sets a non-legally binding benchmark to encourage new CFPP developers to attain 42% thermal efficiency (High Heating Value [HHV]) or the equivalent of ultra-supercritical. • Encourages electricity producers to achieve an average combined HHV efficiency of 41% across all existing and new CFPPs.	METI (2016c) ANRE (2018f) Parra et al. (2018)

(*continued on next page*)

Table 3 (*continued*)

Policy name	Year implemented and *supervising government body*	Policy effect for coal-fired power and coal extraction	Key sources
Sophisticated Methods of Energy Supply Structures	• 2017 • Ministry for Economy, Trade and Industry (METI)	• Sets a non-legally binding target to encourage electricity retailers to achieve a 44% or greater share of generation from non-fossil fuel sources by 2030.	METI (2016c) ANRE (2018f) Parra et al. (2018)
Action Plan for the Electricity Business for Achieving a Low-Carbon Society	• 2015 • Federation of Electrical Power Companies (FEPCO)	• Provides a voluntary target (self-determined by a coalition of utilities) to achieve an emissions intensity of 0.37 kg-CO_2/kWh by 2030 across the industry's entire generation portfolio.	FEPCO (2015)

Table 4
Japan's historical, current and projected electricity mix (total annual power generation) **Sources:** ANRE (2016) for 2010, ISEP (2019) for 2018 and METI (2015) for 2030.

	2010 (%)[a] (Pre-Fukushima)	2018 (%)[b]	2030 (projected)
Nuclear	28.6	4.7	20–22
Coal	25	28.3	26
LNG	29.3	37.4	27
Oil	6.6	3.7	3
Hydro	8.5	7.8	8.8–9.2
Renewables (non-hydro)	1.1	9.6	13.4–14.4
Geothermal	[a]	0.2	1–1.1
Biomass	[a]	2.2	3.7–4.6
Wind	[a]	0.7	1.7
Solar	[a]	6.5	7

[a] Data not available in source, but each is close to 0%.
[b] Figures do not include 'other thermal' sources (8.5%).

emissions reduction pledge for the Paris Agreement (i.e. −26% by 2030 and −80% by 2050 from 2013 levels) is based on this energy mix and demand forecast. National energy policy thus provides an institutional framework whereby the long-term use of coal-fired electricity can co-exist with climate mitigation efforts (elaborated in Section 4.3).

The economic importance of developing new CFPPs both domestically and internationally is explicitly recognised in economic stimulus policies such as the *Infra-Systems Export Strategy* (Kantei, 2018) and earlier public statements from the Abe Administration (Kantei, 2013). In the goal of stimulating domestic growth, these policies call for the aggressive exporting of Japanese infrastructure technology to emerging economies with government financial assistance. Notably, these place a particular emphasis on power generation technology, including coal. Exports of CFPPs have flourished under such policies. Since 2013, Japanese corporations have participated in some 22 GW of projects under construction or planning (NRDC, 2018) while receiving financial support (i.e. loans and export insurance) from government and private financial institutions. Support provided just from government agencies (e.g. Japan Bank for International Cooperation and the Japanese International Cooperation Agency) over the period 2013 to 2017 amounts to US $10 billion, with the majority directed to Vietnam, Indonesia and India (Chen and Schmidt, 2017).

Many policies supporting coal-fired electricity were urgently introduced after the loss of nuclear baseload power in 2011 (e.g. streamlining EIA requirements to allow accelerated replacements of existing CFPPs). Others, however, merely continue support for coal that pre-dates Fukushima (e.g. the *Basic Energy Strategy* and various subsidies that encourage new investments in coal extraction). The pro-coal flavour of the national policy mix is particularly apparent when considering the lack of regulatory instruments discouraging coal consumption. For example, although Japan has a carbon tax, the weakly set carbon price of JPY 289 t-CO_2 (included in fossil fuel taxes) impairs any functioning as a genuine 'carbon tax' (Hirata, 2016).

Liberalisation of the national retail electricity market after the Fukushima disaster is a key driver behind the recent expansion of new CFPP construction. Like the feed-in-tariff scheme introduced in 2012 (see Duffield, 2016), market liberalisation aimed to spur renewables diffusion by upsetting the historical monopoly of incumbent regional utilities and stimulating competition to encourage new market entrants such as specialised renewable generators (DeWit, 2014; Kucharski and Unesaki, 2018). Both the feed-in-tariff scheme and market liberalisation have collectively contributed to an explosive growth of solar power. This rose from 0.34% in FY2010 to 6.5% in FY 2017 (ISEP, 2019). In parallel, however, numerous new market entrants and incumbent utilities have responded to competitive pressures to supply the cheapest electricity possible by choosing coal over other energy sources (Hirata, 2016). National policy has enabled this situation in three ways. Firstly, by failing to pair market liberalisation with enforceable GHG emission limits for electricity generators. Secondly, by freely issuing construction permits to CFPP proposals via METI. And thirdly, by signalling long-term government support for coal (which encourages private investments) via the multiple policies listed in Table 3.

This argued, government agencies are by no means *opposed to* renewables. Notable post-Fukushima policies to promote renewables aside the feed-in-tariff include a new bill introduced in 2018 to drive off-shore wind development via auctioning and government determined zoning (METI, 2019). Moreover, although government renewable targets notably lack ambition, the chronically underdeveloped state of renewables such as geothermal and onshore/offshore wind is equally influenced by other factors. These include NIMBY (not in my backyard) resistance from local fisherman and landowners like hot spring operators (Kubota et al., 2013) and underdeveloped grid infrastructure—notably in remote northern areas with rich wind potential.

3. Methods

3.1. Identification of coal regime actors and other stakeholders

Government and industry coal regime actors were identified from the Japanese energy policy literature (Tanner, 2018; Moe, 2012b; Sklarew, 2018) in addition to recommendations made by interview respondents (i.e. snowball sampling). In addition, our analysis includes insights gained from anti-coal or pro-renewable stakeholders and independent experts. These include government agencies, domestic and international NGOs, specialised renewable utilities and research institutions. A list of interview respondents appears in the Appendix.

3.2. Data collection

Fieldwork and data collection took place from April 2017 to June 2019. 30 semi-structured interviews with 61 respondents were conducted. The first author also participated in eight seminars and symposiums related to coal power and energy policy in Japan. Secondary documents by coal regime actors stemmed from grey literature like

government policy documents, policy advocacy literature, conference presentations, government advisory group reports and public media statements. For anti-coal stakeholders, scholarly literature, reports, press statements and databases were examined. Interviews were conducted in person, and in Japanese (except overseas organisations) by the first author. Questions were tailored to each organisation and typically provided in advance. These prompted respondents to elaborate their views around the necessity for coal-fired electricity and share insights into the economic, policy and technological developments driving post-Fukushima CFPP construction activity. All interviews except one were recorded to facilitate subsequent transcription.

3.3. Identification of key narratives

We identified and examined narratives that are widely shared in the printed and oral discourse of both industry and government actors. Akin to similar studies (Hermwille, 2016; Roberts, 2017; Mangat et al., 2018), emphasis is given to discursive themes recurring both temporally and across multiple organisations. Narrative identification was iterative. After an initial scoping, several themes were identified through grey documents published by coal regime actors. These were then used as cues during interviews with coal regime actors to invite respondents to further elicit their views on the need for coal power in Japan. In parallel, interviews also provide space for free articulation without any framing from the author. Narrative identification was also aided by interviews and document analysis from anti-coal or pro-renewable stakeholders. After several key narratives were identified manually, more detailed qualitative and quantitative data for each was processed with the software tool MAXQDA. While we focus on the four most significant narratives that emerged across pre- and post-interview data, they by no means represent the entire spectrum of pro- and anti-coal discourse in Japan. When integrating direct quotations into the findings, a coding system identifies interviews (e.g. #1 etc.) while concealing respondent names and affiliations.

4. Key pro-coal narratives

4.1. Narrative one: efficiency and cleanliness of Japanese coal technology

Coal regime discourse is permeated by a narrative that frames Japanese coal technology as the most efficient and cleanest in the world. Government and industry actors regularly use terms such as 'high-efficiency' and 'clean' (ANRE, 2018c; JCOAL, 2019) and cite international data (e.g. Nierop et al., 2017) to emphasise the average thermal efficiency attained by Japan's fleet. In 2015 this stood at around 42.1% in contrast to 39.6% in Germany, 38.6% in China and 37.1% in the U.S. Similarly, the average CO_2 intensity of Japanese coal power (864 g-CO_2/kWh) is also brandished in contrast to Germany (914 g-CO_2/kWh), China (915 g-CO_2/kWh), the U.S. (927 g-CO_2/kWh) and India (1023 g-CO_2/kWh) (METI, 2017b). In addition to promoting new construction on home soil, the framing of Japanese coal technology as the cleanest in the world is widely used by coal regime actors to justify the export of CFPPs to developing economies. This export industry is publicly financed and is framed as part of Japan's contribution to international climate change mitigation (Keidanren, 2016, 2018a; ANRE, 2018c; JCOAL, 2019). In promoting this agenda, coal regime actors assert that many developing countries must burn coal to provide cheap electricity in rapidly growing markets. Exporting Japan's highly efficient coal technology, they argue, can generate significant CO_2 savings relative to a scenario where competing export countries like China or Korea were to build a lesser efficient plant (ANRE, 2018d, c; Keidanren, 2017; JCOAL, 2019).

Narratives touting the global superiority of Japanese coal technology also extend to air-pollution (ANRE, 2018e; JCOAL, 2019) (#3,12,17). For example, METI and ANRE frequently use international comparisons to emphasise that average SOx and NOx emissions from domestic powerplants (0.2 g/kWh and 0.3 g/kWh respectively) are far below averages in Germany, U.S, Canada and the U.K, where older plants frequently breach permitted air pollutant levels (ANRE, 2018d). Employing this narrative, ANRE's website states: *'[When thinking of coal plants] most people probably imagine bellowing clouds of black smoke. However current coal technology has significantly reduced environmental impacts'* (2018e). J-Power's Isogo powerplant, located in heavily populated Yokohama, features frequently in the clean coal marketing discourse of industry and government. This ultra-super critical 1.2 GW facility is widely recognised as the cleanest CFPP in the world after reducing historical SOx, NOx and particulate matter emissions by 90% to 0.0001 g/kWh, 0.06 g/kWh and 5mg/m^3N respectively. The coal regime's unwavering promotion of the cleanliness of domestic coal technology generates a nonchalance for potential health impacts from air pollution. Illustrating this, an industry organisation remarked: 'it's not like everybody [in Japan] walks around coughing like in China [because of coal-fired power plant pollution]' (interview #3).[5]

Similarly, another interview revealed widespread views that air pollution concerns are 'a thing of the past' (#16) since Japanese society prides itself for overcoming chronic environmental devastation caused by rapid economic growth during the 1970's.

Furthermore, coal regime actors share a discourse of ecological modernisation that promises continuing improvements in efficiency and CO_2 emissions. For instance, industry and government actors often showcase an illustration from the *Technological Roadmap for Next-Generation Thermal Electricity Generation* (METI, 2016b). This depicts a continuing trajectory of technological progress whereby subcritical plants are ceded by increasingly efficient technologies such as ultra-supercritical, advanced ultra-supercritical, integrated gas combined cycle and integrated gas fuel cell[6] (FEPCO, 2017a; ANRE, 2018d). As well as rationalising further investments in research and commercialisation of next-generation coal technologies, this storyline of increasing cleanliness also promotes a strategy of reducing emissions through replacing older facilities with newly constructed ultra-supercritical plants (ANRE, 2018c).

4.2. Narrative two: compatibility of coal-fired electricity with climate policy

Complementing the above clean coal discourse centred on Japan's technological superiority, coal regime actors employ a narrative that acknowledges the need for GHG emissions reductions while asserting that a suite of voluntary industry governance instruments can achieve this—even as utilities exploit coal as a baseload power (Keidanren, 2016; 2018a; ANRE, 2018f). This reasoning differs somewhat to coal producing countries like the U.S. and Australia where climate change denial and blatant rejection of the need for climate action surface regularly in political and industry discourse. Japan's *Fifth Basic Energy Strategy* is a notable example. While promoting coal electricity as an important baseload, it argues that 'a balance' of economic interests and environmental protection can be achieved through a combination of national policy and voluntary industry governance frameworks (ANRE, 2018c: 56).

The first instrument involves a low-carbon roadmap formulated in 2015 by a coalition of utilities representing 98% of the national market. This fixes a self-determined, voluntary target of reaching an average emissions intensity of 0.37 kg-CO_2/kWh by 2030 (relative to 0.52 kg-CO_2/kWh in 2016) for the shared generation portfolio of the coalition (FEPCO, 2017b). This target is the simple translation of the present electricity mix projection for 2030 in Table 4, which allows for mostly

[5] Hereon interviews will be signified solely by numbers (e.g. #1).

[6] These different types of boiler technologies involve different temperatures and steam pressure, with higher temperatures/pressures generally resulting in higher efficiency. Associated thermal efficiencies and carbon intensity for each appear in Table 4

equally shares of coal, LNG, nuclear and renewables (including hydro). Coal regime actors maintain that a self-administered Plan, Do, Check, Act (PDCA) cycle will ensure targets are met. Keidanren even points out that the current Paris Agreement pledge system involves the same approach (2016).

Two other non-regulatory instruments from METI complement this self-governance arrangement. Based on the Energy Conservation Act, the first targets individual new CFPP construction planned or built after April 2016. It stipulates a thermal efficiency (higher heating value) of 42% or more (equivalent to ultra-supercritical). The second instrument targets the electricity generation portfolio of each utility and sets two non-mandatory benchmarks for thermal efficiency: 1) a combined average of 41% for all existing and new CFPPs; and 2) a combined average of 44.3% across all coal and LNG power plants. Thus, both benchmarks promote the replacement of aged assets with newer ultra-supercritical technology but also allow a utility to keep older CFPPs since efficiency shortfalls can be offset by investments in LNG plants.

In sum, despite lacking regulatory clout, the above suite of governance instruments frequently feature in the pro-coal regime's narrative that the current rollout of new CFPPs is compatible with climate targets (ANRE, 2018f). This mix of instruments is also used to reject the need for tougher regulation such as carbon pricing (Keidanren, 2018a).

4.3. Narrative three: coal and energy security

Coal regime actors frequently frame coal as indispensable from a national energy security perspective. This narrative calls for the maintenance of a diversified electricity generation portfolio (at both the national and individual utility level) that incorporates mostly equal shares of nuclear, coal, LNG and renewables (including hydro). The *Fifth Basic Energy Strategy* articulates the need for energy mix diversification by emphasising: ‘ … in times of crisis, in the event where the supply of one particular energy source is interrupted we need to be able to swiftly and smoothly turn to other energy sources as backup. We should therefore strive to achieve a diverse and flexible energy mix’ (ANRE, 2018c: 13). The principle of maintaining a diversified electricity mix containing coal is widely normalised as a ‘best mix’ and is central to Japan's energy policy. This insistence on diversity is shaped by two historical experiences that caused widespread social anxiety and damage to the Japanese economy. Firstly, successive oil crises during the 1970's caused massive fuel shortages and price hikes in transport and electricity generation after oil imports from the Middle East were suddenly embargoed. Secondly, and more recently, chronic electricity shortages following the Fukushima nuclear disaster in 2011 provoked a national rationing of electricity to industry.

To argue that coal power is essential for reducing dependence on Middle Eastern oil and increasing energy security, pro-coal discourse (ANRE, 2018a) frequently emphasises both the widespread geographical distribution and abundance of global coal reserves. Regime actors also employ a narrative of necessity from a national security perspective by emphasising the unique and restricting geographical circumstances of Japan. This narrative portrays Japan as an ‘island nation without energy resources’ in contrast to E.U. or North American nations that are able to import energy from neighbours via international grids or gas pipelines (Keidanren, 2018a; ANRE, 2018a; FEPCO, 2017c; JCOAL, 2019). Employing this narrative, an industry-lobbying group (#3) culturally normalised Japan's energy mix and reliance on coal by pointing out unique national circumstances, which they argued should be respected by the international community:

> All a nation can do is build a best mix according to its particular circumstances. […] It's not as if we have huge deserts. We don't have shallow seas and frequent typhoons will damage offshore wind turbines. We don't have an international grid so we can't copy Germany. We are just pursuing a best mix given our conditions. We might be criticised [by other nations] but this is the type of country we are and so we have no choice.’

4.4. Narrative four: Coal's cost superiority and economic importance

Another recurring narrative concerns the economic superiority of coal power relative to other sources and the vital role this plays in boosting the international competitiveness of domestic firms through affordable electricity costs. This reasoning relies on price estimates for differing forms of electricity generation from a government committee assembled in 2014 (ANRE, 2015). Encompassing construction, fuel, maintenance and conservative carbon pricing, these estimates position coal (12.3 yen/kWh) as the second cheapest option after nuclear (10.1 yen/kWh) but ahead of LNG (13.7 yen/kWh). Conversely, prices for onshore wind (21.6 yen/kWh) and solar installations above 1 MW (24.2 yen/kWh) exceed coal around two-fold. Coal regime actors also underscore the economic burden caused by higher electricity prices[7] after the Fukushima disaster as the national nuclear fleet was idled and LNG and oil imports increased to substitute lost baseload power (FEPCO, 2017c; Keidanren, 2018a). Baseload sources such as nuclear and coal are promoted as the only realistic way to decease these costs while, conversely, the high costs of renewables and public burden of the feed-in-tariff are cited to argue for its abolishment (Keidanren, 2017; 2018a). These discourses spread fear of negative consequences for economic competitiveness by framing Japan's electricity costs as the highest in OECD nations. Keidanren literature, for instance, argues that for scrap metal recyclers a mere rise of ‘1 yen per unit of output reduces profit margins by one third’ (2017: 7) and that post-Fukushima electricity price hikes have caused widespread bankruptcies or factory closures in this industry (2018a). Coal regime actors shared these concerns, arguing that high electricity prices will risk driving firms to relocate overseas (#3,12).

5. Dissecting coal regime narratives

The following sections critically examine the above four narratives from Japan's coal regime using an array of evidence and insights derived from: 1) interviews with or documentation from coal regime actors and anti-coal/pro-renewable stakeholders; 2) data on recent market developments in the coal and electricity industry; and 3) scientific literature.

5.1. Efficiency and cleanliness of Japanese coal technology

Table 5 categorises newly operating and planned CFPPs by capacity and boiler technology. This illustrates the inaccuracy of the coal regime's narrative that *all* new domestic CFPPs are efficient. While most large projects use efficient ultra-supercritical technology and a further three involve large-scale demonstrations of emerging coal gasification technology, even the cleanest option (integrated gasification and fuel cell) will still emit roughly double the CO_2 emissions of combined-cycle LNG (Kiko Network, 2018; Tanabe, 2018). Moreover, around half of the recently constructed or still active projects are small plants below 120 MW that integrate low-efficiency, sub-critical technology.[8] This proliferation of small inefficient plants is largely due to a policy loophole where national law exempts projects less than 112.5 MW from having to implement an EIA. Small plants are particularly favourable for plant developers since construction can proceed faster without the delays and costs associated with EIA implementation[9] An interview

[7] Relative to 2010 levels (13.7 yen/kWh), retail electricity prices for industry increased by 28% in 2013 and 14% in 2016 (Keidanren, 2017).

[8] In Table 5, while most small plants fail to publicly disclose boiler technologies, it is extremely likely these would be sub-critical given the poor suitability of ultra-supercritical for small plants (Kiko Network, 2016; Nakayama, 2017).

[9] If implemented, EIAs can delay planning periods and raise construction

Table 5
List of new plants under operation, construction or planning since 2012 (includes 13 cancelled projects) as of June 15, 2019.

Capacity (MW)	Integrated Gasification and Fuel Cell (IGFC)	Integrated Gasification Combined Cycle (IGCC)	Advanced Ultra-supercritical (A-USC)	Ultra-supercritical (USC)	Supercritical (SC)	Sub-critical (Sub-C)	Undisclosed
Thermal efficiency[a] (%)	55	46–50	46	40	38	36	
Carbon intensity[a] (g-CO_2/kWh)	590	650	710	820	850	900	
> 1000				7			2
900–999							
700–899							
600–699				14	2		
500–599		2		1			
400–499							
300–399							1
200–299							
112.5–199		1				1	
< 112.5						5	13
Total: 49 (+1)**	0	3	0	22	2	6	16

Data: Individual plant data: Japan Coal Plant Tracker (2019). Thermal efficiency/carbon efficiency: METI (2016b) and other unpublished documents from METI.
[a] Average industrywide values from data in sources ** Other, non-specified steam turbine (Asahi Kasei Chemicals plant in Miyazaki).

with an incumbent utility revealed that new market entrants have actively exploited this legislation loophole (#10) while a plant equipment manufacturer admitted they have actively assisted this by suppling 'custom-built' equipment below EIA thresholds in accord with client wishes (#15).

Anti-coal stakeholders contest the coal regime's oversight of health risks from coal power. Many CFPP projects are located in densely populated areas in close proximity to kindergartens, schools and hospitals. For example, a 1.3 GW upgrade of an aged facility belonging to Kobe Steel in Kobe's port has broken ground 400 m from multi-family high-rise apartments (Shimamura, 2018) while three large projects have targeted densely populated areas in Tokyo Bay[10]. A NGO representative (#14) explained that since all new CFPPs must observe relatively stringent national and local limits for air pollutants regardless of whether an EIA is implemented, objection to new projects on health grounds is uncommon. This is due to widespread trust in anti-pollution technology and current environmental regulations. Furthermore, especially in the case of plant developers like steel mills (which can build new CFPPs on existing premises), municipalities are often reluctant to voice objections on health grounds. This is because their historical presence in communities has typically nurtured amicable relationships with residents and local governments due to economic benefits like property taxes and employment (#6).

Scientific literature cited by opposing stakeholders however demonstrates that newly added CFPPs will raise disease occurrence and premature deaths in exposed populations. Koplitz et al. (2017) concluded that Japan's existing coal fleet in 2011 was already contributing to 1,054 premature deaths annually. More recent (but unpublished) research[11] indicates that realising all proposed projects in the post-Fukushima pipeline would see this figure grow to around 1,595 premature deaths and 1,152 daily cases of child asthma and respiratory illnesses—with deaths mainly due to stroke and heart disease following exposure to PM 2.5.[12] Although this morbidity burden is far below other nations like China or the U.S., new CFPPs will nevertheless generate significant health impacts over their entire operating lifetimes, not to mention the harms inflicted upstream at sites of coal extraction (Healy et al., 2019). In contrast, economic benefits like property taxes and employment from construction—which garnish municipality support for new plants—are short-lived, and mostly confined to the first decade after construction (Kurasaka et al., 2018).

The clean coal narrative underpinning the export of coal technology to developing countries is also contested. NGOs contend that Japan has historically failed to honour its self-appointed role of contributing to international climate mitigation through clean coal technology exports. For example, projects supported by Japanese government funding agencies over the period 2010 to 2018 are dominated by low-efficiency supercritical CFPPs (Kiko Network, 2015; DeAngelis, 2018). Presently, international rules formulated in late-2015 and enacted in early-2017 by the OECD (2015) restrict public financing of CFPPs to ultra-supercritical projects, with supercritical projects under 500 MW only permitted in rare circumstances.[13] Although the Japanese government has since tightened financing guidelines to only support 'in principle' projects using ultra-supercritical technology or higher (ANRE, 2018c), opposing stakeholders (Tanabe, 2018; Hirata, 2018; DeAngelis, 2018) contend that ongoing government-backed projects continue to break OECD stipulations. This is most notable in multiple supercritical projects planned in Vietnam and India.[14] Furthermore, discussions with NGOs and industry analysts (#19,24,25) revealed that Japanese-built plants actively exploit lax environmental regulations in host countries by failing to install so-called 'best available technologies' for air pollution control. With air-pollutant emissions in some plants up to ten-times higher than domestic plants, several overseas projects supported since 2010 lack even basic equipment such as sulphur or particulate control (Hirata, 2018; Chen and Schmidt, 2017; Kiko Network, 2015).

Finally, the need for Japanese participation in the international CFPP market appears questionable when considering that new Chinese plants have reached a thermal efficiency level comparable or superior to Japan.[15] While Chinese constructions abroad have in some cases failed to meet design specifications in terms of thermal efficiency,

(*footnote continued*)
costs since government stakeholders can demand more rigorous anti-pollution technologies. Although having to meet local government ordinance requirements with regard to air pollutant limits, most newly built supercritical plants have been able to fast track planning periods by side-skirting EIA threshold requirements.

[10] Two projects planned in densely populated areas in Chiba Prefecture have recently been cancelled (i.e. the 1.07 GW plant in Soga and the 1 GW plant in Sodegaura).

[11] Data available at URL: https://act.greenpeace.org/page/21550/petition/1#more1.

[12] p.m. 2.5 from CFPPs is emitted directly from smokestacks and additionally formed in the atmosphere from SO2 and NOx reactions.

[13] For example, these include eligibility for International Development Assistance (IDA), low electrification rates, and geographically isolated conditions such as remote islands.

[14] Projects include two in Vietnam (*Nghi Son 2* [2 × 600 MW units] and *Vinh Tan IV* [2 × 600 MW units]) and two frozen projects in India (Meja [2 × 660 MW units] and Kudgi [3 × 800 MW units]).

[15] For instance, Fan et al. (2018) show that thermal efficiencies in many individual plants in China (e.g. 47.82% at Guodian Taizhou) now surpass Japan's Isogo (around 45%).

interviews (#14,24) revealed a growing awareness among actors within Japan's coal regime that being 'the most efficient in the world' can no longer be the exclusive claim of Japanese technology.

5.2. Compatibility of coal-fired electricity with climate policy

Two central arguments underpin the coal regime's narrative that coal power is compatible with government climate targets. The first is that the aforementioned governance instruments (i.e. the CO_2 emissions intensity target of 0.37 kg-CO_2/kWh and thermal efficiency benchmarks) will ensure that electricity sector emissions remain in line with the national goal of reducing emissions in 2030 by 26% from 2013 levels. However, these frameworks lack authority to prevent new CFPP constructions (Hirata, 2016). Furthermore, as a lobbying group emphasised—utilities widely see the emissions intensity target 'not as a mandatory obligation but a *commitment*' (#4). Coal regime actors assume that restarting idled nuclear reactors to achieve a 20–22% share of electricity generation in 2030 will ensure attainment of this target. Yet public opposition and tougher post-Fukushima safety regulations continue to hamper efforts to increase the share of nuclear electricity generation, which was only 4.7% in 2018. As argued by MOE (2018), without a regulatory framework such as carbon pricing to create an economic incentive for utilities to supress coal power generation, prospects of the utility industry actually achieving the emissions intensity target are still uncertain. This uncertainty is especially apparent if considering that much ambiguity still surrounds who exactly is responsible for meeting the voluntary emissions intensity target; the electricity industry as a whole or individual retailers. Moreover, it should be noted that many industries including utilities have failed to achieve voluntary carbon reduction targets previously formulated through Keidanren in 2013 (i.e. *Low-Carbon Society Roadmap*) without any legal retribution.

The second assumption is that additional coal power capacity will be offset by the retirement of older plants (ANRE, 2018c). Parra et al. (2018) however contrast the insignificant 760 MW of CFPPs currently tagged for retirement against the currently active pipeline of 16.3 GW. Moreover, a national utility representative (#4) conceded that plant retirement is 'easier said than done' due to protests from municipalities and workers facing lost employment and tax revenue. Unpublished materials from the Ministry of Environment also underscore difficulties in retiring older assets for economic reasons. CFPP plant operators have an economic rationale to delay retirement for as long as possible since fuel costs are well below gas-fired plants. Meanwhile, longer operation periods are required to recuperate relatively higher capital costs from pollution control equipment.

Given these problems, the rollout of Japan's CFPP fleet will significantly hamper long term climate mitigation by locking-in carbon intensive infrastructure. For example, the long term GHG emissions reduction target of 80% by 2050 from 2013 levels requires complete decarbonisation of the electricity sector if permitting some unavoidable emissions from other sources like industrial heat etc. However, in 2050 new and soon to be completed CFPPs would be aged only 20- to 25-years against possible operating lifetimes of 40- to 50-years (Parra et al., 2018). Since avoiding construction of CFPPs is the most cost effective way to reduce future GHG emissions (Erickson et al., 2015), aiming for the 2050 climate target while operating newly added plants will necessitate expensive investments elsewhere to offset these emissions.

5.3. Coal and energy security

Three recent market developments in Japan's coal industry challenge the regime's argument that maintaining coal in the energy mix is essential for national energy security. The first concerns a magnitude 6.7 earthquake hitting Hokkaido in September 2018, which triggered the stoppage of Hokkaido Electric Power Company's coal-fired Tomato-Atsuma plant (1.65 GW). Since this previously supplied around half of Hokkaido's electricity needs, the majority of this island's 5.4 million residents were left without power for between two to four days. Underscoring the need for a resilient and distributed energy system, renewable advocates (Takahashi, 2018) argue that this large-scale blackout demonstrates Japan's energy security vulnerability when relying on coal and centralised electricity infrastructure.

A second development concerns supply-chain vulnerabilities posed by Japan's historical overreliance on Australian coal. Currently, around 60% of thermal coal and coking coal comes from Eastern Australia. Mining operations are mostly concentrated in two regions—Hunter Valley in New South Wales for thermal coal and Bowing Basin in Queensland for coking coal. Interviews with coal regime actors revealed widespread concerns that this overdependence poses fundamental supply risks (#5,18,20,21). A large utility (#20) linked this overreliance on Australian thermal coal to the industry's historical preference for high-grade, low-ash coal. While new Japanese plants can accept a broader spectrum of grades, the majority of domestic boilers are designed to exclusively burn bituminous coal from Australia's Hunter Valley and cannot easily switch fuel types (#10,21). The vulnerability of this situation has come to light since Swiss mining company Glencore has begun aggressively expanding its market share of Australian thermal and coking coal reserves. Other companies—including Japanese firms—are also selling-off mining stakes due to a recent collapse of coal prices over 2014-16 and a loss of confidence around long-term demand for thermal coal. Consequently, a utility (#20) explained this situation is negatively impacting the negotiation power of Japanese utilities during renewals of coal purchase contracts. Meanwhile, a large trading company (#26) explained that a degree of anxiety has arisen in Japan's coal consumers over the stability of future supplies.

In reaction, government policy and coal industry organisations (JCOAL, 2019; ANRE, 2018c) are calling for new upstream development of lower grade coal reserves in Indonesia, Vietnam and China. State agencies like METI and JOGMEC support this via exploration subsidies, project financing, and technology transfer programmes (see also Table 3). Yet this push to sustain Japanese investments in overseas coal mining using public funds ignores a grim market reality whereby Japan's five largest trading houses[16] are unveiling strategies to avoid new thermal mine development and dispose existing assets while focusing investments in coking coal (e.g. Itochu, 2019; Mitsubishi Corporation, 2018).

These three market developments call into question the prevailing government paradigm of attempting to bolster energy security by using public funds to coax investment in overseas coal reserves. Private sector appetite for new upstream investments in thermal coal has vanished and trading houses are not responding to government financial incentives for this purpose (#5,18,25,26). Thus, a paradigm shift is required towards the prioritisation of developing domestic energy sources (i.e. renewables) and strengthening grid resilience via distributed energy systems (Takahashi, 2018).

5.4. Cost superiority and economic importance of coal

A further set of recent developments in Japan's electricity market challenges the assumptions underpinning claims around the cost superiority of coal-fired electricity.

The first concerns utilisation rates. The cost superiority of coal hinges on the assumption that new CFPPs will run at 70% capacity over 40-years. This underlies the previously mentioned conclusions of the

[16] So-called 'general trading houses' (or *sogoshosha* in Japanese) have historically supplied coal to domestic industry by investing in overseas mining operations and importing fuel. In alphabetical order, the five largest in terms of annual profits are *Itochu, Marubeni, Mitsubishi, Mitsui* and *Sumitomo*.

government committee charged with estimating differing sources of electricity production (see Section 4.4). Meanwhile, according to recent calculations from METI (2017b), electricity costs from LNG plants outperform coal at utilisation rates below 60%.[17] This has important consequences for CFPPs since the assumption that a 70% utilisation rate will be maintained over several decades appears highly unlikely for several reasons. First, utilisation rates in India, China, E.U. and the U.S are much lower and rapidly declining (Sartor, 2018). Second, the government's (METI, 2015) electricity mix projected for 2030 (see Table 4) optimistically assumes increasing electricity demand from economic growth. This, however, sits at odds with a declining trend since 2007 due to population contraction and economic downturn (Okubo and Kitakaze, 2017). Third, the national average utilisation rate for coal-fired electricity (currently 76%) has already peaked. Renewable advocates argue this will decline significantly further as new electricity sources come online (i.e. from renewables, idled nuclear reactors and new fossil fuel power), as energy efficiency increases, and as population decline continues (Caldecott et al., 2016; Kiko Network 2018; Okubo and Kitakaze, 2017).

It also must be noted that Japanese utilities are citing economic reasons for a suit of recently cancelled CFPPs proposals. Since early 2017, 13 projects totalling around 7 GW have been cancelled at various stages of the planning or assessment process (Japan Coal Plant Tracker, 2019). Six of these involve large ultra-supercritical constructions and five smaller plants around 112 MW. Through press statements (e.g. J-Power, 2018; Tokyo Gas, 2019) and email correspondences, the energy utilities behind these projects (comprising both large incumbent actors and new market entrants) cite concerns over a 'lack of economic feasibility' and potential investment risks as key triggers for these cancellations. More specifically, multiple economic analyses individually carried out by these utilities have lead to the shared concern that profits would be heavily impacted by reductions in electricity demand due to newly added renewable capacity and nuclear plants coming back online (J-Power, 2018).[18] Moreover, another national utility[19] abandoning a large ultra-supercritical proposal in January 2019 underscored high construction costs and concerns over 'project risks'. Specifically, they cited high capital costs required for new CFPP construction and explained that meeting the thermal efficiency benchmarks required under the Energy Conservation Law (see Section 4.2) would have necessitated additional investments. Incidentally, after abandoning plans to build with coal, two large projects in the Tokyo Bay Area (Soga [1.07 GW] and Sodegaura [2 GW]) have started feasibility studies into LNG.

6. Conclusion and policy implications

This study identified and critically examined key narratives employed by coal regime actors in Japan to justify and promote continued investment in CFPPs and coal extraction while exporting this technology abroad. Key narratives included: 1) the efficiency and cleanliness of Japanese coal technology relative to other nations, 2) benefits for energy security, 3) compatibility between coal and climate policy, and 4) coal's cost superiority. While narratives related to clean coal, energy security and cost superiority are used by coal regime actors in other countries (Leipprand and Flachsland, 2018; Kuchler and Bridge, 2018), the degree to which Japanese energy policy and climate mitigation targets are designed to permit continued exploitation of coal as a baseload power source is striking.

This paper provides evidence of two key ways that narratives can influence energy system trajectories. First, by maintaining support and ideological entrenchment around fossil fuel-based power generation and coal extraction, Japan's coal regime leverages a shared discourse to resist technological change that threatens continuation of the incumbent energy order. Second, these narratives are used to justify and drive further investment in coal power technology, as well as its deployment abroad. Discursive strategies employed for such purposes are particularly problematic given the urgent need to halt the development of new CFPPs and retire existing assets if the world is to preserve any chance of meeting temperature targets under the Paris Agreement (IPCC, 2018; Edenhofer et al., 2018; Pfeiffer et al., 2018; Nace, 2018).

Given common operating lifetimes of around 40-years (Erickson et al., 2015), new domestic and foreign CFPPs will lock in emissions intensive pathways for decades. Furthermore, by betting on a technological agenda focused on raising the efficiency of fossil fuel energy, Japan is misaligning its entire economy with global climate mitigation efforts and the growing shift towards renewables. Although a world leader in energy efficiency, per capita GHG emissions have decreased only 5% in 20-years, with increased coal burning being the main factor (MOE, 2018). Given this situation, we propose the following policy suggestions for altering the institutional and market conditions driving the recent rollout of new CFPP constructions:

6.1. Severing energy policy from the coal regime

Japan's Ministry of Economy, Trade and Industry (METI) and in-house Agency for Natural Resources and Energy (ANRE) have historically enjoyed a quasi-monopoly authority over national energy and climate policy. This has long prioritised cost and feasibility considerations for heavy industry and incumbent utilities over aggressive climate mitigation and renewables diffusion (Moe, 2012b; Kingston, 2019). While other ministries heading environmental policy and foreign affairs explicitly oppose domestic and international coal-fired electricity projects, they hold limited influence in energy policy formulation. Thus, severing ties between incumbent coal regime actors and energy policy would be greatly served by shifting energy policy to an independent agency, either existing or newly established (Edahiro, 2018). In parallel, this agency should also be charged with overseeing the implementation of EIAs and the issuing of construction permits, which is currently headed by METI. While a disruptive proposition, nuclear safety matters were notably removed from METI after the Fukushima disaster to an independent body with the aim of minimising industry's influence over nuclear policy (Sklarew, 2018; Vivoda, 2012; Oshima, 2016).

6.2. Setting a coal phase-out timeline

Rather than signalling an eventual reduction of coal-fired electricity, successive national energy policies continue to promote new CFPP construction on home soil and abroad. Moreover, these policies encourage investment in coal extraction and call for continued development of next generation coal technologies. Even the recently assembled METI committee exploring the vision for Japan's energy system in 2050 has failed to reveal any long-term desire to phase-out coal electricity (ANRE, 2018b). Such policies send powerful signals to market actors. Utilities pitching new CFPP proposals to public audiences frequently cite national policy like successive *Strategic Energy Plans* (ANRE, 2018c, 2014) and their normalisation of coal power. It is essential that Japan disrupts this signal driving new CFPP investments by establishing a specific timeline for phasing out coal (Parra et al., 2018). Heeding lessons from Germany and Canada, this could involve establishing a government-initiated committee of both coal industry and environmental actors to map out a just transition pathway beyond coal. A particularly difficult issue for this committee would be how to address the economic implications of a coal phase-out for the many incumbent utilities and plant equipment manufacturers that suffer from path dependancy to coal power due to historical expertise and investments.

[17] This is mainly due to longer operation lifetimes that CFPPs require to pay off capital and operation costs, which are roughly double to LNG-fired plants.

[18] Email Correspondence with Utility A by first author on March 29, 2019.

[19] Email Correspondence with Utility B by first author on March 29, 2019.

6.3. Carbon pricing

Whether by increasing the currently weak carbon tax or introducing a national emissions trading scheme, regulation through carbon pricing is essential for upsetting the widely perceived economic superiority of coal over low- or zero-carbon alternatives (Parra et al., 2018). Coal regime actors have historically rejected carbon pricing by promoting voluntary instruments and claiming that regulation would harm economic performance (Keidanren, 2018a). Recently, however, MOE (2018) has strategically collaborated with businesses in favour of carbon pricing to compile exhaustive evidence from Europe and abroad that carbon regulation and economic growth can co-exist. With a proposal to parliament eminent, carbon pricing would be a powerful instrument for incentivising abandonment of the majority of the CFPP proposed pipeline.

6.4. Pairing liberalisation with regulation

A valuable opportunity has been missed to decarbonise the electricity market after liberalisation was introduced in 2016. Unlike the U.K or Canada, new power plants are not subject to legally-binding emissions limits. Given that CFPPs have dominated recently added power capacity and that increased coal combustion is largely responsible for increasing energy related CO_2 emissions (MOE, 2018), government intervention is required. The voluntary emissions intensity target (0.37 kg-CO_2/kWh by 2030) self-determined by utilities is a logical start. If legally pinned to individual retailers rather than the utility industry as a whole, this could upset the current herd-like mentality, where those with lower emission portfolios are protecting freeriding and coal-intensive utilities unable to meet the target.

6.5. Re-orienting overseas investments from coal to renewables

Despite the narrative that exporting higher efficiency Japanese technology to developing countries will contribute to global climate change mitigation, additions of new CFPPs are incompatible with the Paris Agreement (IPCC, 2018; Edenhofer et al., 2018). Instead, Japan should reorientate its international diplomacy toward renewable energy deployment in line with calls from the Ministry of Foreign Affairs (2018). Plant equipment manufactures like *Mitsubishi Hitachi Power Systems* are acutely aware that global additions of thermal power will decline rapidly in the coming years (MHI, 2018). These incumbent firms must therefore develop business models compatible with increasing demand for non-fossil fuel alternatives. There are signs that industry is moving in this direction. General trading companies (e.g. *Marubeni*) and incumbent utilities (e.g. *Tokyo Electric Power Corporation*) have recently unveiled plans to dramatically increase shares of renewable power (TEPCO, 2019; Marubeni, 2018). However, since international competitiveness in this field relies on domestic experience, government foresight is required to steer domestic utilities and power plant manufacturers towards renewables. Although METI has recently played a proactive role to foster offshore wind development (METI, 2019), more efforts are required to overcome other policy, political, and institutional barriers, which still hamper the domestic diffusion of renewables—particularly wind and geothermal. Among other issues, these include overhauling rules governing grid connectivity (since utilities can legally refuse grid access to renewable project implementers), streamlining and fast-tracking environmental assessment procedures for wind farms (currently, projects above 7 MW require lengthy assessments) and additionally, increasing the projected share of renewables (especially wind and geothermal) in the 2030 electricity mix. This last action especially would spur investor confidence and large-scale projects. In turn, this would drive economies of scale (which coal power current enjoys) and bring down the currently high costs for renewables.

Beyond Japan, urgent global measures are needed to confront coal dependency and avoid continued carbon lock-in by discouraging new investments in coal power infrastructure and extraction. If observing the principle of 'common but differentiated responsibilities' in international climate governance, technologically advanced nations who have attained economic prosperity by exploiting fossil fuels have a historical responsibility to reduce coal consumption first. Yet this study provides evidence that some nations will overlook this responsibility, and employ various narratives to justify the continuation and further deployment of coal power.

Disclosure of interests

The authors declare no conflicts of interest.

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Appendix. Appendix

Details of interviews

Date	Organisation (common abbreviation or alternative name)	Industry type	No. of respondents
18/12/2017	Keidanren (Japan Business Federation)	Industry lobbying group	2
20/12/2017	Renewable Energy Institute	Thinktank (domestic)	1
25/12/2017	Japan Centre for a Sustainable Environment and Society (JACSES)	NGO (domestic)	1
12/1/2018	Ministry of the Environment	Government	1
15/1/2018	Tohoku Electric Power Co. Inc.	Utility	1
16/1/2018	Federation of Electric Power Companies of Japan (FEPCO or Denjiren)	Utility	5
18/1/2018	JERA	Utility	1
23/1/2018	Tohoku Electric Power Corporation	Utility	2
25/1/2018	Renewable Energy Institute	Thinktank (domestic)	1
26/1/2018	Influence Map	Thinktank (international)	1
30/1/2018	National Resources Defence Council (NRDC)	NGO (international)	1
16/4/2018	Aizu Electricity Corporation; Institute for Sustainable Energy Policies (renewables focused research institute)	Utility (Fukushima-based renewables specialist); Thinktank (domestic)	2
5/2/2018	University of Tokyo (Graduate School of Public Policy) & Ministry of Trade, Economy and Industry (METI)	Government and academia	1
6/2/2018	Japan Coal Energy Centre (JCOAL)	Industry lobbying group	7

6/2/2018	SB Energy Corporation	Utility (renewables specialist)	1
1/3/2018	Nippon Steel Federation	Steel industry lobbying group	5
8/3/2018	Japan, Oil, Gas and Metals National Corporation (JOGMEC)	Government	4
14/5/2018	Toshiba Energy Systems	Plant systems manufacturer	3
22/5/2018	Kiko Network	NGO (domestic)	1
31/5/2018	E's Incorporated	Journalist, consultant and government committee member	1
5/6/2018	Japan Bank for International Development (JBIC)	Government	2
11/7/2018	Shizen Energy	Utility (renewables specialist)	1
31/7/2018	Kobe University (Faculty of Law)	Academia/local resident	1
3/9/2018	Citizen support network in Chiba Prefecture	Local resident	1
18/9/2018	CCS Demonstration Project in Tomakomai, Hokkaido	Carbon capture and storage demonstration and research	3
20/11/2018	Marubeni	General trading company (with investments in coal mining, coal power and renewable electricity)	4
10/12/2018	Mitsubishi Corporation	General trading company (with investments in coal mining, coal power and renewable electricity)	3
19/12/2018	Mitsubishi Hitachi Power Systems	Plant systems manufacturer	1
19/1/2019	Mizuho Bank	Finance (industry research)	1
22/3/2019	Greenpeace Japan	NGO (domestic)	2

* Order of listing does not correspond with interview codes in findings.

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