The Policymaking Process to Restart Japanese Nuclear Power Plants

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Key Points

The Japanese government's decision to continue restarting nuclear power is shaped by a combination of domestic political concerns, energy security challenges, and its ability to meet climate change commitments and targets. Nuclear power plants have started to come back online, but there is still a question regarding the scope and timing for restarting the remaining reactors. In this paper, we apply a model of collective decision-making processes (CDMPs) to assess the political will for restarting nuclear power plants in Japan. We find that:

There is growing political will among Japanese stakeholders to restart nuclear reactors for power generation. Over the next several years, the current political trajectory indicates political acceptance of nuclear power among municipal and prefecture political leaders, who are currently the most significant and consequential opponents to nuclear power. Local governments have the ability to block the restart of nuclear power plants.

Visualization of expert data – baseline scenario. Turn 0 distribution of positions and exercised power.

Source: KAPSARC KTAB analysis.

Key Points

- The process of regaining national support for nuclear power in Japan is expected to take several years of domestic political debate.
- The Nuclear Regulation Authority (NRA) appears to be a credible and effective voice in building political acceptance of restarting nuclear power plants, given enough time. However, it is important that the NRA maintains its role as an unbiased and fact-based entity, to maintain its credibility with opponents to nuclear power.
- Despite the turbulence in Japanese politics in 2017, the trend of slowly growing political will in favor of nuclear power appears to be largely unchanged.

Executive Summary

Beginning in the 1960s, and continuing in the 1970s, Japan embraced the use of nuclear power to fulfill its demand for electricity.

However, the earthquake and subsequent tsunami that triggered the Fukushima-Daiichi nuclear incident in 2011 led the Japanese government to shut down all of its 54 nuclear reactors. As a result, Japanese reliance on imported liquefied natural gas, coal and fuel oil took nuclear power's place in the energy mix. Public opinion, and consequently the advocacy of political leaders at the municipal and prefecture governments, is still opposed to the use of nuclear power in Japan. Amid a backdrop of sustained popular opposition to nuclear power among many localities, as of August 2018, Japan had restarted eight nuclear power plants, and there is continuing debate about whether to restart additional plants.

In this paper, we evaluate the evolving political will in Japan to restart nuclear power plants to generate electric power. We apply a model of collective decision-making processes (CDMPs), using the KAPSARC Toolkit for Behavioral Analysis (KTAB), to simulate the interactions among different interest groups including policymakers, local political leaders, influencers, electricity companies, and the public, given their varying interests, goals and priorities. As a result, the KTAB analysis allows us to assess the political feasibility of reaching consensus, and more importantly the potential for a shift in the attitudes of municipal and prefecture political leaders on the issue of restarting nuclear power plants in Japan. Municipalities and prefectures in the vicinity of a nuclear reactor have an informal veto over the decision to restart that reactor. Without the support of the local populations and thus the agreement of

local political leaders, many nuclear reactors will not be restarted.

The KTAB CDMP model utilizes data collected in semi-structured interviews of subject matter experts. The data were initially collected in May 2017. Because of the tumultuous period of Japanese domestic politics in the second half of 2017, the data were updated several times to reflect changing conditions in Japan's political environment. These results are provided as scenarios that deviate from the baseline simulation.

We find that there is growing political will, over the course of the next several years, to restart nuclear power in Japan. This trend is expected to include mayors and municipal governors who currently oppose nuclear power. The process to regain support for nuclear power is not expected to be rapid but, throughout each of the scenarios tested, we find that the trend holds (even when the opposition party, with an anti-nuclear platform, appeared to have the upper hand in the national political arena).

The Nuclear Regulation Authority (NRA) was established in September 2012, after the Fukushima disaster, and its approval is a prerequisite for the restart of each reactor. In the KTAB simulations, we found that the NRA and its head play significant roles in moderating the opinions of anti-nuclear actors and are critical factors in building consensus for a wide-scale nuclear restart. However, the NRA's persuasiveness is closely linked to the perception that it takes an apolitical and neutral view regarding nuclear power. If the perception of the NRA as an unbiased entity is disrupted, the trend toward growing political will is unlikely to continue.

Introduction

Energy security is a core concern for Japan. As an island nation without indigenous sources of energy, Japan has had to rely heavily on imported fossil fuels, putting the country's energy system at risk if there were to be a geopolitical event that disrupted shipping in East Asia. Since the 1973 oil crisis, energy sources have been a national strategic priority to Japan, leading the country to embrace the use of nuclear power to fulfill a portion of its energy demand. The Fukushima-Daiichi disaster of 2011 resulted in the shutdown of all nuclear reactors in Japan and forced a renewed and increased reliance on imported coal, liquefied natural gas (LNG) and fuel oil. The disaster has had long-lasting polarizing effects on public opinion regarding nuclear power, not only in Japan but globally (e.g., Energiewende in Germany). In the aftermath of the global news coverage of the disaster, the risks of a catastrophe involving nuclear power have significantly reduced the public's willingness to have any nuclear power, particularly in a geographically-small country like Japan. Municipal-level and prefecture-level elections in Japan are significantly driven by candidates' stance on nuclear power, and the polarized views on nuclear power at the national level. In this paper, we use the KAPSARC Toolkit for Behavioral Analysis (KTAB) to assess the political will to restart nuclear reactors in Japan.

In a speech at the International Energy Forum in Riyadh on October 16, 2017, Masakazu Toyoda (Chairman and Chief Executive Officer of the Institute of Energy Economics, Japan) highlighted two factors that will affect when and how nuclear power will be reintegrated into the energy mix, and whether the Ministry of Economy, Trade and Industry's (METI) target of a 20-22 percent share of the energy mix from nuclear energy by 2030 will be achieved. First, elections that change the composition of Japan's National Diet will shape

national policy on the issue of nuclear power. More importantly, the nuclear industry must regain the public's support which, as further demonstrated in this study, heavily relies upon the autonomy, neutrality and transparency of nuclear regulatory institutions.

Political climate

During the 2011 Fukushima-Daiichi incident, the Democratic Party of Japan (DPJ) was the country's ruling party. The DPJ has historically been the opposition to the Liberal Democratic Party's (LDP) rule for almost 60 years. Although nuclear energy had initially been a part of the DPJ's energy plans, the Fukushima disaster forced an unexpected nuclear shutdown. Later in June 2012, Prime Minister Yoshihiko Noda ordered the reactivation of two nuclear reactors at Ohi plants, arguing that the Japanese economy could not survive without the use of nuclear energy. In the eyes of the public, the process of recovering from the Fukushima accident was not well managed under the DPJ government, resulting in widespread public outrage and a significant DPJ loss in the 2012 general election. This demonstrates how poor handling of the political challenges and public views of nuclear power can mark the end of political careers.

The LDP regained power a year after the disaster, and Prime Minister Shinzo Abe and his cabinet began preparing for a nuclear restart. The rationale for nuclear power articulated by the Abe government focuses on the multiple economic and geopolitical threats that could disrupt Japan's energy supply, such as:

- A reliance on fossil fuels increasing Japan's industrial deficit.
- The increasing cost of electricity tariffs following the introduction of a fossil fuel tax.

- The ongoing political disputes in the China Sea.
- The increasing threats and escalation from North Korea.

Abe and his administration are keen on reintegrating nuclear power into the energy mix, abolishing the Energy and Environment Council, created by the DPJ in late 2012 along with the National Policy Institute. Abe's new government has created an agency that enjoys independent decision-making authority based on scientific and technological information, free from any outside pressure to develop new safety standards and confirm the safety of individual units. This new agency is the Nuclear Regulation Authority (NRA), an independent, apolitical government entity formed

from the Nuclear Safety Commission. In 2013, the NRA released new regulatory requirements after extensive public consultation. The new standards are comprehensive, particularly when compared to pre-Fukushima standards.

Figure 1 provides a view on the hurdles that must be overcome in order to restart a nuclear reactor in Japan. To begin the process, the electric power company that owns the particular nuclear reactor must submit a request to the NRA to restart the reactor. If the reactor is deemed safe and technically sound after an extensive and careful review by the NRA, then an informal process takes over before a final decision to restart a reactor is made. While not a formalized part of the decision-making process, the governor of the prefecture where the

Figure 1. Decision process for restarting Japanese nuclear reactors.

Source: KAPSARC.

nuclear reactor is located, as well as the municipal mayor proximate to the reactor site, each have the ability to ‘veto’ the decision to restart. If either the governor or the mayor opposes resuming operations, then it will not be reopened. In some cases, advocacy organizations file an injunction to block a reactor’s restart, which provides the judiciary with an opportunity to weigh in given the merits of the legal case. The Kansai case is a good example of judicial intervention, when the operator received an order from the district court not to restart Ohi 3 and 4 in the Fukui Prefecture following public concerns. However, Kansai, with local government support, appealed the ruling, resulting in both reactors coming back online earlier in 2018. Only after such hurdles have been overcome can a reactor be brought back to criticality.

Prefecture and municipal politicians are highly sensitive to the issue of nuclear power. The ability to win an election often swings on the candidates’ position on nuclear power and the particular views of that localities’ population. In an exception that proves the rule, in June 2018 the LDP-backed governor of Niigata Prefecture, Hideyo Hanazumi, won the gubernatorial elections without stating his position on the nuclear restart. The Niigata Prefecture holds two large nuclear power reactors (the Kashiwazaki-Kariwa nuclear power plant), and despite the importance and sensitivity of the nuclear issue to the locals, the candidate’s position on nuclear restart did not drive the election results. Hanazumi’s victory signals the increased probability that Prime Minister Shinzo Abe will win a third term in the LDP presidential election in autumn 2018, but it also allows him to pass legislation that favors a nuclear restart in Niigata (Japan Times, June 2018).

Abe’s government currently finds itself in a stronger position following developments in the second

half of 2017 and 2018 that has altered the political climate. First, Abe’s popularity, which plummeted in July 2017, recovered in part due to the tough position he is taking against increasing threats from North Korea, but also because of the resignation of his DPJ opponent, Renho Murata, in August 2017, as well as a reshuffling of his cabinet later in August. Some analysts speculate that these events could help Abe’s government further build public support for nuclear power. Yet recent polls have shown that 55 percent of the population continue to oppose nuclear power.

Japan’s energy system

Japan is the world’s third-largest industrial economy behind the United States and China, which means any disruption to its energy mix could have significant implications for its economy. Japan currently depends on imports for over 90 percent of its primary energy needs. Its nuclear energy program became a strategic priority following the 1973 oil embargo, and ultimately the country’s 50 reactors were able to generate up to 30 percent of the country’s electricity, with a goal of increasing the nuclear share to 40 percent by 2017. However, public sentiment shifted following the 2011 disaster, with widespread protests calling for nuclear power to be phased out completely. Figure 2 shows the Japanese energy mix before and after the disaster.

The first two reactors restarted operations in August and October 2015, respectively, with additional reactors coming back online. As of August 2018, nine reactors have been restarted and supply electricity to the grid.

Japanese energy policy has long been driven by considerations of energy security: the need to minimize dependence on growing energy imports while also maintaining economic competitiveness.

Japan's shortage of domestic energy reserves has always been a powerful influence on the country's policies, as it lacks any indigenous natural energy resources. As a result, Japan is the largest consumer and importer of LNG in the world. Following the 2011 disaster, "major Japanese companies such as Mitsui and Mitsubishi started investing heavily in LNG production capacity from Australia and elsewhere" (World Nuclear Association 2018b).

According to the Trade and Industry Agency for Natural Resources and Energy, Japanese energy

self-sufficiency since halting its nuclear energy program is at only 6 percent, as it does not have a grid connection or a pipeline network with neighboring countries. Therefore, energy security and the reintegration of nuclear power, or a radical replacement fuel source such as hydrogen, remain crucial issues. As Figure 2 shows, LNG and coal became nuclear alternatives, resulting in Japan's status as a price-taker for LNG markets. In June 2015 the government announced the 2030 Plan for Electricity Generation, which anticipates that by 2030 nuclear power will account for between 20-22 percent of all energy generated.

Figure 2. Japanese energy mix, 2005-2015.

Source: International Energy Agency.

Environmental effects

Another factor motivating Japan to restart nuclear reactors is its nationally determined contribution (NDC) under the United Nations Framework Convention on Climate Change (UNFCCC). Despite the increased reliance on renewable and alternative sources of energy, Japan risks failing to meet its commitment under the UNFCCC if it does not achieve the 20-22 percent nuclear power target. Nuclear energy was an integral part of Japanese plans to achieve the emission reduction

target of 25 percent by 2020. With the shutdown of all nuclear reactors, Japan had to switch to thermal power to fill the void, resulting in more carbon dioxide emissions at a time when it hoped to reduce its emissions. Carbon dioxide intensity from the electricity industry increased to 39 percent in 2012, an 8 percent increase in emissions when compared to the rate before shutting down nuclear energy. Therefore, climate targets also provide pressure on Abe's government to reintegrate nuclear power into the energy system.

The KAPSARC Toolkit for Behavioral Analysis

The KAPSARC Toolkit for Behavioral Analysis (KTAB) is an open source platform that enables the modeling and analysis of collective decision-making processes (CDMPs). CDMPs are distinguished from other decision-making processes in that:

They involve more than one actor, be it an individual, institution, or identifiable group or 'bloc'.

A single decision is arrived at as a result of some form of coordinated interaction between a finite set of actors.

The form of this interaction is different to large group decision-making processes such as the market-based derivation of a price, which is the result of the uncoordinated actions of countless individuals.

In this paper, we will present an analysis of plausible outcomes for the collective decision-making processes that decision-makers and stakeholders in Japan are currently engaged in regarding the nuclear restart in power generation. To do so, we used a specific instantiation of a model in KTAB, based on the Spatial Model of Politics (SMP), which is one of the most prominent models of CDMPs. It analyzes collective choice or actions of societal actors with various preferences, behavior assumptions and information under pre-defined institutional rules. The theory assumes an individual has well-defined preferences over a given set of alternatives, and will choose any alternative with the property that no other alternative in the set is strictly more preferred by the individual; that is, the social actor will choose a "best" alternative. The SMP models examine the possibility that individual preferences are directly aggregated into a collective preference relation which is then maximized to yield a set of best alternatives,

where 'best' is defined as being the most preferred with respect to the collective preference relation (Austen-Smith and Banks 1998). While we have chosen to use one model for our simulations, KTAB is a toolkit that enables almost limitless variant models to be implemented, based on different assumptions as to how various CDMPs work. Any and all of the assumptions in this paper can be changed, and new models built in the KTAB framework.

For this paper, we have deliberately chosen to focus on the logic of the analysis and to present a description of the results. What this paper does not contain is a detailed technical description of the underlying model and its calculations. Interested readers are pointed to two related KAPSARC papers for more detail:

An Introduction to the KAPSARC Toolkit for Behavioral Analysis (KTAB) Using One-Dimensional Spatial Models (Wise, Lester and Efird 2015a).

Multidimensional Bargaining using KTAB (Wise, Lester and Efird 2015b).

Both papers are available from KAPSARC's website, specifically the KTAB portal, as is the program's source code and documentation. Please visit <http://ktab.kapsarc.org> for all related papers, and <http://www.ktab.software> for the KTAB project page, which includes all relevant information, including the source code and software.

Approach and assumptions

When analyzing CDMPs, one way to show the preferences of and differences of opinion between the various actors is to represent them graphically using a technique referred to as spatial preferences,

where the distance between points on a line that captures possible advocacy reflect the spatial component in this approach (Wise, Lester and Efird 2015b; Efird, Lester and Wise 2016). This approach forms the basis for a model we have implemented in KTAB, the SMP. We apply the SMP to the question of the political feasibility of reintegrating nuclear power into power generation in Japan. The essential aspects of the SMP for the purpose of this study is that a set of actors are defined for their different positions on the issues, the influence they can exert on issues, and their particular salience (or concern) for the issues, respectively. Position, influence, and salience are all captured numerically on a scale of 0 to 100 during semi-structured interviews with subject matter experts. It is the combination of influence and salience that gives a particular actor their ultimate power in making the particular outcome for an issue more or less likely. For further details on the KTAB SMP, consult the aforementioned papers.

Model dynamics: Turns in the KTAB SMP

KTAB's SMP provides a simulation of how actor positions change over time. Time is captured in a

series of iterations or 'turns.' The exact length of time a turn takes is an abstraction: a turn should be thought of as any period of time during which all actors can exchange information and attempt to influence each other. The results of the simulation present the turn-by-turn changes to actors' positions. These shifts in position are based on several different factors in the model, all operating simultaneously. Generally speaking, the behavior of individual actors can vary quite widely, based on the configuration of numeric values in a particular data set. There is no such thing as a 'rule of thumb' regarding how the simulation unfolds. Sometimes actors will move only incrementally as the turns progress; sometimes they may make much larger moves in the simulation. In this paper, we will focus on the high-level outcomes calculated by the KTAB simulation, while trying to provide some explanation for the numeric calculations that result in the most interesting shifts in actor positions.

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Defining the question

When beginning a study of this nature, the first task is to define the modeled question. In the case of restarting Japanese nuclear reactors, we would like to evaluate the disposition of key stakeholders on this issue. This type of question lends itself well to a linear scale that captures a range of potential support for restarting nuclear power, as shown in Figure 3.

The spectrum defined in Figure 3 will provide the range of positions that actors can take on this question. For example, actors that take a position close to 50 take a neutral view regarding the notion of restarting nuclear power. Actors taking a position of 100 at the far right of the figure are fully supportive of restarting the nuclear power plants, while actors that take a position of 0 are fully opposed to nuclear restarts. Positions ranging from 0 to 50 reflect increasing opposition, and positions ranging from 50 to 100 reflect increasing support, with the severity of opposition or support dependent on the distance between an actor's position and the two extremes on the scale.

The KTAB SMP data inputs

As previously referenced, all data for the KTAB SMP model were obtained through semi-structured interviews with subject matter experts. Interviews were conducted with the explicit agreement not to attribute specific answers to any particular expert. Moreover, experts were also given the opportunity to keep their contribution completely anonymous. Ten subject matter experts were initially interviewed in Tokyo, Japan from May-June 2017. The names of the experts are not listed in this paper to protect their confidentiality, but the consulted experts included individuals from government (former and current), industry, academia, print media and think tanks.

It is important to emphasize that the experts only provided numeric values described in this section, and that this paper does not represent their views or conclusions regarding this issue.

As with any KTAB study, a comprehensive list of actors was identified, including policymakers, stakeholders and influencers. Three specific

Figure 3. Spectrum of positions: Range of advocacy opposed to or supportive of restarting nuclear power.

Source: KAPSARC.

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quantitative attributes for each actor were obtained during interviews. Those attributes are defined as:

Position: The location of an actor on the linear spectrum. In other words, what is the actor's advocacy concerning support for, or opposition to, restarting nuclear power in Japan?

Influence: The relative overall degree of political power, or clout, for each actor. The most powerful actor is assigned a value of 100, and other actors are weighted relative to the most powerful actor.

Salience: The relative priority each actor assigns to the modeled question as compared with other issues over which the actor must exert influence.

During interviews in Tokyo, it became clear that the word "position" could be translated in at least two ways. Two Japanese words turned out to provide a very useful distinction that helps clarify the intent of the position attribute in ways that English cannot. *Honne* (本音) reflects a person's true feelings and desires but, as they may conflict with societal expectations, 'honne' is often kept hidden (however, it is often well-known even though it is not spoken about). *Tatemae* (建前) conforms to societal expectations and is likely a politically neutral stance that will minimize offense and, as a result, may not match a person's honne (Doi 1985). For the purposes

of KTAB data elicitation, we treated position as the actor's honne.

Data collected during the expert interviews were then aggregated into a single data set, henceforth referred to as the baseline data set. Whenever there are differences of opinion regarding the assignment of values, particularly for key stakeholders, we make note of this in order to perform a sensitivity analysis. Table 1 presents the baseline data set. This table represents stakeholder data, utilizing the collective knowledge of the actors from our 10 interview subjects to assign values for position, influence and salience. Exercised power is simply the product of influence and salience (i.e., the two values multiplied by each other), and indicates the amount of influence an actor is willing to apply to this issue.

The KTAB module used in this paper is the Spatial Model of Politics (SMP). More information about the SMP can be found in Wise, Lester and Efird (2015a, 2015b). Simulations with the KTAB SMP model rely only on this data set. The model simulates how actors interact with and influence one another over time to arrive at a 'feasible outcome' for the modeled question. This reflects a model-based view of the expected outcome for actors' collective support for – or opposition to – restarting Japanese nuclear power, relying on the aggregate knowledge of experts to characterize the current political landscape.

Table 1. Expert-based actor data.

Actor	Legend	Group	Influence	Position	Salience	Exercised Power
Prime Minister	Abe	Central Govt.	98	90	32	31
Chief Cabinet Secretary	Suga	Central Govt.	84	72	37	31
Executive Secretary to the Prime Minister	Imai	Central Govt.	58	77	40	23
Deputy Prime Minister/Minister of Finance	Aso	Central Govt.	25	80	26	7

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Minister of Economy Trade and Industry	Seko	Central Govt.	60	90	58	35
Ministry of Economy Trade and Industry	METI	Central Govt.	72	82	66	48
Agency for National Resources and Energy	ANRI	Central Govt.	61	88	70	43
Minister of the Environment	Yamam	Central Govt.	18	48	26	5
Minister of State for Reconstruction	Yoshino	Central Govt.	18	25	22	4
Minister of Health, Labour and Welfare	Shiozaki	Central Govt.	18	60	22	4
NRA Chairman	Fuketa	Regulator	93	56	96	89
Nuclear Regulation Authority	NRA	Regulator	100	51	97	97
Democratic Party	Murata	Politicians	23	6	48	11
Japanese Communist Party	Comm	Politicians	11	0	47	5
Liberal Democratic Party	LDP	Politicians	41	73	41	17
Taro Kono	Kono	Politicians	2	0	65	1
Komeito	Komeito	Politicians	35	56	41	14
Japan Nuclear Safety Institute	JANSI	NGOs	28	100	93	26
Central Research Institute of Electric Power Industry/Nuclear Risk Research Center	NRRC	NGOs	23	100	94	22
Institute of Energy Economics Japan	IEEJ	NGOs	37	91	67	25
Japan Atomic Industrial Forum	JAIF	NGOs	38	98	97	37
Science Council of Japan	SciCoun	NGOs	24	26	48	11
Japan Federation of Bar Associations	Jbar	NGOs	25	13	57	14
Atomic Energy Society of Japan	AESJ	NGOs	20	100	98	19
Greenpeace Japan	Green	NGOs	37	0	68	25
Small anti-nuclear NGOs	NGOs	NGOs	40	0	95	38
Metropolitan Coalition Against Nukes	Metro	NGOs	37	0	88	32
Hitachi	Hitachi	Business	48	95	56	27
Mitsui	Mitsui	Business	14	55	27	4
Mitsubishi	Mitsub	Business	33	94	57	19
Toshiba	Toshiba	Business	21	83	58	12
Japan Business Federation	Keidanren	Business	55	92	66	36
Judges in District Courts – neutral	JudgeNeu	Judiciary	15	50	38	6

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Judges in District Courts - anti-nuclear	JudgeAnti	Judiciary	32	32	77	25
High Court	JudgeHigh	Judiciary	47	50	42	20
Supreme Court	JudgeSup	Judiciary	78	50	50	39
Asahi Shimbun	Aasahi	Media	42	7	70	30
Nikkei	Nikkei	Media	33	56	55	18
Yomiuri Shimbun	Yomiuri	Media	33	83	58	19
NHK TV	NHK	Media	42	41	53	22
TV Asahi	AsahiTV	Media	32	7	65	20
TBS Television	TBS	Media	40	20	50	20
Fuji Television	FujiTV	Media	40	78	50	20
Nippon TV	NipponTV	Media	40	73	50	20
Chubu Electric Power Company	ChubEPC	Electric Power Cos.	14	89	74	11
Chugoku Electric Power Company	ChugEPC	Electric Power Cos.	14	91	72	10
Hokkaido Electric Power Company	HokkEPC	Electric Power Cos.	14	100	79	11
Hokuriku Electric Power Company	HokuEPC	Electric Power Cos.	14	100	81	11
Japan Atomic Power Company	JAPC	Electric Power Cos.	13	100	96	12
Kansai Electric Power Company	KEPCO	Electric Power Cos.	19	100	94	18
Kyushu Electric Power Company	KyuEPC	Electric Power Cos.	15	100	92	14
Shikoku Electric Power	ShikEPC	Electric Power Cos.	13	100	81	11
Tohoku Electric Power	TohEPC	Electric Power Cos.	14	97	81	11
Tokyo Electric Power Company Kashiwazaki	TEPCO	Electric Power Cos.	12	90	74	9
J-Power (Electric Power Development Company)	Jpower	Electric Power Cos.	10	93	81	8
Federation of Electric Power Companies	FEPC	Electric Power Cos.	20	100	84	17
Kagoshima Prefecture Governor	KagGov	Local	29	58	60	18
Satsumasendai Municipality Mayor	SatMay	Local	24	100	100	24
Ehime Prefecture Governor	EhiGov	Local	22	89	55	12
Ikata Town Mayor	IkaMay	Local	22	100	80	18
Fukui Prefecture Governor	FukiGov	Local	25	94	76	19
Mihama Town Mayor	MihMay	Local	18	100	80	14
Ohi Town Mayor	OhiMay	Local	18	100	80	14

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Takahama Town Mayor	TakMay	Local	18	100	80	14
Tsuruga Town Mayor	TsuMay	Local	18	100	80	14
Aomori Prefecture Governor	AomGov	Local	24	86	70	17
Oma Town Mayor	OmaMay	Local	22	100	80	18
Higashidori Village Mayor	HigMay	Local	22	100	80	18
Ibaraki Prefecture Governor	IbaGov	Local	27	32	62	17
Tokai Village Mayor	TokMay	Local	28	100	80	23
Ishikawa Prefecture Governor	IshGov	Local	24	66	58	14
Shika Town Mayor	ShikMay	Local	21	100	80	17
Niigata Prefecture Governor	NiigGov	Local	38	12	75	28
Kashiwazaki Town Mayor	KashMay	Local	32	87	75	24
Kariwa Town Mayor	KariMay	Local	32	100	75	24
Niigata Prefecture – population	NiigPop	Local	24	0	55	13
Saga Prefecture Governor	SagGov	Local	21	85	65	14
Genkai Town Mayor	GenMay	Local	20	100	100	20
Shimane Prefecture Governor	ShimGov	Local	23	43	58	13
Matsue Municipality Mayor	MatsMay	Local	20	93	100	20
Shizuoka Prefecture Governor	ShizGov	Local	30	21	75	22
Omaezaki Municipality Mayor	OmaeMay	Local	31	40	95	30
Hokkaido Prefecture Governor	HokkGov	Local	33	71	72	24
Tomari Town Mayor	TomMay	Local	38	100	100	38
Miyagi Prefecture Governor	MiyGov	Local	26	58	61	16
Ishinomaki Municipality Mayor	IshiMay	Local	26	100	100	26
Fukushima Prefecture Governor	FukuGov	Local	26	4	68	18
Fukushima Prefecture – population	FukuPop	Local	15	0	90	14
Public in Prefectures without NPPs (pro-nuclear)	PubPro	Local	8	85	45	4
Public in Prefectures without NPPs (neutral)	PubNeu	Local	42	46	35	15
Public in Prefectures without NPPs (anti-nuclear)	PubAnti	Local	11	15	45	5
World Association of Nuclear Operators	WANO	Foreign	4	100	68	3
International Atomic Energy Agency	IAEA	Foreign	5	100	68	3

Source: KAPSARC.

Altering Scenarios as a Result of a Changing Political Climate

2017 was an eventful year in Japanese politics. A KTAB data set should be thought of as a ‘snapshot’ in time. That is, the interviews obtain the current set of actors and their advocacy, influence and salience at the time of data collection. However, in many cases the actors may change, their priorities may change, their disposition toward a political issue may change – all due to exogenous factors in terms of the KTAB SMP model. Some of the data needed to be adjusted multiple times to reflect changes in the Japanese political environment. We describe each revised version of the baseline data set, and its associated simulation results, as a scenario. The KTAB approach supports the idea that data change over time, i.e., that the actors may change, and the model makes assumptions about those changes.

The first scenario was needed because of a series of scandals and cronyism accusations, causing Prime Minister Abe to experience a significant drop in popularity. By July 2017, he suffered his lowest popularity rating since coming to power in 2012. First came the Moritomo Gakuen scandal, where an ultra-

nationalist private elementary school had purchased government-owned land at a massive discount, and eventual links between the school’s founder and Abe’s wife were alleged. Next came the Kake Gakuen scandal. It was the first veterinary school to receive government approval in over 50 years (because there was already an adequate number of veterinary schools to meet demand). The school was founded by a close friend of Abe, amid allegations that the Cabinet Office influenced the Education Ministry’s decision. Tokyo elections have historically been seen as a barometer of national politics and, in addition to the aforementioned scandals, a significant LDP defeat in the Tokyo Metropolitan Assembly elections at the hands of the newly founded Tomin First no Kai (Tokyoites First) party demonstrated the shift in unfavorable public opinion regarding Abe and the LDP.

In order to best reflect the new environment in which Abe and the LDP were forced to maneuver because of their massive drop in popularity, changes to actor data were required. Table 2 shows the new values

Table 2. Post-Abe Popularity Drop Scenario actor data.

Actor	Influence	Position	Salience	Exercised Power
Prime Minister	88	90	45	28
Chief Cabinet Secretary	76	72	37	28
Executive Secretary to the Prime Minister	52	77	40	21
Deputy Prime Minister/Minister of Finance	32	80	26	8
Minister of Economy Trade and Industry	54	90	58	31
Ministry of Economy Trade and Industry	65	82	66	43
Agency for National Resources and Energy	55	88	70	39
Minister of the Environment	16	48	26	4
Minister of State for Reconstruction	16	25	22	4
Minister of Health, Labour and Welfare	16	60	22	4
Democratic Party	23	6	65	15
Liberal Democratic Party	37	73	41	15
Taro Kono	2	0	65	1

Source: KAPSARC.

assigned to actors highlighted in red; all other actor data remained the same. In order to demonstrate the effect of a drop in support for Abe and the LDP, the influence of each of the LDP actors was reduced by 10 percent. It was expected that the DPJ would begin to assert itself politically as a result of a drop in LDP popularity. Thus, Renho Murata, the leader of the opposing Democratic Party, was assigned a significant increase in her salience, to reflect the political opportunity presented during this period of relative LDP weakness. Abe's salience was increased to reflect an expected push toward securing his pro-nuclear constituency base. Additionally, Deputy Prime Minister Taro Aso's faction had recently merged with the Santo faction, creating the second largest coalition within the LDP. Thus, Aso's influence was slightly increased to reflect his now-elevated role within the ruling party as the head of its second-largest faction. The aforementioned changes comprise the data for the 'Post-Abe Popularity Drop' scenario.

In August 2017, Renho Murata resigned from her position as the Democratic Party leader, several days following the resignation of Yoshihiko Noda,

the DPJ's secretary-general. It is generally accepted that Murata and Noda's resignations were caused by the DPJ's disappointing results during the Tokyo Metropolitan Assembly election, with Murata claiming that "the best way forward is I step down so a stronger leadership can take my place" (Harding 2017). Murata and Noda's resignation signaled disarray within the DPJ, requiring us to reverse the earlier change that increased the DPJ's influence during the LDP's moment of weakness. This led to a significant reduction in Murata's salience to reflect the change in priorities within the party: a shift from an assumed attempt at capitalizing on LDP weakness to focusing on an organizational restructuring instead. While Renho Murata was no longer in this position, for the purposes of this data set, the actor named Renho Murata captures the advocacy and behavior of her successor in the DPJ. To balance the new weakness of DPJ actors, we increased LDP actors' influence by 10 percent. We refer to this scenario as the 'Post-Murata Resignation' scenario. Again, changes to the data are reflected in red in Table 3. Once more, all other data remain unchanged from the Post-Abe Popularity Drop Scenario and baseline data set.

Table 3. Post-Murata Resignation Scenario actor data.

Actor	Influence	Position	Salience	Exercised Power
Prime Minister	98	90	45	44
Chief Cabinet Secretary	84	72	37	31
Executive Secretary to the Prime Minister	58	77	40	23
Deputy Prime Minister/Minister of Finance	35	80	26	9
Minister of Economy Trade and Industry	60	90	58	35
Ministry of Economy Trade and Industry	72	82	66	48
Agency for National Resources and Energy	61	88	70	43
Minister of the Environment	18	48	26	5
Minister of State for Reconstruction	18	25	22	4
Minister of Health, Labour and Welfare	18	60	22	4
Democratic Party	23	6	30	15
Liberal Democratic Party	45	73	41	17
Taro Kono	2	0	65	1

Source: KAPSARC.

Altering Scenarios as a Result of a Changing Political Climate

Later in August 2017, yet another apparently significant change occurred to the list of actors when Abe suddenly announced a reshuffling of his cabinet in an attempt to recover popularity. Three actors from the baseline data set were impacted in the cabinet reshuffle. Taro Kono, the former chairman of the National Public Safety Commission and former Minister in Charge of Administrative Reform and Disaster Management, was appointed as Minister of Foreign Affairs. Kono was an actor in the baseline data set. At the time of the baseline data collection, he did not hold a significant cabinet or party position, but he is well known as the most prominent, publicly vocal LDP voice opposed to nuclear restart. As Minister of Foreign Affairs, Kono was assigned a significant increase in influence compared to previous scenarios. The assigned position score remained unchanged, as he was expected to remain anti-nuclear. His salience on the issue of nuclear power was reduced to reflect the added responsibilities of his new position.

Masaharu Nakagawa was selected as the new Minister of the Environment and was thus assigned a higher position and higher salience values than his predecessor. Nakagawa is believed to have a deep

interest in environmental conservation and would support a shift away from fossil fuel generation (he has published two books on the matter). Furthermore, Nakagawa formerly held high positions in the Ministry of the Environment, such as General Environment Policy Bureau Director, Secretary-General of the Ministry and President of the LDP's Environment Division.

Katsunobu Kato was selected as the new Minister of Health, Labor and Welfare. The name of the actor was changed in the data set, but the values remained unchanged because this ministry plays a tertiary role in the decision to restart nuclear reactors. Moreover, both Kato and his predecessor, Yasuhisa Shiozaki, were high-level advisers in previous Abe cabinets before heading this ministry and thus were believed to profile similarly. Shiozaki, the previous minister, was Abe's Chief Cabinet Secretary during his first premiership term in 2006. Similarly, Kato was also formerly Abe's Deputy Chief Cabinet Secretary during his second term in 2012. Table 4 captures changes to the Post-Murata Resignation data set. All other data remained the same. We refer to this scenario as the Post-Cabinet Reshuffle.

Table 4. Post-Cabinet Reshuffle Scenario actor data.

Actor	Legend	Group	Influence	Position	Salience	Exercised Power
Minister of Foreign Affairs	Kono	Central Govt.	18	0	50	9
Minister of the Environment	Nakagawa	Central Govt.	18	60	35	6
Minister of Health, Labour and Welfare	Kato	Central Govt.	18	60	22	4

Source: KAPSARC.

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In this section, we present our analysis of the simulation results for the baseline data set. For the sake of brevity, we report our analysis of the Post-Cabinet Reshuffle scenario as well. Results for the remaining two scenarios can be found in a presentation on the KTAB project website at <http://www.ktab.software>.

Baseline scenario: simulation analysis

The KTAB simulation results for the baseline scenario, that is, the original data collected in May/June 2017, are provided in Figures 4 and 5.

Figure 4 presents the landscape of actor positions and exercised power for Turn 0 (which is a direct reflection of the expert data), and Figure 5 presents the landscape of actor positions and exercised power for the final turn of the simulation. In this case, the simulation ran for 34 turns. The KTAB model will continue to iterate and produce new turns until it reaches a point where there is minimal change in position expected in the next turn (i.e., the simulation reaches something akin to a steady state). Most KTAB simulations run between 10-15 turns at most, and many are even shorter. A simulation that runs for 34 turns reflects a very

Figure 4. Turn 0 distribution of positions and exercised power. Visualization of expert data – baseline scenario.

Source: KAPSARC KTAB analysis.

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protracted and lengthy CDMP. While we cannot identify the exact length of time this represents, it is likely to reflect a CDMP that will last several years.

For Figure 4, and all subsequent bar charts, the horizontal axis replicates the position spectrum described in Figure 1. The vertical axis represents the exercised power for each actor (influence multiplied by salience). Each of the bars in the figure represents a specific actor, and actors are color-coded according to the figure's key to make it easier to read. The height of each bar reflects the actor's exercised power. Note that many of the actors are stacked on top of each other – this indicates that they take the same position (within roughly a five-point range). Thus, the overall height of the 'stack' of bars shows the exercised power from those actors in a 'coalition' that advocates a particular position. Figure 4 also overlays the actor names to show their distribution across the political landscape.

Figure 4 presents a visualization of the expert data without any simulation results. In other words, this presents the turn 0 positions of actors before running the KTAB SMP. This figure makes clear that the question of nuclear power is a controversial topic, and that nothing resembling a consensus is present in the Japanese political system – actors take positions across the spectrum. Given the height of the stacks of bars across the spectrum, i.e., the 'coalitions,' the figure indicates that powerful groups of actors stake out positions across the range of positions for and against nuclear power.

While actor positions are varied across the spectrum, we observe four rough clusters of actors. The largest cluster centers around the neutral positions of 50-60 and is anchored by the Nuclear Regulation Authority (NRA) and its

chairman, Toyoshi Fuketa, as well as the Japanese Supreme Court. This is a natural position for these three actors to take, as their role to adjudicate the disposition of nuclear power plants should be unbiased and apolitical. The second largest cluster centers around the supportive positions between 90-100, with the cluster anchored by Abe, Hiroshige Seko (METI Minister), the Japan Industrial Forum (JAIF), and the Japan Business Federation (Keidanren). In other words, these actors take a strong position in favor of nuclear power (though recall that this was assessed to be their 'honne' and not necessarily their 'tatemae,' given the sensitivity of taking such a position publicly).

The remaining two clusters are roughly equal in size and sit on opposite ends of the spectrum. The first centers around the supportive positions of 80-90 and is anchored by METI and the Agency for National Resources and Energy (ANRE – a METI instrument). These actors take positions that support the restart of nuclear power but are less favorable than those actors on the right of the scale. The second of these last two clusters centers around the very unsupportive positions of 0-10 and is anchored by the Metropolitan Coalition Against Nukes, the Japanese media powerhouse Asahi Shimbun, as well as small anti-nuclear non-government organizations (NGOs).

Importantly, a number of local actors (the light yellow bars) take positions that are less than the neutral position of 50. These actors are primarily governors, who oppose the restart of nuclear reactors in their prefectures. Given the ability of governors to block a resumption of nuclear power plants, their opposition is a critical reason that the majority of reactors remain offline.

Figure 5 depicts the final actor positions (turn 34)

following the completion of the simulation. At the end of the simulation, the majority of the actors occupy positions that range between 60 and 70; the majority of local government officials occupy the more supportive side of this range. The two actors occupying the neutral position of 50 are the Japan Nuclear Safety Institute (JANSI) and the Niigata Governor. The only two actors that still occupied their initial completely anti-nuclear position were the small anti-nuclear NGOs and the Metropolitan Coalition Against Nukes.

Figure 5 thus demonstrates that, over time, there is a near-universal consensus in support of restarting nuclear power plants. Of the sets

of actors that are outlined in Figure 1 as key parts of the decision to restart a reactor (i.e., the regulator, governors, mayors and the judiciary), none oppose restarting nuclear power by the end of the simulation. However, a 34-turn simulation is quite extended. The KTAB SMP model will continue to iterate a simulation and produce new turns until there is minimal change expected in the next turn (something akin to a steady state). Most simulations tend to run for 10-15 turns, which makes 34 turns significantly longer than expected. As touched on briefly earlier in the paper, a turn is a rough measure of time in the KTAB simulation. However, it is not directly related to a real-world measure of time. Nevertheless, given the typical

Figure 5. Turn 34 distribution of positions and exercised power. KTAB SMP simulation results – baseline scenario.

Source: KAPSARC KTAB analysis.

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understanding of a turn for models like KTAB, 34 turns probably translates to years. A follow-up KAPSARC discussion paper will dissect the timing of the simulation much more precisely in order to assess the potential impact of Japanese nuclear power on LNG markets. Nevertheless, Figure 5 suggests that there is a long and slow trend toward widespread political will in Japan to restart nuclear reactors.

Note that the NRA and its chairman Fuketa (the light and dark blue bars at position 60) both take a position just slightly more favorable than neutral. Their consistent neutrality during the simulation was calculated to be the critical factor that persuaded opposing governors and mayors to reduce their opposition and even accept the restart of nuclear reactors. The neutrality of the regulator is thus an important element in the changing local and public attitudes toward nuclear power. If the regulator is seen as taking an apolitical and unbiased view, then those actors opposed to nuclear power can feel more trust in regulatory rulings that assess safety and technical issues.

Figure 6 provides six additional visualizations of the KTAB simulation. As there are almost 100 actors in the data set, we have broken down the results displayed in Figure 6 to capture groups of similar actors. Figure 6a displays actors who are members of the central government and national-level politicians, Figure 6b displays the regulator as well as advocacy groups and non-government organizations, Figure 6c displays electric power companies and other business, Figure 6d displays prefecture governors (and again the regulator), and Figure 6e displays mayors and segments of the relevant local populations (and again the regulator).

While Figures 4 and 5 display static visualizations at turn 0 and turn 34, Figure 6 provides a turn-

by-turn view of how actors' positions change over time in response to the pressures exerted during the political bargaining process. These line charts allow us to observe the simulation results of all the actors as they shift their positions from one turn to the next. Turn 0 reflects the actors' initial state (aggregated expert-collected data) as shown in Table 1 and Figure 4. The remaining turns are the result of KTAB's estimate of the CDMP.

In each turn, actors generate a series of proposals in an attempt to influence one another to adjust their positions. In return, actors generate a series of counter-proposals that might result in accepting a negotiation, thereby shifting positions from one turn to the next. In the KTAB SMP model, actors balance their desire to achieve their preferred outcome against the desire to be part of a consensus solution, resulting in compromises and the shifting of positions over time to try to find the right balance between an outcome the actor can live with and an outcome that is supported by some level of consensus. As such, simulated changes in position capture the give-and-take that happens during a negotiation process. The line charts in Figure 6 allow the reader to track the evolving support for particular positions as the CDMP simulation progresses. The range of positions from 0 to 100 is shown on the vertical axis. Turns from 0 (initial state) to 34 (final turn) of this simulation are shown on the horizontal axis. Actors are once more color-coded by group. Further details for this and all other simulations are available in PowerPoint presentations on the KTAB project website, which can be found at <http://www.ktab.software>. The simulation ultimately leads to a narrowed range of positions which reflect our best guess as to the plausible outcome of the CDMP.

A consensus seems to have formed among the central government actors in Figure 6a by turn 19

Figure 6. Turn-by-turn KTAB SMP simulation results – baseline scenario. Governmental actors.

Source: KAPSARC KTAB analysis.

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Figure 6.1. Turn-by-turn KTAB SMP simulation results – baseline scenario. Private sector actors.

Source: KAPSARC KTAB analysis.

(what we will refer to as the “central government consensus”). Examining the reasons for this consensus inside the KTAB model results reveals several interesting insights. For example, the KTAB simulation suggests that Minister Yoshino (identified as the biggest opponent of nuclear power within the LDP) is willing to support nuclear power if he sees increasingly positive public perceptions. Shinzo Abe, in the simulation, is consistently focused on trying to persuade those segments of the population who are either neutral or opposed to nuclear power throughout the simulation. Abe also focuses consistently on trying to persuade local politicians at the municipal and prefecture level. Taro Aso’s position oscillates over the course of the simulation until the central government consensus emerges. In the logic of the KTAB model, this indicates that Aso is more focused on achieving consensus among other government actors than achieving any particular outcome.

The observed neutrality of the NRA and Fuketa is reinforced by these figures, as they not only begin and end at an essentially neutral position but remain quite stable in their neutrality – confirming their resistance to political pressure and their credibility as regulators. This credibility plays a key role in the positive trends observed in Figure 6b and 6d (helping to foster support for nuclear power among NGOs such as Greenpeace, advocacy groups and anti-nuclear media).

The positive trends among governments, mayors, and other local actors in Figures 6e and 6f are also a story that is largely dominated by the NRA’s and Fuketa’s credibility (based on their sustained neutral positions). Directly and indirectly, their apolitical behavior goes a long way to eliminate anti-nuclear sentiment and foster acceptance to restart nuclear reactors. The KTAB simulation

strongly suggests that the credibility of a neutral regulator creates the conditions in which restarting nuclear power becomes politically acceptable over time.

Post-cabinet reshuffle scenario: simulation analysis

As discussed earlier in the paper, we will discuss only the results of the last scenario here. A discussion of the findings for the other scenarios can be found in PowerPoint format on the KTAB project website, <http://www.ktab.software>.

The final scenario combines the three sets of changes to the data following the collection of the baseline data set: the drop in Abe’s popularity, the resignation of Murata, and the reshuffling of Abe’s cabinet. These changes are described in Tables 2-4, with Table 4 taking precedence for this particular scenario. Those data not listed as changed in Tables 2-4 remain the same as the baseline data set. This simulation ran for 40 turns, an increase from the already lengthy 34 turn simulation with the baseline data. The overall shape of the results is similar to the baseline simulation, though the central government consensus emerges closer to a position of 70 than 75. Despite the lengthy dialogue and debate regarding this contentious issue, local and national decision-makers in Japan remain on a trajectory of increasing openness to restarting nuclear power plants.

Figure 7, as in the previous simulation, depicts actor positions for the final turn of the simulation (turn 40). In this scenario, while the broad results are similar to the baseline, actors are less consolidated. The behavior of METI is worth noting, as it ends the simulation occupying the very slightly

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opposed position of 40 (in the logic of the KTAB SMP model, it is a result of media pressure). This suggests that, following Abe's cabinet reshuffle, METI is likely to step back from leading the push for a nuclear restart.

Figure 8 is once again divided into six panels (8a-8f), showing the changing positions of subsets of actors over time (i.e., turn-by-turn). In each of the subfigures, as in the baseline simulation, there are large fluctuations for actor positions during the first 15 turns of the simulation. This again reflects the broad efforts of actors to search for a broadly acceptable consensus.

The biggest difference as compared to the baseline in the Post-Cabinet Reshuffle scenario, other than the additional length of the simulation, comes with the behavior of central government actors. Central government actors were noticeably more assertive, most likely because of the reduced influence of the opposition as well as the recovered popularity of the LDP.

Prime Minister Abe again was once more focused on trying to influence public perception, particularly during the first 10-15 turns of the simulation. Later in the simulation, Abe once more shifts his attention to anti-nuclear governors and mayors.

Figure 7. Turn 40 distribution of positions and exercised power. KTAB SMP simulation results - Post-Cabinet Reshuffle scenario.

Source: KAPSARC KTAB analysis.

Figure 8. Turn-by-turn KTAB SMP simulation results – Post-cabinet reshuffle scenario. Governmental actors.

Source: KAPSARC KTAB analysis.

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Figure 8.1. Turn-by-turn KTAB SMP simulation results – Post-cabinet reshuffle scenario. Private sector actors.

Source: KAPSARC KTAB analysis.

The newly-appointed Minister of the Environment, Masaharu Nakagawa, is an active driver of the trend toward accepting nuclear power, helping to shift the positions of non-LDP politicians, other members of the central government, the judiciary and business-related actors.

As in the baseline simulation, the NRA and Fuketa remain at neutral positions throughout the

simulation; again demonstrating their credibility as regulators. Once again, this credibility is important in driving the broad consensus that emerges by the end of the simulation among nuclear skeptics. Fuketa and the NRA, in the logic of the KTAB SMP model, are important in moderating the opposition of anti-nuclear District Court judges, governors and mayors.

Conclusion

This paper presents an analysis of politically-plausible outcomes regarding restarting nuclear power generation in Japan. The authors would be happy to provide clarifications on methodology, results, and specific behaviors identified by the model. The issue of restarting nuclear power has been controversial since the 2011 disaster at the Fukushima-Daiichi station. Public concerns regarding the safety and security of nuclear facilities need to be addressed, and it appears that the NRA can be (and is) a credible organization for this trusted role. The KTAB simulations indicate that the political dialogue will remain contentious and extend over a lengthy period of time. Nevertheless, the trend appears to be heading in a positive direction in terms of local acceptance of nuclear power.

An impartial and politically resistant regulator has proved effective in persuading and easing the apprehensions of stakeholders concerned by nuclear power. Regulation of the nuclear power industry was formerly a part of METI, and as a consequence “examinations of the Japanese nuclear regulatory system following the Fukushima-Daiichi accident concluded that regulatory agencies were not independent and were subject to regulatory

capture” (process by which regulated entities manipulate regulators) (The National Academies Press 2014). The NRA is now an extra-ministerial organization, able to perform as a trusted entity that can moderate the views of nuclear skeptics.

While it is likely that it will be politically infeasible to restart most nuclear power plants for years, the simulations demonstrate that there is growing political will favoring nuclear energy. It is unclear whether further measures to assure safety will be required, and more significant political shifts in the Japanese polity could also disrupt the simulated trend. The argument for a nuclear restart is a compelling one, especially in a country with limited energy resources such as Japan, and will likely have long-reaching implications as well.

This is the first in a series of three papers that detail the results of a KAPSARC study on restarting nuclear power in Japan. The second paper will evaluate whether there are scenarios in which the growing political will described in this paper could accumulate more quickly. The third paper will evaluate the impact of the politically-feasible outcomes described in this paper on regional and global LNG markets.

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Appendix 1: Political Restarting Nuclear Power Plants That Have Filed for a Restart

Table A1. Support for restarting nuclear power plants.

NPP/reactor	Application status		Political will	
	Submitted	Approved	Current	Expected
Sendai-1 (operational)	7/8/2013	5/27/2015	Governor: Moderately positive Mayor: Extremely positive	Governor: Positive (medium-term)
Sendai-2 (operational)	7/8/2013	5/27/2015		Mayor: Moderately positive (medium-term)
Ikata-3 (operational)	7/8/2013	4/19/2016	Governor: Extremely positive Mayor: positive	Governor: Positive (short-term) Mayor: Positive (medium-term)
Mihama-3 (undergoing extension renovations)	3/17/2015	11/16/2016	Governor: Extremely positive Mayor: Extremely positive	Governor: Positive (medium-term) Mayor: Positive (medium-term)
Ohi-3	7/8/2013	9/1/2017	Governor: Extremely positive Mayor: Extremely positive	Governor: Positive (medium-term)
Ohi-4	7/8/2013	9/1/2017		Mayor: Positive (medium-term)
Takahama-1	3/17/2015	N/A	Governor: Extremely Positive Mayor: Extremely positive	Governor: Positive (medium-term)
Takahama-2	3/17/2015	N/A		Mayor: Positive (medium-term)
Takahama-3 (operational)	7/8/2013	10/9/2015		
Takahama-4 (operational)	7/8/2013	10/9/2015		
Tsuruga-2	11/5/2015	N/A	Governor: Extremely positive Mayor: Extremely positive	Governor: Positive (medium-term) Mayor: Positive (medium-term)
Ohma	N/A (under construction)		Governor: Extremely positive Mayor: Extremely positive	Governor: Positive (medium-term) Mayor: Positive (medium-term)
Higashidori-1	6/10/2014	N/A	Governor: Extremely positive Mayor: Extremely positive	Governor: Positive (medium-term) Mayor: Positive (medium-term)
Tokai-2	5/20/2014	N/A	Governor: Negative Mayor: Extremely positive	Governor: Positive (medium-term) Mayor: Positive (short-term)
Shika-2	8/12/2014	N/A	Governor: Moderately positive Mayor: Extremely positive	Governor: Positive (medium-term) Mayor: Positive (short-term)
Kashiwazaki-Kariwa-6	9/27/2013	N/A	Governor: Extremely negative	Governor: Neutral (medium-term)
Kashiwazaki-Kariwa-7	9/27/2013	N/A	Kashiwazaki Mayor: Extremely positive Kariwa Mayor: Extremely positive Niigata Prefecture population: Extremely negative	Kashiwazaki Mayor: Positive (medium-term) Kariwa Mayor: Moderately positive (short-term) Niigata Prefecture population: Positive (medium-term)

Appendix 1: Political Restarting Nuclear Power Plants That Have Filed for a Restart

Genkai-3	7/12/2013	8/25/2017	Governor: Extremely positive	Governor: Positive (short-term)
Genkai-4	7/12/2013	4/24/2017	Mayor: Extremely positive	Mayor: Positive (long-term)
Shimane-2	12/25/2013	N/A	Governor: Moderately negative	Governor: Positive (short-term)
			Mayor: Extremely positive	Mayor: Positive (medium-term)
Hamaoka-3	6/16/2015	N/A	Governor: Negative	Governor: Moderately positive (medium-term)
Hamaoka-4	2/14/2014	N/A		
Tomari-1	7/8/2013	N/A	Governor: Positive	Governor: Positive (short-term)
Tomari-2	7/8/2013	N/A	Mayor: Extremely positive	Mayor: Moderately positive (long-term)
Tomari-3	7/8/2013	N/A		
Onagawa-2	12/27/2013	N/A	Governor: Moderately positive	Governor: Positive (medium-term)
			Mayor: Extremely positive	Mayor: Moderately positive (medium-term)

Source: Japan Atomic Industrial Forum, KTAB.

A green geometric graphic consisting of several overlapping triangles and polygons, located in the top-left corner of the page.

Notes

Notes

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Faisal is a former research associate in the Policy and Decision Science team, focusing on geopolitical analysis and national security policies. Previously he worked with the National Security Department at the University of New Haven in Connecticut, U.S. as a research assistant, and as an analyst at the university's Institute for the Study of Violent Groups.

About the Project

KAPSARC has developed the KAPSARC Toolkit for Behavioral Analysis (KTAB), an open source software platform, to support modeling and analysis of collective decision-making processes (CDMPs). KTAB is intended to be the standard platform for analyzing bargaining problems, generalized voting models and policy decision-making. It is our intent to use KTAB to assemble the building blocks for a broad class of CDMPs. Typical models in KTAB will draw on the insights of subject matter experts regarding decision-makers and influencers in a methodical, consistent manner; and then assist researchers to identify feasible outcomes that are the result of CDMPs.

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