

SHOCK TO THE SYSTEM: HOW CATASTROPHIC EVENTS AND
INSTITUTIONAL RELATIONSHIPS IMPACT JAPANESE ENERGY
POLICYMAKING, RESILIENCE, AND INNOVATION

by

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of
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DEDICATION

This dissertation is dedicated to my incredibly supportive husband, Dann, and my wonderfully encouraging children, Benji and Jasmine.

In memory of Ko Sugiura, whose lifelong dedication to U.S.-Japan energy cooperation continues to inspire me.

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LIST OF ABBREVIATIONS

ANRE	Agency for Energy and Natural Resources
ANS	American Nuclear Society
BWR	Boiling Water Reactor
CRIEPI.....	Central Research Institute of Electric Power Industry
FBR	Fast Breeder Reactor
FEPC	Federation of Electric Power Companies
FIT	Feed-in Tariff
GW	Gigawatts
IEA	International Energy Agency
JAEA	Japan Atomic Energy Agency
JAERI	Japan Atomic Energy Research Institute
JANTI	Japan Nuclear Technology Institute
JNC	Japan Nuclear Cycle Development Institute
JNES	Japan Nuclear Energy Safety Organization
JPDC	Japan Petroleum Development Corporation
JNOC	Japan National Oil Corporation
KEPCO	Kansai Electric Power Company
LDP	Liberal Democratic Party
LNG	Liquefied Natural Gas
LWR	Light Water Reactor
MAFF	Ministry of Agriculture, Forestry and Fisheries
METI.....	Ministry of Education, Culture, Sports, Science and Technology
MEXT	Ministry of Economy, Trade and Industry
MITI.....	Ministry of International Trade and Industry
MLIT	Ministry of Land, Infrastructure and Transport
MOE	Ministry of Environment
MOX	Mixed Oxide Fuel
NEDO	New Energy and Industrial Technology Development Organization
NISA	Nuclear and Industrial Safety Agency
NRA	Nuclear Regulatory Authority
NSC	Nuclear Safety Commission
OPEC	Organization of Petroleum Exporting Countries
PNC	Power Reactor and Nuclear Fuel Development Corporation
PWR	Pressurized Water Reactor
RPS	Renewable Energy Portfolio Standard
STA	Science and Technology Agency

TEPCO..... Tokyo Electric Power Company
TMI..... Three Mile Island

ABSTRACT

SHOCK TO THE SYSTEM: HOW CATASTROPHIC EVENTS AND INSTITUTIONAL RELATIONSHIPS IMPACT JAPANESE ENERGY POLICYMAKING, RESILIENCE, AND INNOVATION

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External shocks do not always generate energy system transformation. This dissertation examines how government relationships with electric utilities and the public impact whether shocks catalyze energy system change. The study analyzes Japanese energy policymaking from the oil crises through the Fukushima nuclear disaster. Findings reveal that policymakers' cooperation with and clout over electric utilities and the public can enable shocks to transform energy systems. When electric utilities wield clout, public trust in and influence on the government determine the existing system's resilience and the potential for a new system to emerge. Understanding this effect informs energy policy design and innovation.

CHAPTER ONE: INTRODUCTION

National energy policy responses to accidents, resource competition, climate change and pollution concerns, and resource price disruptions vary widely. Resilience has become the new global mantra, but each nation is conducting an individual struggle to define a resilient energy system.¹ Understanding the factors behind energy system entrenchment can shed light on these variations, as these same factors also shape the potential for resilience, change and innovation when external shocks occur.

Background

Existing literature on external shocks, path dependence, institutional change, policy processes, and energy systems provides insights on these factors behind energy policy entrenchment and change. New historical institutionalism recognizes that exogenous shocks alone and endogenous institutional change alone represent incomplete views of the forces behind system change. While each of these bodies of literature offers insights into why energy policy and policymaking processes change, little scholarly precedent exists for combining exogenous and endogenous factors or understanding how they interact to influence such change.

This dissertation builds on this literature and aims to address this gap by examining the combined effects of institutional relationships and external shocks on the

¹ Amory Lovins' work has raised the issue of energy system resilience for decades, starting with his article in *Foreign Affairs* in 1976. See Amory Lovins, 1976.

potential for changes to Japan's established energy policy and policymaking processes. Institutional relationships that impact energy policymaking include intragovernmental relationships, as well as government relationships with the private sector, the public, and the media. Of these, the government's relationships with the energy industry and the public appear to most directly influence national energy policymaking and the possibility of change. Thus, this project's primary research question examines how these two relationships have combined with exogenous shocks to generate change or maintain the status quo in energy policy and policymaking.

To answer the primary research question, this dissertation explores several subsidiary questions on the impact of relationships on energy policy and policymaking processes. As relationships move from cooperation toward conflict, what happens to energy policy and policymaking after a shock? As clout shifts from one group to another, what happens? How do these relationship elements combine to affect changes in energy policy and the policymaking process? This dissertation considers these questions in the form of potential relationship scenarios and their effects on energy policy and the policymaking process.

Research Questions and Hypotheses

As a nation that responded to the 1970s oil crises and has faced recent external challenges to its established energy system, Japan represents a case that can offer informative insights. Japanese energy policy development from the time of the 1970s oil shocks through the aftermath of the Fukushima disaster reveals connections between factors contributing to energy system development and the impact of these same factors

on system resilience and change. This dissertation answers the question of how the Japanese government's relationships with the electric utilities and the public combine with these shocks to contribute to entrenchment and change in Japan's energy policies and policymaking process.

The dissertation tests three hypotheses that define how energy policies and policymaking processes respond to external shocks and changes in the government's relationships with the public and the electric utilities.

First, the 1970s oil crises did not alter the Japanese government's cooperative relationships with or clout over the electric utilities and the public. This continued cooperation and government clout led to energy policy change in Japan, but no immediate changes to the policymaking process or regulatory structure.

Second, the electric utilities gained clout over time, contributing to a scenario in which a series of technological and institutional failures in the 1990s and early 2000s did not result in Japanese energy policy change, policymaking process change, or significant, persevering regulatory or market structure change. The regulatory change that did take place was intended to appease conflict between the government and the public, though the government retained clout.

Finally, the 2011 Fukushima nuclear disaster occurred in this environment of tenuous balance between cooperation and conflict, coupled with the battle for clout. This dissertation hypothesizes that the key to whether this shock leads to policy change along with policymaking process change lies in the conflict/cooperation axis of the government's relationships with the electric utilities and the public, as well as the

public's retention of clout. If the relationships remain in conflict, policy change will likely accompany Japanese policymaking process and structural change. If bureaucrats' and politicians' relationships with the electric utilities return to cooperation, transformative energy policy change is unlikely to emerge. Over time, a possibility arises that public clout or conflict with the government could decline, resulting in no major change at all. If the electric utilities regain clout before any irreversible policymaking process change, this scenario becomes even more likely.

Research Contributions

Literature on exogenous shocks and focusing events suggests that such shocks can open policy windows for dramatic change. In contrast, historical institutionalism and evolutionary theory would suggest that slow policy change will occur over time based on relationship changes. Neither of these disparate theories completely explains Japan's energy policy and policymaking trajectory. Merging these frameworks forms a more holistic depiction of Japanese energy policymaking during four decades characterized by both shocks and relationship evolution.

This dissertation thus will contribute to the ongoing scholarship on energy policy development and change on three important levels. First, its results will deepen understanding of the drivers that shape and transform national energy policies and systems. Second, it will provide a model for understanding how institutional relationships affect the impact of external shocks on national energy policymaking. Finally, this model can help to explain current and future energy policy conflict and inform domestic and international energy cooperation.

The study also will contribute to the broader public policy literature on breaking policy lock-in. By exploring the influence of institutional relationships on the transformative capability of external shocks, this project's narrative will offer insights for future policy design and ways to turn shocks into opportunities for policy innovation.

Dissertation Overview

The second chapter presents the controversies, connections, and gaps in the existing theories that ground this study: scholarship on path dependence, institutional change, external shocks, policy processes, and energy systems. The third chapter provides a detailed description of the research questions and hypotheses that shape the project's contribution to this body of work on energy policy development and change, as well as work on breaking policy lock-in. This chapter also highlights the ways in which this project will contribute to the existing literature on energy policy development and change theory. It also explains potential practical lessons emerging from the theoretical contribution. The fourth chapter describes the study's data collection, methods of analysis, and limitations.

Empirical chapters five, six and seven convey the study's findings on the ways in which shocks and institutional relationships have affected Japan's energy policy and policymaking processes from the time of the oil crises through the aftermath of the Fukushima nuclear disaster. Chapter five examines this effect after the 1970s oil crises, establishing a foundation for chapter six, which analyzes the series of nuclear accidents and a scandal that took place during the 1990s and early 2000s. This chapter connects the patterns from the post-oil crises era with the trends during this period and explains

how they contributed to the final empirical chapter. Chapter seven examines the roles of the Fukushima nuclear disaster and institutional relationships in defining policy and policymaking process change and stasis. Because Japan's energy situation and policymaking process have continued to evolve since 2011, the analysis of this period involves predictive patterns rather than definitive conclusions.

The dissertation's final chapter consolidates and links the conclusions from each of the empirical chapters into a unified narrative, also offering some thoughts on broader lessons for energy system development and resilience. Chapter eight concludes with promising areas of future research that flow from the study.

CHAPTER TWO: THEORETICAL FRAMEWORKS

Recent scholars of comparative institutions believe that history matters. Historical institutionalists recognize the importance of sequencing in both the development of institutions and the role these institutions play in the paths of the technological systems they create. The existing theoretical and empirical literature on path dependence collectively defines the factors that produce entrenched technological systems, including institutional support, as well as infrastructure, interrelatedness and complexity, momentum, and uncertainty and risk.

Complementary work on disruptions in such entrenched systems examines the nature of focusing events or critical junctures that can destabilize these systems. This literature generally focuses on the role of either external shocks or incremental institutional change in fomenting system shifts. New institutionalism recognizes that examined separately, exogenous shocks and endogenous institutional change represent incomplete views of the forces behind system change. While each of these bodies of literature offers insights into why energy policy and policymaking processes change, little scholarly precedent exists for combining exogenous and endogenous factors or understanding how they interact to influence such change. Analyzing both external shocks and institutional relationships as factors behind system change offers a more holistic view of how system stasis and change occur. This dissertation builds on this

literature and aims to address this gap by examining the combined effects of institutional relationships and external shocks on the potential for changes to established energy policy and policymaking processes.

The existing literature often characterizes institutional relationships as featuring a balance of cooperation and conflict, as well as power. These balances affect how these relationships impact system entrenchment and collapse.

Energy systems, often touted as susceptible to path dependence, offer an opportunity to observe how external shocks and institutional change can combine to preserve or disrupt an entrenched system. Examining how institutional relationships and external shocks combine to contribute to development and deterioration of lock-in in the energy sector can illuminate some of the puzzling inertia emerging after shocks that seem likely to catalyze innovation and system transformation.

Historical Institutionalism: Constrained Paths

Existing literature on institutions broadly agrees on a definition articulated by Nelson and Sampat, who describe them as “social technologies” that resemble patterns of behavior that shape effective collective action or interaction. Their definition encompasses the “rules of the game,” governing structures, and cultural beliefs and norms.²

Until Pierson and others like him incorporated the concept of change over time into the role of institutions, scholars of comparative institutions adhered to comparative capitalism theories that viewed institutions as moving toward equilibrium. They also

² Richard R. Nelson and Bhaven N. Sampat, 2001, 40-41.

viewed them as empowering or disabling agents for social change, rather than as both agents and products of social change.³ In contrast to these somewhat static depictions of institutions, more recent institutionalists such as Pierson view institutions as the outcomes of social processes unfolding over time.⁴ Many historical institutionalists cite the importance of interaction effects between networks of institutions and processes. Institutional change stems from shifts in these relationships across institutions and between institutions and processes.⁵ Scholars developing this evolutionary theory of institutional change, including Hall, Thelen, Mahoney, and Streeck, assert that the prior focus on equilibrium has inhibited understanding of institutional change and its role in innovation.⁶

Historical institutionalism applies these concepts of sequencing and institutional change to explain institutional and policy lock-in, as well as occasional change. Thelen summarizes this historical institutionalist view of path dependence that develops during “crucial founding moments of institutional formation that send countries along broadly different developmental paths.”⁷ Creation of particular institutions at specific points in a system trajectory contributes to the paths these systems follow. Pierson explains that the sequencing of processes can impact whether future options are removed from political

³ See Peter A. Hall and David Soskice, 2001, and Robert Hancke, 2009.

⁴ Paul Pierson, 2004.

⁵ See Paul Pierson, 2000; James Mahoney and Kathleen Thelen, 2009; Wolfgang Streeck, 2011.

⁶ Peter Hall and Kathleen Thelen, 2009.

⁷ Kathleen Thelen, 1999, 387. This perspective also appears in work by Pierson, Streeck, Steinmo and others. See Paul Pierson, 2004; Wolfgang Streeck, 2010; Sven Steinmo, 2010.

possibility.⁸ The order of events thus takes precedence over their size in shaping processes, and small events early in a sequence can have a greater impact on the future than big events occurring later.

Historical institutionalists also posit that policies and institutions can generate positive feedback. Stefes and Laird describe positive feedback as “a circumstance in which groups and individuals involved in that policy get more benefits the longer the policy stays in place and the more deeply it is entrenched,” generating incentives to perpetuate it.⁹ This dynamic can lead to system entrenchment. However, these proponents of endogenous institutional evolution theory deny the idea that institutional lock-in emerges solely from positive feedback processes. These scholars assert that in addition to positive feedback’s influence, adoption of certain institutions renders later adoption of other institutions more or less likely. As Thelen explains, historical institutionalists believe that institutional change occurs “in ways that are constrained by past trajectories.”¹⁰ These constrained institutions yield constrained policy paths.

Path Dependence in Energy Systems

Historical sociologists, political scientists, innovation systems theorists, and energy system theorists tend to agree broadly on a definition of path dependence as entrenchment of an economic or technological path based on occurrences early in a process. All of these schools apply the historical institutionalist framework on the influence of history and the role of timing of influential events and decision points. To

⁸ Paul Pierson, 2004, 12.

⁹ Christoph Stefes and Frank Laird, 2010, 7.

¹⁰ Kathleen Thelen, 1999, 387.

varying degrees and with different emphases, they all also examine the roles of actors, institutions and organizations in creating path dependence. The schools differ in their interpretations of the ways in which these elements contribute to path dependence, as well as their influence compared with other factors such as efficiency and safety risk.

Literature by energy systems theorists, which discusses the tendency of energy systems toward system lock-in or path dependence, complements the views expressed by historical sociologists, political scientists, and innovation systems theorists.¹¹ This work collectively suggests that certain features of energy systems make them prone to lock-in. These features include reliance on infrastructure, interrelatedness and complexity, institutional support, momentum, and uncertainty and risk.

Much of the literature observes that infrastructures that develop around large systems promote lock in of existing technologies. They also create barriers to new technologies that are incompatible with the existing infrastructure.¹² The most frequently cited examples emerge from transportation and energy systems, including automobile and railroad infrastructure, as well as nuclear, coal and hydropower generation and transmission infrastructure. Rosenberg offers the telecommunications sector as an example of a system in which compatibility of related components and systems limits future options for innovation.¹³ Energy system and electricity production analysts observe that large investments in energy systems infrastructure, including power plant

¹¹ E.g., Thomas Hughes, 1987; Hughes 1993; Gregory Unruh, 2000; Frans Berkhout, 2002; Timothy Foxon, 2005; Jochen Markard and Bernhard Truffer, 2006; A. van der Vooren and F. Alkemade, 2011; Raimo Lovio, et al., 2011.

¹² For example, see R. Kemp, 1994; Timothy Foxon, 2005; A. van der Vooren and F. Alkemade, 2011.

¹³ Nathan Rosenberg, 1994.

construction and connections to electricity transmission and distribution grids, create vested interests in perpetuating an existing system.¹⁴ These vested interests prioritize returns on investment over increasing efficiency and reducing safety risks.

A number of scholars attribute path dependence in energy systems broadly, and electricity production systems specifically, to the interdependence of components, organizations, and institutions in these systems.¹⁵ They describe network effects resulting from system interrelationships, which make system change more difficult since a shift in one part of a system necessitates changes in other components of the network. Unruh connects the depiction of the co-evolution of technological systems and institutions with lock-in of fossil fuel use in energy systems, as well as the network of systems that utilize energy. He describes interactions between technologies, organizations and institutions that create path dependence in a carbon-based energy system.¹⁶ Research on innovation processes in energy systems also links interdependence with system path dependence. Markard and Truffer note that interdependent components and organizations within electricity production systems lead innovation processes in these systems toward the incremental rather than the radical.¹⁷ In their analyses of fossil fuel lock-in, Unruh, Berkhout, and Lovio, et al. come to similar conclusions

¹⁴ E.g., R. Kemp, 1994; Raimo Lovio, et al., 2011; Espen Moe, 2012.

¹⁵ E.g., Gregory Unruh, 2000; Jochen Markard and Bernhard Truffer, 2006; Raimo Lovio, et al., 2011.

¹⁶ Gregory Unruh, 2000.

¹⁷ Jochen Markard and Bernhard Truffer, 2006.

regarding the possibility of system change and the rate of such change.¹⁸ This slow rate of change in energy systems and electricity production subsystems thus has implications not only for system growth and momentum, but also for shifts in the direction of energy systems and innovation.

Much of the literature on path dependence in institutions and technological systems suggests that they combine to form interlinked technological and institutional lock-in.¹⁹ Some scholars posit that the energy sector is particularly susceptible to such co-evolution of technological and institutional systems, due to its dependence on infrastructure and public goods.²⁰ For example, Unruh discusses the development of the automobile as the dominant personal transport technology, describing the co-development of related industries in automobile components, road construction materials, and road and driver services.²¹ The development of civilian nuclear power programs by different nations such as the United Kingdom, France, and Japan reflect this notion of path dependence that results from combined interactions between technological systems and governing institutions. The literature suggests that governmental support policies reinforced the dominance of nuclear power in these nations' energy portfolios.²² Other

¹⁸ See Gregory Unruh, 2000; Frans Berkhout 2002; Raimo Lovio, et al., 2011.

¹⁹ For example, see Paul Pierson, 2004; Gregory Unruh, 2000 and 2002; Timothy Foxon, 2007; Richard Nelson and Bhaven Sampat, 2001; and Jörg Musiolik and Jochen Markard, 2011.

²⁰ See, for example, Gregory Unruh, 2000; Timothy Foxon, 2005; A. van der Vooren and F. Alkemade, 2011.

²¹ Gregory Unruh, 2000.

²² See Robin Cowan, 1990; Magali Delmas and Bruce Heiman, 2001; Bjorn Sanden and Christian Azar 2005.

scholars have focused on the same co-evolution of fossil fuels.²³ While many scholars cite these interrelated technological and institutional frameworks as barriers to renewables development, some have countered that such tandem frameworks for renewables have yielded success.²⁴

Institutional support also can lead a system toward lock-in. Existing literature also suggests that institutional policies can override market forces such as efficiency, which might otherwise limit expansion of an energy system. Cowan's study of the light water reactor's (LWR) ascension to global dominance in the nuclear power sector serves as an example of this phenomenon. Cowan attributes the LWR's worldwide dominance largely to U.S. government subsidies intended to promote the developing technology over other domestic and overseas technologies.²⁵

Jacobsson and Bergek cite legitimization of a new technology as a key to its success or failure. Recognition of the legitimacy of institutional support for an existing technology can prevent new technological systems from emerging. They offer the example of institutional support for nuclear power in Sweden as a reason for relatively poor legitimization of renewable energy. In contrast, German opposition to nuclear power enabled legitimization of and institutional support for renewable energy, contributing to development of a renewable energy system.²⁶ Institutional support mechanisms involve advocates that generate and perpetuate them. Scholars refer to these

²³ See Gregory Unruh, 2000 and 2002; Richard Perkins, 2003; Bjorn Sanden, 2004.

²⁴ Staffan Jacobsson and Anna Bergek, 2004; Bjorn Sanden and Christian Azar, 2005.

²⁵ Robin Cowan, 1990.

²⁶ Staffan Jacobsson and Anna Bergek, 2004, 826.

advocates by different terms, including sponsors, advocacy coalitions, and supporters.²⁷

Westrum observes that such support is necessary for successful adoption of a technology, and it also shapes the development of the system that surrounds it.

Hughes suggests that energy system momentum combines with interrelatedness with other systems to perpetuate system continuity.²⁸ As systems absorb elements of their environment, reducing system uncertainty, these expanding, influenced networks of actors, technologies and processes contribute to system perpetuation. Again, the transportation and energy sectors serve as widely cited examples. Geels describes how the Dutch highway system initiated in the 1950s gained momentum and established infrastructure networks, confounding a later effort to shift to public transport when pollution and congestion concerns arose. A number of scholars examine the U.S. electric utility system as an example of momentum, including Hughes.²⁹ The development of incremental technologies such as improved steam turbine components and alternating current (AC) technologies contributed to electric utility system momentum. In addition, institutional mechanisms such as creation of regulatory oversight of utilities also played a role.³⁰ Unruh links system interrelatedness, institutional support and positive feedback to momentum. He observes that increasing returns to technologies and institutions that support them can lead to rapid expansion and entrenchment of the technological system they create.³¹

²⁷ See Ron Westrum, 1991; Paul Sabatier, 1988; Thomas Birkland, 1997.

²⁸ Thomas Hughes, 1987.

²⁹ e.g., Thomas Hughes, 1993; Richard Hirsh and Benjamin Sovacool, 2006.

³⁰ For more details, see Richard Hirsh and Benjamin Sovacool, 2006.

³¹ Gregory Unruh, 2000 and 2002.

Historical institutionalists posit that inefficient paths can result from earlier choices. As systems build around technologies, problems that arise later in the life of a technology are less likely to result in termination of the technology and the system around it. This idea suggests that while technological safety and efficiency issues contribute to initial decisions on development of a technology, as systems grow around the technology, safety and efficiency problems arising once a system is established are unlikely to derail the system entirely.

An array of empirical examples suggest that as reduced uncertainty reinforces investments in a technology and promotes its expanded use, it also leads to less emphasis on risks, including safety risks.³² Institutions play a role in reducing uncertainty, and they also can reinforce existing risk perceptions. In their study of the U.S. electric utility system, Hirsh and Sovacool highlight the rule of regulatory oversight in reducing uncertainty for the electric utilities.³³ Unruh offers the case of electric utility regulators' tendency for risk averseness based on fear of blackouts, which leads to investment in dominant power supply and plant technology designs rather than potentially riskier alternatives.³⁴

³² E.g., Thomas Hughes, 1987; Robin Cowan, 1990; Gregory Unruh, 2000; Bjorn Sanden and Christian Azar, 2005; Raimo Lovio, et al., 2011.

³³ Richard Hirsh and Benjamin Sovacool, 2006. Not surprisingly, the set of actors and organizations Hirsh and Sovacool mention as contributors to electric utility system momentum overlaps greatly with those identified by Hughes as prominent in creation of momentum in the broader electric power production system. Both systems receive support from interactions between networks of regulators, utility managers, financiers, component manufacturers, academic institutions, and customers.

³⁴ Gregory Unruh, 2000, 825. Unruh uses the concept of “dominant design” to refer to technologies that become the de facto standard, per Abernathy and Utterback’s theory. See Abernathy and Utterback 1978.

Since technological systems emerge from and co-evolve from the societies that generate them, these energy system traits that contribute to lock-in manifest themselves differently in different societies. While many empirical studies of energy system lock-in reference these drivers, few examine how they influence responses to shocks that might otherwise break system lock-in.

Breaking Lock-In in Energy Systems

Scholarship examining path dependence includes views on how such lock-in erodes. This literature focuses on the role of either exogenous shocks or endogenous change in forming critical junctures that break technological and institutional lock-in. Scholars examining destruction of path dependence describe critical junctures that enable escape from system lock-in. Kingdon and Birkland frame critical junctures as events that galvanize the policy community to consider change.³⁵ Pierson depicts critical junctures as “critical moments or junctures that shape the basic contours of social life.”³⁶ Such junctures, which emerge from a confluence of exogenous and endogenous factors, can move policies toward path dependence or break it.

Followers of Kingdon and Pierson differ on the time frame and precipitating factors behind these critical junctures. Kingdon and other policy process scholars note specific points in time when external shocks become critical junctures that punctuate a stable system. Institutionalists and evolutionary theorists frame critical junctures as phases that can range from days to a decade, rather than one-time occurrences pinpointed

³⁵ John Kingdon, 1997; Thomas Birkland, 1997.

³⁶ Paul Pierson, 2004, 18-19.

on a calendar. These phases can include an exogenous shock, but they are driven by institutions and shifts in these institutions over time that lead to gradual change in established paths.³⁷ Building on the ideas proposed by both Kingdon and Pierson, several scholars define critical junctures as periods of opportunity for changes to policy paths, which can break existing path dependencies or lead to new ones.

The Role of Exogenous Shocks in Breaking Lock-in

The concept of focusing events initiated by Kingdon, and elaborated upon by Birkland and others, involves exogenous shocks that occur during brief time periods, providing a catalyst for change. Kingdon depicts focusing events such as crises or disasters as mechanisms that push problems to the forefront, opening “policy windows” that can lead to policy change. Disasters, which Birkland defines as sudden, severe events that reach the public and the policy world at the same time, can serve as focusing events or trigger critical junctures. Crises, which emerge from within organizations, build over time. Birkland explains, “A crisis can be internally generated or it can be the result of a disaster or some other undesirable event that strains an organization’s adaptive capacity.”³⁸ When an organization is adequately prepared for potentially disastrous events, disasters may not result in crises. In his examination of large technological systems, Hughes describes a similar “confluence of contingency, catastrophe and conversion” that can alter system momentum.³⁹ Kingdon and Birkland describe how

³⁷ Peter Hall and Kathleen Thelen, 2009; James Mahoney and Kathleen Thelen, 2009; Sven Steinmo, 2010.

³⁸ Thomas Birkland, 2006, 5.

³⁹ Thomas Hughes, 1987, 470-471.

shocks serve as focusing events that can become critical junctures when they succeed in spurring the policy community to consider change.⁴⁰

Birkland develops a framework for examining why certain events are focal and how their effects can vary across seemingly similar policy domains. The framework analyzes the features of events that determine how focal they become, including suddenness, rarity, level of impact on the public, and timing of public and policy maker awareness of the event. Birkland examines large oil spills and serious nuclear power plant accidents as examples of sudden, rare events that significantly impact the public and are not easily concealed. These characteristics make these events focal, sparking “mobilization of bias” to drive communities toward policy change.⁴¹ Birkland suggests that significant human-induced events such as large oil spills can accelerate long term social change, which influences policy change. He describes the focal power of an oil spill as an attention driver that expands interest and concern, alters the status quo opposition to strict environmental regulation, and offers a window of opportunity for an organized environmental community to push for new policies. Examining the case of the Exxon Valdez oil spill, Birkland observes that it garnered significant Congressional and public attention, which led to policy change within 18 months, after nearly 14 years of deadlock on revision of oil pollution laws. House of Representatives members preferred a uniform national law, while members of the Senate supported individual state liability laws. The Exxon Valdez spill broke the legislative stalemate and enabled federal

⁴⁰ John Kingdon, 1997; Thomas Birkland, 1997.

⁴¹ Thomas Birkland, 1997, 79.

legislation that included a compromise between the House and Senate positions.⁴² The levee flooding from Hurricane Katrina offers another example of a technological disaster that led to public policy change.

Birkland and some other scholars of the policy process and path dependence suggest that focusing events alone may not engender policy action, and action from within the policy community must support the effect of such events in order to make them focal.⁴³ Birkland highlights the degree of organization and polarization within the policy community as factors affecting the impact of focusing events on policy change. Baumgartner and Jones posit that changes in policy images and/or realignment of institutional jurisdiction over an issue can destabilize policy equilibrium. Birkland suggests that human-induced disasters such as oil spill are more likely to galvanize policy entrepreneurs opposed to existing policy, rather than defenders of the status quo.⁴⁴ Supporters of policy change capitalize on issue expansion, while defenders of the status quo rely on issue containment to minimize the need for policy change. Birkland observes that Exxon failed to tell its story quickly enough after the Exxon-Valdez oil spill, and attempts to minimize the spill and reassign blame backfired. TEPCO's belated efforts to explain the Fukushima Daiichi nuclear disaster met a similar fate.

While these observations help to explain the transformative power of exogenous shocks, little to no scholarship exists on institutional features that limit ability of exogenous shocks, even those that meet the criteria for focusing events, to break lock-in.

⁴² Thomas Birkland, 1997.

⁴³ e.g., Frank Baumgartner and Bryan Jones, 1993; John Kingdon, 1997; Thomas Birkland, 1997; Christoph Stefes and Frank Laird, 2011.

⁴⁴ Thomas Birkland, 1997.

Such studies would help to explain why shocks do not always lead to energy system transformation. This dissertation serves as one such study.

The Role of Institutions and Institutional Change in Breaking Lock-in

Schools that contribute to innovation and policy development theories diverge on the role of institutions and how they change. Comparative political scientists, institutionalists, and innovation systems theorists broadly agree that institutions and time influence system evolution. Their divergent views on the role of institutions and institutional change in innovation systems impact their philosophies on energy systems innovation trajectories.

Scholars from the comparative politics and historical institutionalist schools believe that institutions influence strategic interaction between system actors. Institutions thus can serve as constraints, but system actors can turn them into supportive structures, and internal forces can elicit incremental institutional change.⁴⁵ More recent institutionalists such as Pierson, Hall, Thelen and Mahoney view institutions as products of dynamism stemming from current actors' interactions that influence institutions created and changed by previous actors.⁴⁶ Innovation systems theorists such as Jacobsson and Bergek view institutions as factors that can support or hinder an innovation system.⁴⁷ Institutions' positive or negative impact on infrastructure, interrelatedness and complexity, institutional support, momentum, and uncertainty and risk thus determine whether lock-in is preserved or broken. For example, Jacobsson and Bergek mention the

⁴⁵ Peter Hall and Kathleen Thelen, 2009; James Mahoney and Kathleen Thelen, 2009.

⁴⁶ Paul Pierson, 2002; Kathleen Thelen and James Mahoney, 2010; Wolfgang Streeck, 2011.

⁴⁷ Staffan Jacobsson and Anna Bergek, 2004.

role of institutions in fostering infrastructure and interrelatedness of energy systems. They also cite failure of institutional support for a shift as a reason for continued lock-in.⁴⁸ Unruh cites institutional influence on expectations and uncertainty as a driver behind technological system stasis or change.⁴⁹ Davies finds that institutions are the main inhibitors and drivers of system change in the telecommunications sector.⁵⁰

This body of work also suggests that institutional structures and government priorities can combine to form a national energy policy that can support or alter an energy system.⁵¹ Verbong and Geels describe how the government prioritized energy saving over renewables development in crafting the Dutch electricity system.⁵² Scholarly work on Japanese energy policy also indicates the role of government priorities as drivers that affect the direction of policy change in response to shocks.⁵³

Like the work on exogenous shocks and focusing events, this scholarship also does not address institutional features that limit the ability of exogenous shocks, even those that meet the criteria for focusing events, to break lock-in. New institutionalists believe that prior approaches to institutional change – economic, historical institutionalist, and evolutionary -- are lacking in different ways. Since institutional

⁴⁸ Staffan Jacobsson and Anna Bergek, 2004.

⁴⁹ Gregory Unruh, 2000.

⁵⁰ Andrew Davies, 1996.

⁵¹ For example, see Thomas Hughes, 1983; Paul Pierson, 2004; Staffan Jacobsson and Anna Bergek, 2004; Geert Verbong and Frank Geels, 2007; and Peter Hall and Kathleen Thelen, 2009.

⁵² Geert Verbong and Frank Geels, 2007.

⁵³ These works mention how the Japanese government's priorities impacted energy policy responses to particular shocks or institutional shifts. See Scott Victor Valentine and Benjamin Sovacool, 2010; John Duffield and Brian Woodall, 2011; and Espen Moe, 2012.

stability is a function of both positive feedback and ongoing political mobilization, institutional change can emerge suddenly from external shocks and in an ongoing, incremental way from endogenous factors.⁵⁴ Such factors involve ambiguities created by different interpretations and enforcement of institutional rules, which enable actors to apply existing rules in new ways. Based on this assumption, Thelen and Mahoney assert the need for a model of change that can account for both endogenous and exogenous sources of change.⁵⁵ Further, few empirical studies demonstrate a linkage between exogenous shocks and endogenous institutional change in breaking path dependence. This dissertation project will serve as such an empirical study that contributes to building the kind of model called for by the new institutionalists.

Consistent with the broader literature, scholarly work on Japanese energy policies references either shocks or institutions as forces behind policy development.⁵⁶ This dissertation will join these works in analyzing Japan's energy policy development as shaped by exogenous shocks and institutional relationships. In particular, it will build on Samuels' historical account of the institutional relationships influencing Japanese energy policy development from the end of World War II through the oil shocks period.

Cooperation and Power Balance in Institutional Relationships

Existing scholarly literature on institutional and interorganizational relationships describes cooperation between stakeholder groups and relative power balances between

⁵⁴ James Mahoney and Kathleen Thelen, 2009.

⁵⁵ James Mahoney and Kathleen Thelen, 2009.

⁵⁶ E.g., Ronald Morse, 1981; Wilfrid Kohl, 1982; Richard Samuels, 1987; Linda Cohen, et al., 1995; Susan Pickett, 2002; Scott Victor Valentine and Benjamin Sovacool, 2010.

them as factors affecting the nature and influence of these relationships.⁵⁷ Analyses of institutional relationships often frame them as characterized by cooperation and/or conflict. These works generally use the term “cooperation” to describe inter-institutional coordination or collaboration on policy action. Mainstream theoretical and empirical work analyzing cooperation has highlighted trust between groups as a major underlying factor determining cooperation.⁵⁸

Studies of stakeholder power balances include literature on advocacy coalitions, a framework developed by Sabatier.⁵⁹ Some of these studies examine the impact of advocacy coalitions on energy policymaking.⁶⁰ Some theoretical and empirical studies of institutional relationships emphasize the importance of considering power balances that may produce different outcomes than economic considerations alone would suggest.⁶¹ Scholarly work on energy policy and institutions also incorporates the role of power balance, which some characterize as clout.⁶² In their analysis of energy system shifts toward renewable energy, Stefes and Laird refer to “political clout” of the renewable energy industry in Germany, and lack thereof in the United States.

⁵⁷ e.g., Frank Baumgartner and Bryan Jones, 1993; Marco Orru 1993; R. Berardo and J.T. Scholz, 2010; M. Lubell, et al., 2010; Thomas Birkland, 2011; Guy Peters, 2012; Mohammad Yarahmadi and Peter Higgins, 2012.

⁵⁸ E.g., Henry Farrell, 2004; Henry Farrell, 2005; Torger Gillebo and Charles Francis, 2006; Michael Pirson and Deepak Malhotra, 2007; Henry Farrell, 2009; Nivine Abbas, et al., 2014.

⁵⁹ Paul Sabatier, 1988.

⁶⁰ E.g., Shu-Hsiang Hsu, 2005; Staffan Jacobsson and Volkmar Lauber, 2006; Daniel Nohrstedt, 2008; Daniel Nohrstedt, 2009.

⁶¹ E.g., Andrew Cumbers, et al., 2003; Moe, 2005; Daron Acemoglu and James Robinson, 2006; E.A. Armstrong and M. Bernstein, 2008.

⁶² E.g., Thomas Birkland, 1997; Richard Hirsch and Benjamin Sovacool, 2006; Christoph Stefes and Frank Laird, 2010; Michael Aklin and Johannes Urpelainen, 2011.

Analyzing these two elements – cooperation vs. conflict and power balance/clout – offers a holistic view of institutional relationships. This dissertation thus will link these two criteria to determine the nature of changes in the institutional relationships examined, as well as their impact on energy system stasis and change after shocks occur.

Bridging the Gap: Combining Shocks and Institutional Relationships

Theoretical work on path dependence in energy systems has established a strong foundation for analyses of two drivers that can perpetuate or break it: external shocks and institutional change. While existing theoretical and empirical scholarship on these factors offers many insights, it does not adequately explain why exogenous shocks do not always result in energy system transformation, nor how institutional change can contribute to this effect. While the literature indicates that the size of the shock can affect the changes that result from it, size alone may not predict the impact on an energy system. Small shocks can lead to big changes, and large shocks may not result in much energy system change at all. For example, the 1979 accident at Three-Mile Island did not precipitate permanent shutdown of the U.S. nuclear reactor fleet. Studies of nuclear power trends in the United States also show that the accident merely compounded a downward trend in nuclear plant construction.

The existing literature on external shocks and institutional change thus suggests that both of these fields partially explain disruptions in entrenched technological systems. Recent scholarship in these fields points to a need to link these fields for more complete understanding of how path dependence disintegrates.

Birkland's distinction between disasters and crises moves toward such a link between exogenous shocks and endogenous factors that can lead to policy change. Thelen and Mahoney assert the need for a model of change that can account for both endogenous and exogenous sources of change.⁶³ Such a model would enable a more comprehensive approach to analyzing cases involving external shocks and how they combine with endogenous institutional change to break or perpetuate lock-in in large technological systems. This dissertation moves toward defining such a model through examination of an empirical case.

⁶³ James Mahoney and Kathleen Thelen, 2009.

CHAPTER THREE: RESEARCH QUESTIONS AND HYPOTHESES

To answer the primary research question, this dissertation explores the impact of relationships on energy policy and policymaking processes. As relationships move from cooperation toward conflict, what happens to energy policy and policymaking after a shock? As clout shifts from one group to another, what happens? How do these relationship elements combine to affect changes in energy policy and the policymaking process? This dissertation considers these questions in the form of potential relationship scenarios and their effects on energy policy and the policymaking process.

This project analyzes Japan's experiences over a period of four decades, during which government relationships with the electric utilities and the public combined with three external shocks to national energy systems: the 1970s oil crises, technological and institutional failures in the 1990s and early 2000s, and the 2011 Fukushima nuclear disaster. Examining Japan's energy policies and policymaking processes before and after these shocks enabled analysis of specific questions on the nature of institutional relationships, their interaction with the shocks, and the impact on energy policymaking.

Key Concepts

This dissertation addresses the gap in scholarship on institutional features that limit the ability of exogenous shocks to derail policy entrenchment. Shocks are defined here as focusing events such as crises or disasters, in accordance with the vast bodies of

literature on shocks and work based on Kingdon's general concept of focusing events.⁶⁴

This scholarship gap exists across sectors, but it wields particular significance in the energy sector, since existing literature demonstrates that energy systems are especially prone to lock-in.

Institutional relationships that influence energy policymaking include intragovernmental relationships, as well as government relationships with the private sector, the public, and the media. Existing empirical studies suggest that of these, the government's relationships with the electric utilities and the public appear to most directly influence national energy policymaking and the possibility of change.⁶⁵ Other studies suggest that government relationships with the media and manufacturing industry influence government relationships with the public and electric utilities. However, these studies indicate that government-media relations do not directly alter policymaking. They also suggest that the manufacturing sector typically competes or coordinates with, but does not trump, the electric utilities for influence over energy policymaking.⁶⁶ A future study of these two relationships will enhance understanding their relative importance in energy policymaking and change, as described in the final chapter. Focusing here first on the government's relationships with the electric utilities and the public, this dissertation's primary research question examines how these relationships have combined with exogenous shocks to generate change or maintain the status quo in

⁶⁴ E.g., Frank Baumgartner and Bryan Jones, 1993; John Kingdon, 1997; Thomas Birkland, 1997; Christoph Stefes and Frank Laird, 2010.

⁶⁵ E.g., Richard Samuels, 1987; Geert Verbong and Frank Geels, 2007; T. Stenzel and A. Frenzel, 2008.

⁶⁶ e.g., Vietor 1987; Gamson and Modigliani 1989; Walgrave, et al. 2008; Sengers, et al. 2010; Birkland 2011; Heras-Saizarbitoria, et al. 2011.

energy policy and policymaking.

Data from the first phase of Japan-based interviews for this project demonstrated a need to subdivide the government into four groups to holistically understand relationships with the electric utilities: energy policymakers, politicians, economic regulators, and safety regulators. Energy policymakers include bureaucrats responsible for energy policy decisions. Politicians include elected officials involved in energy policymaking. Economic regulators are officials designated to handle the electricity market structure. Safety regulators are officials responsible for power plant and electricity grid safety. The interviews confirmed that the relationships of these groups with the electric utilities are not homogenous, and the differences impact changes to energy policy and policymaking processes. This dissertation reserves the analysis of intragovernmental relationships as an important topic for future study. This said, it analyzes the relative power of these four groups' relationships with the electric utilities to determine the overall effect when the relationships yield conflicting influences on energy policymaking.

Since the data also reflect the Japanese public's tendency to view the government as a monolithic entity, this dissertation examines the public's relationship with the government as a whole, rather than with the three subgroups.

Existing empirical work reflects the relative power of these groups in the Japanese policymaking process.⁶⁷ Policymakers in the bureaucracy have both formal and informal relationships with the electric utilities. Both kinds of relationships directly affect energy

⁶⁷ E.g., Richard Samuels, 1987, and Espen Moe, 2012.

policy changes, as well as process and structural changes, thus dominating changes to energy systems. Politicians' relationships with the electric utilities hold equal weight, since they influence energy policy directly through legislative changes, and they also indirectly impact energy policy by affecting policymakers' interactions with bureaucratic policymakers. Economic and safety regulators' relationships with the electric utilities affect energy system stasis or change, but their impact is bounded by policymakers' and politicians' dominance in policymaking.

Independent Variables: Cooperation vs. Conflict and Power Balance/Clout

To analyze how the government's relationships with the electric utilities and the public combine with exogenous shocks, this dissertation applies the concepts of cooperation vs. conflict and power balance/clout discussed in the literature review in the previous chapter.

Cooperation and Conflict

As previously discussed, existing literature often frames institutional relationships as characterized by cooperation and/or conflict. These works generally use the term "cooperation" to describe inter-institutional coordination or collaboration on policy action, and conflict to describe lack of such coordination. Existing literature also identifies trust in institutional relationships as a major underlying factor determining cooperation.⁶⁸ In particular, trust comprises a major component of public cooperation with changes in government policies and can precipitate changes in policymaking

⁶⁸ e.g., Henry Farrell, 2004; Henry Farrell, 2005; Frances Gillebo and Charles Francis, 2006; Michael Pirson and Deepak Malhotra, 2007; Henry Farrell, 2009; Nivine Abbas, et al., 2014.

processes. Cooperation between government institutions and electric utilities includes trust but also transcends it to include direct collaboration and consultation on policy development. As a result, in this study, government cooperation with the public and the electric utilities is measured by a combined factor of trust and level of coordination on energy policies. Conversely, conflict is measured by lack of trust and lack of coordination on government policies. In this dissertation, relationships are measured in terms of cooperation and conflict using a four-point scale developed for this project: cooperation, some cooperation, some conflict, and conflict. Qualitative assessment of the interview data determines placement on the scale. This four-point scale enables a more nuanced analysis of the intergroup tensions and their impact on policy and process change than a two-point scale allows.

Power Balance/Clout

In addition to cooperation, existing literature on institutional relationships and advocacy coalitions also highlights power balances between groups, or relative clout of these groups, as a factor affecting policy change. This work reflects the notion that shifts in power balance or clout resulting from a shock or other catalyzing event may alter policy outcomes differently than economic considerations alone would suggest. Some work on energy policy has incorporated this concept of stakeholder clout, particularly as it applies to shifts out of existing energy systems.⁶⁹ While these works do not measure power balance/clout directly, they establish a precedent for including it as a factor representing relationship change that affects energy policy.

⁶⁹ e.g., Thomas Birkland, 1997; Richard Hirsch and Benjamin Sovacool 2006; Christoph Stefes and Frank Laird 2010; Michael Aklin and Johannes Urpelainen 2011.

This dissertation analyzes qualitative interview data to determine shifts in relationship power balance or clout. Since the term “power” appears frequently in this dissertation in the context of electricity, the term “clout” will be used in assessing relative influence of government subgroups vs. the electric utilities and the government vs. the public. Clout is measured by the amount of input the public and electric utilities have on government policies, either through formal channels or informally.

Dependent Variables: Energy Policies and Policymaking Processes

To create a comprehensive understanding of the effect of external shocks and shifts in institutional relationships, this dissertation examines their influence on energy supply policies and policymaking processes. Policymaking processes analyzed here focus on the formal and informal roles of government entities, the electric utilities and the public in development of energy supply policies and regulations. Analyzing changes to energy policies sheds light on energy system stasis and transformation. By also analyzing changes to policymaking processes, this study broadens understanding of the ways in which shocks and relationship changes can impact energy systems, even when policies do not change. Structural changes to the government and electric utilities also can influence the energy policymaking process. Such changes include alteration of the electric utility industry structure, as well as shifts in energy policymaking and regulatory bodies. Accordingly, the analysis also includes changes to these structures. Analyzing whether changes in energy supply policies, policymaking processes, and structure occur also enables a more complex analysis of how institutional relationships can limit certain kinds of change while catalyzing others after an external shock occurs.

Scenarios

While shifts in the cooperation/conflict and clout axes of the relationships can manifest in numerous combinations, this dissertation will focus on four potential scenarios that could elicit change in policy but not process, change in process but not policy; no change in policy or process; and change in both policy and process. These scenarios enable comparisons of relationship dynamics across the cases examined and their impact on energy system stasis and change.

Scenario 1: Cooperation and Government Clout

As shown in Table 1, this scenario assumes that a shock does not challenge cooperation between energy policymakers and electric utilities. Scenario 1 predicts that if this is the case, and if the policymakers wield more clout in policymaking than the utilities, we can expect to see changes in energy policies that will alter the incumbent energy system if policymakers prioritize such change. Conversely, changes to policymaking processes and regulatory structure are unlikely to occur. Public cooperation and lack of clout would facilitate policy change spearheaded by policymakers. Thus, scenario 1 suggests that a relationship in which policymakers have clout over and cooperation from the utility industry and public enables a shock to generate enduring policy change while preserving policymaking processes.

Table 1: Scenario 1: Cooperation and Government Clout

Indep. Variable	Mediating Variables				Change in Dependent Variable	
	Relationships	Change in Cooperation/Conflict		Change in Clout	Policy	Policy Process/ Structure
		Before Crises	After Crises	Before Crises	After Crises	
	Bureaucrats-Utilities	At least some cooperation	No change	Bur. > Util.	No change	Yes
	Politicians-Utilities	At least some cooperation	No change	Pol. > Util.	No change	No
	Economic Regulators-Utilities	At least some cooperation	No change	Reg. < Util.	No change	
	Safety Regulators-Utilities	At least some cooperation	No change	Reg. > Util.	No change	
	Government-Public	At least some cooperation	No change	Gov. > Public	No change	

Scenario 2: Regulator-Utility Conflict and Government Clout

If the shock involves an accident or technology failure, we can expect the regulator-utility and government-public relationships to be in conflict after a shock. The second scenario depicts this situation, as shown in Table 2. However, even with the emergence of such conflict, a shock may not affect policymakers' cooperative relationship with the electric utilities, even if the electric utilities lose clout. If this is the case, as the regulator-utility relationship moves toward conflict, we can expect policy process change and/or structural change, but not policy change that alters the incumbent energy system. Policy process and/or structural change is more likely if the public wields clout over the government after a shock, since policymakers would need to regain public trust in order to preserve the incumbent energy system. While no discernible precedent for this scenario exists in the energy arena, Japan's trajectory since the Fukushima nuclear disaster could follow this path if the government's creation of an independent nuclear regulatory agency and unbundling of the electric utilities are coupled with nuclear reactor restarts.

Table 2: Scenario 2: Government-Public and Regulator-Utility Conflict and Government Clout

Indep. Variable	Relationships	Mediating Variables				Change in Dependent Variable	
		Change in Cooperation/Conflict		Change in Clout		Policy	Policy Process/ Structure
		Before Crises	After Crises	Before Crises	After Crises	No	Yes
	Bureaucrats-Utilities	At least some cooperation	No change	Bur. > Util.	No change		
	Politicians-Utilities	At least some cooperation	No change	Pol. > Util.	No change		
	Economic Regulators-Utilities	At least some cooperation	At least some conflict	Reg. > Util.	Reg. > Util.		
	Safety Regulators-Utilities	At least some cooperation	At least some conflict	Reg. > Util.	No change		
	Government-Public	At least some cooperation	At least some conflict	Gov. > Public	Gov. < Public		

□

Scenario 3: Regulator-Utility Conflict and Utility Clout

The third scenario assumes that the electric utilities retain clout over policymakers and regulators, even if they are in conflict with regulators. In this scenario, reflected in Table 3, utility company conflict with regulators after a shock will not elicit change in policy or policymaking processes and the regulatory structure. This outcome also depends on continued cooperation with policymakers. Stasis also is especially likely if the public does not wield clout over the government, even if public trust in the government declines. The 2008 coal ash spill at the Kingston Fossil Plant embodies this situation. On December 22, 2008, a dike failure at the Tennessee Valley Authority's Kingston Fossil Plant led to the largest U.S. coal ash spill to date. It released 5.4 million cubic yards of coal ash into the Emory and Clinch rivers and covered more than 300 acres of land and water. No immediate injuries occurred, but the spill negatively impacted local citizens and the area's environment. To date, the Environmental Protection Agency (EPA) has proposed but not implemented new regulations classifying coal ash as a hazardous substance.⁷⁰ The U.S. response to the Three-Mile Island nuclear accident arguably offers another example of this scenario, since regulations changed, but not energy supply policy or the policymaking process.

Scenario 3 depicts a relationship in which government policymakers have little/no clout, but cooperation with the electric utilities, while the utilities have clout over politicians, and policymakers have clout over and cooperation from the public. This

⁷⁰ Tennessee Department of Environment and Conservation,
<http://www.tn.gov/environment/kingston/index.shtml>

combination of relationships can inhibit the ability of a shock to generate enduring change in energy policy, the policymaking process, and regulatory structure.

Table 3: Scenario 3: Government-Public and Regulator-Utility Conflict and Utility Clout

Indep. Variable	Relationships	Mediating Variables				Change in Dependent Variable	
		Change in Cooperation/Conflict		Change in Clout		Policy	Policy Process/Structure
Shock	Relationships	Before Crises	After Crises	Before Crises	After Crises	No	No
		Bureaucrats-Utilities	At least some cooperation	No change	Bur. < Util. No change		
		Politicians-Utilities	At least some cooperation	No change	Pol. < Util. No change		
		Economic Regulators-Utilities	At least some cooperation	At least some conflict	Reg. < Util. No change		
		Safety Regulators-Utilities	At least some cooperation	At least some conflict	Reg. < Util. No change		
		Government-Public	At least some cooperation	At least some conflict	Gov. > Public No change		

Scenario 4: Policymaker and Regulator-Utility Conflict and Government Clout

Scenario 4 assumes that the both the government-public and policymaker-electric utility relationships move toward conflict after a shock, as shown in Table 4. If so, we can expect to see energy policy change, as well as policy process or regulatory structural changes, if the policymakers wield more clout than the electric utilities. We also would expect to see these changes if economic and/or safety regulators gain clout over the electric utilities after a shock. If the public has clout, a loss of public confidence in policymakers deepens the likelihood of change in energy policy and policymaking processes.

However, lack of cooperation from both the utilities and the public can complicate policy change. These complications arise from utility reluctance to implement policy changes, public distrust of policymakers' motives, the potential for diverse public views on the direction of change, and the challenges of educating the public on implications of policy change. Further, if shocks cause energy policy priorities across these stakeholder groups to become out of alignment, cooperation becomes more difficult, and the stakeholders with more clout will determine which priorities policymakers will pursue through policy change. Following the Fukushima disaster, Japan offers the first opportunity to examine the possibility of this scenario.

Table 4: Scenario 4: Government-Public, Policymaker and Regulator-Utility Conflict, Government Clout

Indep. Variable	Mediating Variables					Change in Dependent Variable	
	Relationships	Change in Cooperation/Conflict		Change in Clout		Policy	Policy Process/Structure
Shock		Before Crises	After Crises	Before Crises	After Crises		
	Bureaucrats-Utilities	At least some cooperation	Conflict	Bur. > Util.	No change	Yes	Yes
	Politicians-Utilities	At least some cooperation	Conflict	Pol. > Util.	No change		
	Economic Regulators-Utilities	At least some cooperation	Conflict	Reg. < Util.	Reg. > Util.		
	Safety Regulators-Utilities	At least some cooperation	Conflict	Reg. < Util.	Reg. < Util.		
	Government-Public	At least some cooperation	Conflict	Gov. > Public	Gov. < Public		

Case Selection

Japan has experienced several sets of major shocks to its energy system, offering a prime opportunity to test the four scenarios defined above. Many nations have faced the same or similar shocks: the 1970s oil crises and accidents at nuclear power plants or other electricity supply technology failures. Japan's energy policy and energy policymaking processes have not changed in the same way after each shock. These divergent responses enable an assessment of whether and how each shock combined with shifts in institutional relationships to maintain stasis or effect change in Japan's energy policy and policymaking processes. Shifts in the Japanese government's relationships with the electric utilities and the public allow comparisons with and lessons for other nations that have faced shocks to their energy systems.

The culturally driven paternal government-public relationship may appear to make the Japanese case an outlier. However, Japan's parliamentary system of government, in which the bureaucracy plays a leadership role in Japanese policymaking along with the political parties, parallels policymaking structures in many other developed and developing nations, including the United Kingdom, Sweden, Australia, New Zealand, Denmark, India, Malaysia and Thailand. Politicians' close relationships with the electric utilities resemble similar relationships in many other democratic, industrialized nations like the United States and Germany. The tensions and transitions in electric utilities' relationships with safety and economic regulators also reflect trajectories in other nations. Japan's lack of indigenous fossil fuel resources also enables this dissertation's analysis to offer insights for other nations facing a similar challenge.

This project analyzes Japan's experiences from the time of the 1970s oil crises through the Fukushima nuclear disaster. During these four decades, government relationships with the electric utilities and the public combined with three external shocks to national energy systems: the 1970s oil crises, nuclear accidents and a scandal in the 1990s and early 2000s, and the 2011 Fukushima nuclear disaster. Examining Japan's energy supply policies and policymaking processes before and after these shocks illuminates the nature of institutional relationships, their interaction with the shocks, and the impact on energy policymaking.

Hypotheses

This dissertation tests the scenarios outlined above in the form of three hypotheses:

- First, per scenario 1, the 1970s oil shocks did not alter the Japanese government's cooperative relationships with or clout over the electric utilities and the public. This continued cooperation and government clout led to energy policy change in Japan, but no immediate changes to the policymaking process or regulatory structure.
- Second, the electric utilities gained clout over time, contributing to scenario 3, in which a series of technological and institutional failures in the 1990s and early 2000s did not result in Japanese energy policy change, policymaking process change, or significant regulatory change. The regulatory change that did take place was intended to appease conflict between the government and the public, though the government retained clout.

- Finally, the 2011 Fukushima nuclear disaster occurred in this environment of tenuous balance between cooperation and conflict, coupled with the battle for clout. This dissertation hypothesizes that the key to whether this shock leads to scenario 2 or scenario 4 lies in the conflict/cooperation axis of the government's relationships with the electric utilities and the public, as well as the public's retention of clout. If the relationships remain in conflict, policy change will likely accompany Japanese policymaking process and structural change. If bureaucrats' and politicians' relationships with the electric utilities return to cooperation, transformative energy policy change is unlikely to emerge. Over time, a possibility arises that public clout or conflict with the government could decline, resulting in scenario 3, no major change at all. If the electric utilities regain clout before any irreversible policymaking process change, this scenario becomes even more likely.

CHAPTER FOUR: DATA COLLECTION, METHODS OF ANALYSIS AND LIMITATIONS

Data Collection

Data collection, which took place in Japan, included 80 interviews of 58 interviewees: 21 government or former government officials involved in energy policymaking, 23 executives from electric utility companies and affiliated energy organizations, 7 NGO representatives identified by the government to represent public opinion and journalists covering public opinion, and 7 academics researching Japanese energy policymaking and public opinion.⁷¹ One-fourth of these interviews were conducted in Japanese, and the remainder were conducted in both Japanese and English. Quotations that appear in the dissertation preserve interviewees' original English statements where possible. Translations of the interviewee's Japanese statements were confirmed by the dissertation author and supplemented by interviewees' English recapitulations.

This data collection occurred in two stages. The first stage involved two concurrent data collection processes. One of these processes consisted of examining Japanese secondary data from the periods just prior to and following the 1970s oil crises, the 1990s nuclear accidents, and the March 2011 Japanese nuclear disaster. These documents include public opinion polls on trust in the government before and after the

⁷¹ The Institutional Review Board approved the interviewees and interview protocols for this study.

three shocks, energy industry statements, and government documents such as policy statements and white papers on energy policy. To establish a foundation of understanding regarding the government's relationships with the energy industry and public following the three shocks, the second, concurrent process within the first stage involved semi-structured, one-on-one interviews of eight Japanese government officials, five energy sector executives, four journalists and NGO leaders, and two scholars. These secondary documents and initial interviews generated interview questions for the second stage.

In the second stage, interviews engaged the original interviewees and 13 additional government officials, 19 additional energy sector executives, three additional journalists and NGO leaders, and six additional scholars. This approach enabled historical grounding and incorporation of new questions generated by initial interviews, enhancing the validity of subsequent interview results.

Government interviewees included current and former officials from the Ministry of Economy, Trade and Industry (METI); the Ministry of Environment (MOE); the Cabinet Office; the Japan Atomic Energy Commission (AEC); and the Japan Atomic Energy Agency (JAEA).

Diet members have become increasingly involved in Japanese energy policymaking during the period covered in this project. Thus, interviewees also included two Diet members active on energy issues and institutions: Taro Kono and Yasuhisa Shiozaki.

Electric utility interviewees included current and former executives from Tokyo Electric Power Company (TEPCO), Kansai Electric Power Company (KEPCO), Tohoku Electric Power Company, Chubu Electric Power Company, J-Power, and the Federation of Electric Power Companies of Japan (FEPC). Other energy industry interviewees included executives and officials from the Japan Atomic Industrial Forum (JAIF), and Japan Nuclear Fuel, Ltd. (JNFL), and the Research Institute for Innovative Technology for the Earth (RITE), as well as analysts from the Central Research Institute of Electric Power Industry CRIEPI, the Japan Electric Power Information Center (JEPIC), and the Institute for Energy Economics Japan (IEEJ).

Subsidiary questions that contributed to testing the four scenarios were incorporated into interview questions. These questions focused on the nature of government relationships with the electric utilities and the public before and after these shocks, as well as risk perceptions and priorities of these groups. Questions included the following:

1. What kinds of Japanese government relationships with the electric utility companies and the public existed before each of these shocks?
2. How have these shocks impacted these government relationships with the energy industry and the public?
3. What risk perceptions did these groups hold regarding established energy technologies prior to the shocks?
4. How did these risk perceptions change after each shock?
5. How have these nations' energy policies or policymaking processes changed after

these shocks?

6. Have they represented changes in both policymaking process and policy, or only one of the two?
7. Have these shifts represented incremental modifications within an incumbent technology or radical shifts toward new technologies?
8. How have these changes impacted responses to later shocks?

Answering these questions created a narrative that can inform energy system trajectories in other nations.

Methods of Analysis and Limitations of the Data

Analysis of the data consisted of coding the initial interviews for themes that guided the secondary interviews. To formulate systematic responses to project research questions, analysis identified data trends across all interviews. Conclusions were based on analysis of the complete data set for each case and across all three time periods to create a holistic narrative.

In this dissertation, relationships are measured in terms of cooperation and conflict using a four-point scale developed for this project: cooperation, cooperation outweighs conflict, conflict outweighs cooperation, and conflict. Qualitative assessment of the interview data determines placement on the scale.

Limitations

Main limitations of the research design include challenges to internal validity, study replication, and generalizability. Since a flexible design requires a well-defined protocol to support replication and ensure validity, this study will generate a database of

interview questions and interviewees applicable to new cases added in the future. Data analysis will utilize codes across cases to allow for addition of such future cases.

The use of multiple data sources for interviews and secondary data strengthened the internal validity of the project. In addition, conclusions based on interviewees' responses were confirmed or negated through follow-up questions in subsequent interviews.

Media sources in Japan have political affiliations that can bias their poll data. To correct for this internal validity challenge, poll results from the source cited in the dissertation were cross-checked with data from media organizations with different political affiliations.

Although the study features historical grounding in events occurring in the 1970s through early 2000s, shifting governmental, private sector, and public relationships and positions in the aftermath of the Fukushima pose an additional reliability challenge that can have implications for generalizability of study results.

Countering alternate hypotheses for the role of institutional relationships in energy policy entrenchment and change constitutes an important element of the study. Interview questions thus probed the roles of efficiency, cost and safety as values that contribute to energy policy developments.

CHAPTER FIVE: 1970S-1980S: THE OIL SHOCKS: NOT SO SHOCKING

“...there was a time...when after the oil shock, there was a clear shift of energy sources from fossil fuels to nuclear. That was, I think, under a very close relationship with government and industry. They changed the course.”

-- Former government official, Ministry of Economy, Trade and Industry (G16)

“...the utilities financially did not have power, so there is no way but to hear the government. They relied on the government and at that time they supposed that government will establish some goal, and utilities and private sector will have to follow the goal.”

-- Electric utility executive (I1)

“...the Japanese government has been creating their energy policy as a very serious response to the social changes or the events that happened. So the first one is the oil crisis, so they diversified.”

-- NGO leader (P2)

We examine Japan's energy policymaking following the 1970s oil crises to analyze how the crises and the government's relationships with the electric utilities and the public influenced Japanese energy policy and the policymaking process. Interview data, public opinion polls and government documents reflect a relationship in which policymakers and politicians have clout over and cooperation from the utility industry

and public. Despite tensions between the electric utilities and both safety and economic regulators, the 1970s oil shocks did not alter the Japanese government's cooperative relationships with or clout over the electric utilities and the public. This continued cooperation and government clout enabled the shocks to generate dramatic energy policy change in Japan without immediate changes to the policymaking process or regulatory structure.

The Oil Crises: Sudden Shock

A vast array of existing literature and government documents describes the origins and global effects of the 1970s oil shocks or oil crises, two episodes of steep oil price rises in the 1970s.⁷² After Arab members of the Organization of Petroleum Exporting Countries (OPEC) imposed and lifted an oil embargo against the United States and other nations supporting Israel in 1973-4, the global market price of oil stabilized at a level almost quadruple the pre-crisis price. As Japanese electric utility executive I7 noted, because oil accounted for 75 percent of Japan's primary energy supply, "the price increase of oil had a very big influence on the Japanese economy. So the Japanese economy experienced, for first time after WWII, zero percent GDP growth." Several studies of the first oil crisis' effects on the Japanese economy corroborate this assertion. Mihut and Daniel's analysis cites slightly negative Japanese economic growth in 1974.⁷³ The study also finds that Japan's trade surplus before the crisis, over 5 billion dollars in

⁷² Michael Ross offers one scholarly account: Michael Ross, 2013. The U.S. Department of State's Office of the Historian provides an example of a governmental summary: <https://history.state.gov/milestones/1969-1976/oil-embargo>.

⁷³ Marius Ioan Mihut and Decean Liviu Daniel, 2012, 1045.

1972, plunged into a deficit that peaked at over 6 billion dollars in 1974.⁷⁴ Mihut and Daniel also determine that Japan faced a consumer price increase of over 18 percent, due in part to an exponential increase in electricity prices that affected the manufacturing sector.⁷⁵

This impact was not limited to Japan; existing literature portrays similar jolts to the energy systems and economies of other oil importing nations around the world. However, the policy responses to the oil crises varied by country, and the Japanese government's choices suggest a more complex set of catalysts than just the shock itself.

The oil crises shocked the citizens of oil importing countries, including Japan. Japanese interviewees who experienced the oil shocks firsthand recalled a new public awareness of the role of oil in their daily lives. I6, who worked at TEPCO at the time, recounted,

What happened was that there was nothing to buy in the supermarket. No toilet paper. Only from that phenomenon, we, general public, understands, we Japan depend on other countries for energy sources, especially the Middle East. Before that, the general public didn't care about the oil shock and where energy was coming from, and where it changes to electricity. Such kind of knowledge, we don't have any. Only plug in, and we can use it.

Interviewees asserted that the second oil crisis in 1978-9 did not alter the Japanese mindset to as great a degree as the 1973 shock. However, it reiterated recognition of the vulnerability associated with oil dependence.

This second shock was precipitated by a decline in Iranian oil production during a revolution in 1978, coupled with a surge in oil demand that some historians and

⁷⁴ Marius Ioan Mihut and Decean Liviu Daniel, 2012, 1045.

⁷⁵ Marius Ioan Mihut and Decean Liviu Daniel, 2012, 1044.

economists believe emerged in part as a hoarding response to the first shock.⁷⁶ World oil prices more than doubled between 1979 and 1981. Mihut and Daniel assert that this time, Japan's economic growth declined by two percent and did not fall below zero.⁷⁷ This improved reaction compared to the first oil crisis response occurred despite continued high levels of Japanese oil imports, according to an analysis by Richard Finn.⁷⁸

If the second oil crisis arose partly due to policy responses to the first shock, such as hoarding behavior by oil importing nations, this linkage represents a pattern repeated in Japanese energy policy over the following four decades. Several interviewees suggested that each policy response to address a shock or other energy system challenge resulted in a new problem.

After shocks: Electricity supply and policy process changes

We might expect that the 1970s oil crises would spur the Japanese government's efforts to bolster the existing energy system by diversifying oil supply sources, while altering the system by reducing oil dependence through diversification of energy supply alternatives to oil. We also might expect the Japanese government to avoid shifts toward reliance on other imported energy sources, as well as dependence on any one particular energy source. We thus would expect that the Japanese government would pursue a balance of domestically sourced coal and renewables, supplemented by nuclear power. Since the oil crises highlighted the vulnerability associated with imported energy sources, we might expect to see a particular emphasis on nuclear fuel recycling as a key

⁷⁶ E.g., see Laurel Graefe, 2014.

⁷⁷ Marius Ioan Mihut and Decean Liviu Daniel, 2012, 1047.

⁷⁸ Richard Finn, 1983, 61.

component of nuclear power development, because Japan possesses no indigenous uranium deposits.⁷⁹ These same energy security fears would lead to an expectation that Japan would not shift toward imported natural gas as a replacement for oil. We would expect to see these supply changes combined with initiatives to reduce energy consumption through energy efficiency and conservation measures. However, we also would expect difficulty in accomplishing energy efficiency and conservation improvements. These measures should have faced challenges from the public, which might have opposed curbing personal energy use, and the electric utilities, whose profit increases were directly related to higher electricity use.

While Japanese energy supply shifts and policy and process changes following the oil crises match some of these expectations, some surprises emerge regarding specific energy supply source shifts. In particular, nuclear power use expanded dramatically, while renewables and coal experienced limited growth. These surprises, as well as accomplishment of some of the expected but challenging goals, lead to examination of institutional relationships as a factor influencing the Japanese government's policy and process choices, as well as energy system changes. The interview data reveals that the electric utilities cooperated with the government to transform Japan's energy system and expand electricity supply in exchange for incentives and increasing clout in the energy policymaking system. At the same time, public compliance with the energy system transformation was grounded in public trust in the government's goals, as well as incentives provided by the government.

⁷⁹ In the 1970s and 1980s, Japan imported uranium primarily from Australia and Canada.

Energy System Changes

The Japanese government's general policy goals following the oil shocks align with our expectations, but the specific energy supply source shifts diverge from what we might expect.

In the midst of and following the oil crises, the Japanese government did develop goals featuring stabilization of oil supplies, diversification of energy supply sources beyond oil, and energy conservation and efficiency. In 1975, MITI's Advisory Committee for Energy submitted a report recommending development of a stable energy supply as MITI's top priority.⁸⁰ Based on this report, MITI established five policy pillars: oil dependence reduction; diversification of energy supply alternatives to oil; establishment of stable oil supply through petroleum reserves; exploration and development of oil by Japanese companies; promotion of energy conservation; and promotion of new energy R&D. These goals simultaneously fostered resilience in the existing oil-based energy system, while shifting to a new system comprised of a balance of energy supply sources.

Some unexpected energy system and policy shifts occurred after the oil crises. As depicted in **Figure 1**, oil dropped precipitously from 73 percent of Japan's electricity supply in 1973 to 28 percent in 1990. Concurrently, nuclear power rose from a mere 2 percent to 24 percent. Natural gas experienced a similar rise from 2 percent to 23 percent. Coal use also expanded to a lesser degree from 8 percent to 16 percent of the Japanese electricity supply. In the 1970s, hydropower was the only renewable energy

⁸⁰ International Atomic Energy Agency, 2014, and MITI Advisory Committee on Energy, 1975.

source in Japan's electricity mix, a trend that largely continued through 1990.

Hydropower's share of Japan's electricity supply actually declined from 15 percent in 1973 to 12 percent in 1990. The shifts in specific fuel sources -- and at times, even the policies promoting these changes -- do not reflect an avoidance of reliance on imported energy sources. The new policies also began to shift Japan's energy system away from oil dependence, but toward reliance on a different energy supply source: nuclear power, with natural gas following closely behind. At the same time, coal and renewables policies were not sustained, and growth of these fuels in Japan's energy supply did not reach the Japanese government's expected targets. The Japanese government's relationships with the electric utilities and the public seem to have influenced the expansion of these sources.

On the demand side, the oil crises also spurred new energy conservation measures. Since these measures should have faced opposition from the public and the electric utilities, the government's relationships with the public and the electric utilities appear to have played an influential role in the success of conservation and efficiency measures.

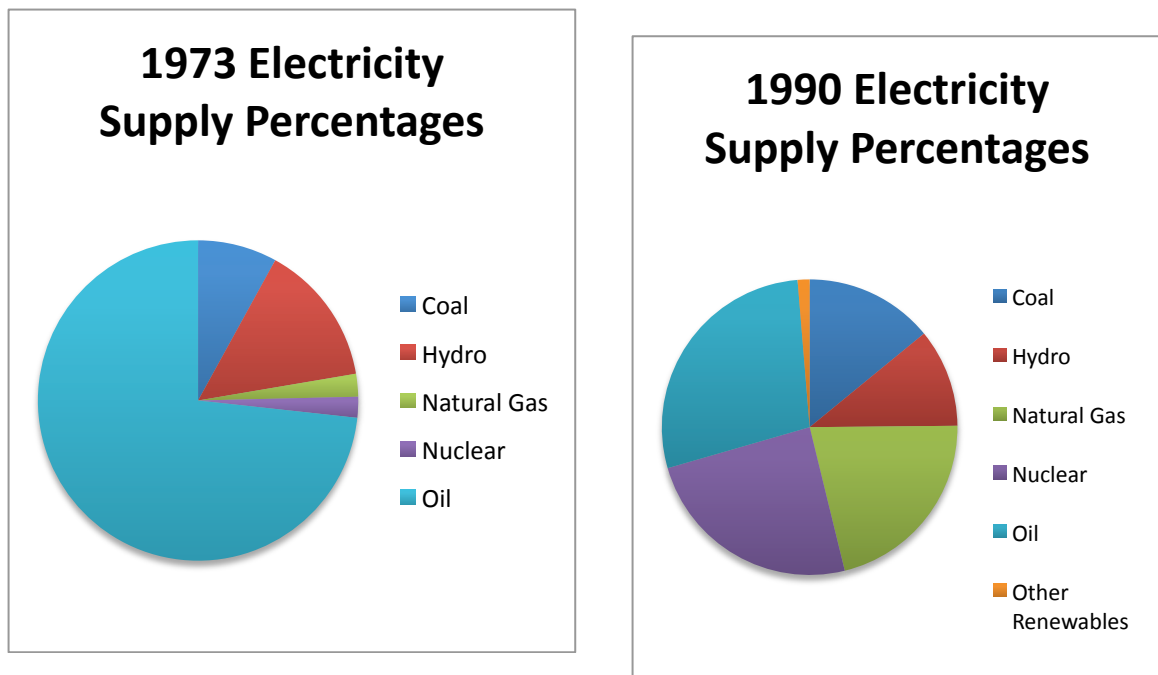


Figure 1: Comparison of 1973 vs. 1990 Electricity Supply Fuel Percentages

Source: International Energy Agency

<http://www.iea.org/statistics/statisticssearch/report/?country=JAPAN&product=electricityandheat&year=1990>

Oil supply diversity and energy system preservation

According to several government officials (e.g., G9, G21), the oil crises catalyzed the Japanese government's pursuit of an energy policy focused on securing stable oil supplies. In December 1975, the Japanese government enacted the Petroleum Reserve Law, which established an oil stockpile target; obligated refiners, marketers and importers of petroleum to hold minimum oil stockpiles above the level of their basic obligation volumes; and lowered the basic obligation volume, specifically in the event of an oil supply shortage in Japan.⁸¹ In 1978, the government-owned Japan Petroleum Development Corporation (JPDC) became the Japan National Oil Corporation (JNOC), when the Japanese government added the function of stockpile operation and strategic petroleum reserves.⁸² In 1981, the Japanese government established a system that obligated the private sector to hold a 90-day equivalent oil stockpile.

These measures reflect the Japanese government's efforts to build resilience against future shocks to the existing oil-based energy system. These policies also strengthened MITI's oversight of the electric utilities' oil stockpiling efforts. We would expect that such measures indicate policymakers' and politicians' clout over and cooperation with the electric utilities, as well as an aim to retain public trust.

Energy system transformation

At the same time, the Japanese government also undertook a dramatic transformation of the energy system. The oil crises alone do not appear to have enabled a shift from an oil-dependent electricity supply to a diversified electricity supply portfolio.

⁸¹ Ministry of International Trade and Industry, Government of Japan, 1975.

⁸² For detailed history, see <http://www.jogmec.go.jp/english/about/about003.html>.

In 1980, the Cabinet called for a reduction in the share of imported oil from 75 to 50 percent of Japan's primary energy supply by 1990, supported by imposition of a tariff on petroleum imports. The tariff revenue financed implementation of the Petroleum Reserve Law, but it also funded R&D on oil alternatives. The Cabinet also approved MITI's proposed 1990 targets for "oil-alternative energy supplies" in primary energy supply, including increases in nuclear power use from 3.9 to 10.9 percent, coal from 12.9 to 17.7 percent, and natural gas from about 4 percent to 10.2 percent.⁸³ Electricity accounted for approximately 30 percent of Japan's energy supply in 1980, and a large component of Japan's energy system transformation after the oil crises involved reducing the amount of oil used to generate electricity. Examination of policymakers', politicians' and regulators' relationships with the electric utilities and the public reveals how they affected actual shifts in Japan's electricity supply.

Nuclear expansion: the key to transformation...and future lock-in

Nuclear power expanded from 2.1 percent of Japan's electricity supply in 1973 to 27 percent in 1990.⁸⁴ Since Japan's electricity supply portfolio appears relatively proportionally allocated between nuclear, natural gas, coal, oil, and hydropower during this period, this increase does not yet embody a nuclear-dependent system. However, the large increase in nuclear energy's share reflects the beginnings of such a system, as infrastructure, momentum, and institutional support grew along with nuclear generation

⁸³ Cabinet Office, Government of Japan, 1980.

⁸⁴ International Energy Agency,
<http://www.iea.org/statistics/statisticssearch/report/?country=JAPAN&product=electricityandheat&year=1990>

capacity. Supporting policies established a foundation for future increases, a rational decision based on energy security concerns.

The most prominent policy measures of this era, passed in 1974 and known as the Three Power Source Development Laws (*dengen sanpo*), institutionalized formerly ad hoc compensation to localities to promote siting of nuclear power plants. The Electric Power Resources Development Promotion Tax Law imposed a tax of 85 yen per 1000 kilowatt-hours of power sold by the electric utilities. The Power Resources Development Special Account Law and the Law on Adjustment of Areas Surrounding Generating Plants defined how the tax revenue would be collected and disbursed to localities siting nuclear power plants. Analyses by Lesbirel and Aldrich asserted that while the laws provided compensation for nuclear, coal, and hydropower plants, nuclear plant host communities had access to the largest amount of funding.⁸⁵ A paper by long-time energy policy scholar and government official Tatsujiro Suzuki confirms this assertion, stating that “nuclear power plants were to be given subsidies twice as high as coal-fired or oil-fired thermal power plants.”⁸⁶ Over time, only nuclear power plants remained eligible for all of the subcategories of grants and subsidies, while those available to hydropower and thermal plants shrank.⁸⁷ Electric utility interviewee I1 noted that the government eventually phased out thermal and hydropower plant host subsidies, and only communities hosting nuclear plants received funds.

⁸⁵ Sidney Hayden Lesbirel, 1998, 36; Daniel Aldrich 2005, 119.

⁸⁶ Tatsujiro Suzuki, 2001, 4.

⁸⁷ For more details, see Daniel Aldrich, 2013, 85.

The period following the second oil shock and the Three Mile Island (TMI) accident saw related increases in Japanese government subsidies to localities hosting nuclear plants. An analysis by Richard Suttmeier shows that MITI's grants to localities cooperating with nuclear plant construction increased from 37,514 million yen in FY1979 to 39,974 million yen in FY1980. Grants from the Cabinet Office's Science and Technology Agency (STA) rose from 1,405 million yen to 1440 million yen during the same period. Nuclear power plant safety improvement subsidies and grants from MITI and STA also increased dramatically from FY1979 to 1980. MITI's grants rose from 360 million yen in FY79 to 1,164 million yen in FY1980, and subsidies increased from 3,345 million yen to 4,440 million yen. STA grants rose from 563 million yen to 1,392 million yen during the same period.⁸⁸

The Japanese government also promoted advances in nuclear fuel recycling as a means of fostering energy independence after the oil crises.⁸⁹ This choice is unsurprising in this period, but some government officials and scholars assert that the government's relationships with the electric utilities and the public also influenced the nuclear fuel recycling policy. Later chapters of this dissertation will examine continuation of the nuclear fuel recycling program and the economic challenges associated with it.

⁸⁸ Richard Suttmeier, 1981, 115.

⁸⁹ The Japanese government included the nuclear fuel recycling program in the Long-Term Plans for the Research, Development and Use of Nuclear Power established in 1956. A paper by Tadahiro Katsuta and Tatsujiro Suzuki posits that the Japanese government's commitment to the nuclear fuel cycle emerged from local communities' concerns that spent fuel would remain on reactor sites. See Tadahiro Katsuta and Tatsujiro Suzuki, 2006.

Given the high start-up costs for nuclear power plants and the negative impacts of the Three-Mile Island and Chernobyl accidents that occurred in 1979 and 1986 respectively, the oil crises alone seem unlikely to have propelled this rapid expansion of nuclear power use. The government's relationships with the electric utilities and the public can help to explain this shift.

Gas growth

In addition to expanding nuclear power use after the oil crises, the Japanese government also aimed to increase natural gas use in Japan's electricity supply from about 4 percent to 10.2 percent of Japan's primary energy supply by 1990. Japanese natural gas use in electricity generation rose from 2 percent in 1973 to 21 percent in 1990. After the crises, the Japanese government encouraged the electric utilities to increase LNG use by exempting LNG from the import tariffs imposed on other petroleum products in 1980.⁹⁰

The electric utilities recognized the environmental benefits of LNG use, especially in comparison to coal and oil. TEPCO implemented an ambitious LNG import agenda to meet SOx and NOx pollution standards even before the oil crises occurred.⁹¹ From an energy security perspective, LNG also posed an attractive alternative to oil, since the electric utility companies were able to minimize imports from the Middle East in favor of imports from Southeast Asian neighbors such as Indonesia, Malaysia, and Brunei, as well as Australia.

⁹⁰ Stewart 2009, 180.

⁹¹ Gale 1981, 99.

LNG also offered economic advantages over nuclear power. Roger Gale quotes a TEPCO spokesman as confiding during an interview after the second oil crisis, “If we quantify the social costs, the inordinate delays, the remote and extra-large sites, and the ensuing transmission losses with which we have had to contend with nuclear power, then LNG is far less expensive.”⁹² These advantages suggest that the government and the electric utilities would cooperate to expand natural gas use, and they did.

In the 1970s, state-owned JNOC guaranteed loans for projects in Southeast Asia, and MITI provided overseas investment insurance to the electric utilities for their loan guarantees. We expect to find that government’s cooperative relationships with the electric utilities and the public influenced these policies and the trajectory of LNG use in Japan.

Coal takes its lumps

After the oil crises, the Japanese government aimed to increase coal use in Japan’s primary energy supply from 12.9 to 17.7 percent by 1990. Coal use in Japan’s electricity supply rose from 8 percent in 1973 to 14 percent in 1990.

In addition to the energy security benefit of coal substitution for oil, the Japanese government also focused on the potential of new coal technologies to meet Japanese pollution control standards. While land use, transmission line development, and processing costs posed economic challenges, they resembled problems facing nuclear power.

⁹² Gale 1981, 100.

The 1974 Electric Power Resources Development Promotion Tax that provided subsidies to communities hosting nuclear power plants also funded subsidies to localities hosting coal-fired power plants. Although MITI engaged in coal liquefaction and gasification projects after the oil crises, they terminated these projects a decade later.

Given that the oil crises should have spurred a return to coal use and a dedication to developing clean coal technologies, the Japanese government's relationship with the electric utilities appears to have played a role in limiting coal use expansion.

Renewables' failure to thrive

Hydroelectric power already supplied 14.3 percent of Japan's electricity at the time of the first oil crisis. The drive to diversify after the oil crises led the Japanese government to create policies and programs to foster development of other renewables, including solar, wind and biomass. However, these policies and programs did not lead to notable increases in renewable energy use.⁹³ Including hydropower, the total renewables share in Japan's electricity production in 1990 amounted to just over 12 percent of Japan's electricity supply.⁹⁴ Non-hydroelectric renewables accounted for 1.3 percent, comprised primarily of biofuels, geothermal and waste heat.⁹⁵ Government and electric utility documents as well as media analyses widely cite the high cost of renewables as the reason for this slow growth, but this rationale does not fully explain renewables' slow

⁹³ In 1990, hydropower supplied 10.7 percent of Japan's electricity, but replacement by other renewables did not account for or compensate for this decline.

⁹⁴ The total is derived from a 1.4 percent increase from 1990 levels to a 2011 total of 2.8 percent excluding hydropower. Data is extracted from Jones and Kim 2013, 19.

⁹⁵ The IEA's statistics for 1990 indicate that non-hydroelectric renewables accounted for approximately two percent of Japan's electricity. See <http://www.iea.org/statistics/statisticssearch/report/?country=JAPAN&product=electricityandheat&year=1990>

growth. By contrast, despite the high investment costs for nuclear plants, nuclear power's share grew exponentially. Further, the government's incentive programs, described below, should have made renewables more financially appealing.

After the first oil crisis, MITI created the Sunshine Project in 1974 to advance R&D on solar PV, geothermal and hydrogen technologies. After the second oil crisis, the Japanese government increased the budget for this project. Some analyses tout the project as the impetus for expansive growth in Japanese solar PV, but the commercial growth of this technology was not reflected until the 1990s.⁹⁶

In 1980, the Japanese government enacted the Law Concerning Promotion of the Development and Introduction of Alternative Energy. This law empowered the MITI Minister to establish and make public supply targets for alternative energy. The law also stipulates that energy users will make efforts to use alternative energy sources. The law defines "alternative" energy sources as alternatives to oil, including renewables. Under the same law, the Japanese government established the New Energy and Industrial Technology Development Organization (NEDO) to promote renewable energy development through R&D that the private sector considered too risky, and through subsidies to private firms developing renewables. However, these projects also made little headway during the post-oil crises period. Some scholars predicted the slow pace of renewables growth in Japan's electricity supply, citing uncertainty regarding the path to commercialization and diffusion.

⁹⁶ For example, see Osamu Kimura and Tatsujiro Suzuki, 2006.

And yet, we would expect that the emphasis on energy security would have driven more rapid development and use of these indigenous, oil-alternative technologies after the oil crises. Given the emergence of the opposite trend, the government's cooperation with the electric utilities on nuclear power expansion, coupled with electric utility clout, also appears to have stifled renewables growth.

Conservation and efficiency: Japan saves itself

Existing literature indicates that the oil crises led to the Japanese government's first implementation of supply efficiency and demand conservation measures. In 1978, the Japanese government created the Moonlight Project, which involved MITI-led R&D on energy efficiency and energy storage technologies, including fuel cells. On the demand side, the Japanese government passed the Act Concerning the Rational Use of Energy in 1979. The measures in the law focused on energy conservation by large users, particularly manufacturers, as well as the housing and transportation industries.⁹⁷

As a result, Japan's already comparatively high energy efficiency improved by three percent per year through 1990.⁹⁸ The nation's primary energy intensity per GDP dropped by approximately 33 percent between 1973 and 1985.⁹⁹ Vaclav Smil's analysis of Japan's post-oil crises conservation and efficiency efforts shows that the energy intensities of all major Japanese industries fell by 20 to 50 percent between 1973 and the late 1980s.¹⁰⁰

⁹⁷ Ministry of International Trade and Industry, 1979.

⁹⁸ Japan Center for Economic Research Middle-Term Economic Forecast Team, 2012, 4.

⁹⁹ The Energy Conservation Center Japan, 2002.

¹⁰⁰ Vaclav Smil, 2007, 2.

While we should not be surprised by the Japanese government's initiatives to promote energy efficiency and conservation in response to the oil crises, we would expect private sector and public opposition to them. The government's cooperative relationships with and clout over the electric utilities and the public appear to have contributed to the success of these measures.

Policy Process and Structural Changes

While the Japanese government employed policy changes to pursue energy system transformation from oil dependence to diversification, no energy policymaking process changes occurred as a direct result of the oil crises. One process change did take place, but a Cabinet Office document attributes this shift to an event completely unrelated to the oil crises.¹⁰¹ Until 1978, the Cabinet office-led Atomic Energy Commission (AEC) maintained responsibility for both regulation and promotion of nuclear power in Japan. The Cabinet Office document explains that after a 1974 radiation leak from Japan's first (and last) nuclear-powered ship, the *Mutsu*, the Japanese government redistributed responsibilities for nuclear power promotion and regulation. MITI assumed responsibility in 1978 for both nuclear power plant promotion and initial regulatory assessments of nuclear power plants. In addition, the Nuclear Safety Commission (NSC), responsible for secondary safety checks, was created as an offshoot of the AEC in 1978. While not a result of the externally driven oil crises, this shift offers an example of Japanese process changes as a response to technological shocks, a pattern repeated after future nuclear accidents in the 1990s and again following the Fukushima disaster.

¹⁰¹Cabinet Office, Government of Japan, 2013.

The Missing Link: Institutional Relationships

The oil crises alone do not completely explain Japanese energy policy changes implemented in the 1970s and early 1980s. Interview and secondary data indicate that the government's relationships with the electric utilities and the public also influenced these policy changes and their impacts on Japan's energy system. The effects of the oil shocks on these relationships, institutional features inherent in the relationships, and risk perceptions and priorities of the stakeholder groups impacted the ways in which each relationship influenced energy policymaking after the oil shocks.

Table 5: Japanese Government's Relationships and Changes to Policy, Process and Structure after the Oil Crises

Indep. Variable	Mediating Variables				Change in Dependent Variable	
	Relationships	Change in Cooperation/Conflict		Change in Clout	Policy	Policy Process/ Structure
Oil Crises		Before Crises	After Crises	Before Crises	After Crises	
	Bureaucrats-Utilities	Cooperation	No change	Bur. > Util.	Bureaucrats = Utilities	Yes: out of incumbent system No
	Politicians-Utilities	Cooperation	No change	Pol. > Util.	Politicians = Utilities	
	Economic Regulators-Utilities	Some Cooperation	No change	Reg. < Util.	No change	
	Safety Regulators-Utilities	Some Cooperation	Some Conflict	Reg. > Util.	No change	
	Government-Public	Cooperation	No change	Gov. > Public	No change	

• The highlighted relationships' change or stasis most strongly influence whether changes to policy and/or the policy process and structure occur.

The Oil Crises' Impact on Relationships

The interview data identified three broad groupings of factors affecting relationships after the oil crises: the crises themselves, institutional features, and risk perceptions and priorities. Unsurprisingly, all interviewees across the three stakeholder groups identified the 1970s oil crises as a major turning point in Japan's energy system, in alignment with existing literature.¹⁰² All interviewees also agreed that the shocks did not weaken the strong relationships maintained by bureaucrats and politicians with the electric utilities and the public. In fact, policymakers' relationships with the electric utilities strengthened. Electric utility and government interviewees also suggested that Japanese policymakers in the bureaucracy generally controlled energy policymaking. At the same time, interview data suggests that an ongoing struggle with the electric utilities over economic and safety regulation also added tension to the relationship.

The interviews yielded some surprising nuances regarding the government's relationship with the public and support for policymakers' efforts to change the energy system. While public opinion polls reflect frustration with the government following the oil shocks, NGO and media interviewees explained that the Japanese public trusted the

¹⁰² Some interviewees noted that they were too young to remember the oil shocks personally, and some wryly noted that most of the government officials and utility executives with institutional memory of the oil shock era have died. However, several interviewees recounted their personal experiences as government officials or utility company executives during the 1970s and early 1980s, while others relied on history imparted to them by their predecessors. For examples of scholarly accounts of the oil shocks' impact on Japan, see R.P. Sinha, 1974; Ronald Morse, 1981; Marius Ioan Mihut and Decean Liviu Daniel, 2012; and Japan Center for Economic Research Middle-Term Economic Forecast Team, 2012.

government to implement policies that would protect them from future shocks. Even when these policies involved public sacrifice in the form of energy conservation, the Japanese public complied.

Based on the interview data, Japanese policymakers' cooperation with and clout over the electric utilities and the public after the oil crises thus enabled the oil crises to transform energy priorities and policy, while preserving existing policymaking processes (Table 5). This cooperation also facilitated advancement of nuclear power's share of the electricity supply, while limiting the growth of renewable energy and coal.

Bureaucrats, Politicians and Electric Utilities

The Japanese government established the electric utility companies in 1951. In the post-war period leading up to the 1970s oil crises, bureaucrats in the then-Ministry of Economy, Trade and Industry (MITI) and politicians in the ruling Liberal Democratic Party (LDP) sustained cooperative relationships with these electric utilities, according to all electric utility and government interviewees. They collaborated to build a post-war energy system that would promote national security through energy security.

Until the 1970s oil crises occurred, the Japanese bureaucrats and politicians wielded clout over electric utilities in energy policymaking. Electric utility interviewees perceived government clout due to the utilities' financial insecurity at that time. The utilities felt obligated to cooperate with energy system goals established by the bureaucracy. As electric utility executive I1 noted, the relationship was cooperative because "the utilities financially did not have power, so there is no way but to hear the government. They relied on the government and at that time they supposed that

government will establish some goal, and utilities and private sector will have to follow the goal.” Existing work by Samuels, Navarro, and others supports this idea of weak utilities due to financial challenges.¹⁰³ The Electric Utility Industry Law established in 1964 reinforced government clout by mandating the electric utilities to provide a stable supply of electricity within their service areas.

The oil crises, institutional features, and risk perceptions and priorities all contributed to cooperation and clout in the policymakers’ relationship with the electric utilities in the 1970s and 1980s. Government and electric utility interviewees’ comments suggest that the oil crises deepened the cooperative axis of the government-electric utility relationship as the bureaucrats and utilities worked together on policies to build resilience in the existing energy system by diversifying Japan’s oil sources and expanding non-oil supply sources, namely nuclear power and coal. Many interviewees also observed that to reshape an energy system less dependent on fossil fuels, Japanese policymakers needed utility companies’ support of and investment in nuclear power. This reliance empowered the electric utilities in the energy policymaking process. As I6, a former electric utility executive, noted of the post-oil crises era, “METI heavily depends on *Denjiren* [the Federation of Electric Power Companies], and also the Japanese economy heavily depends on the utility companies.” Since the Electric Utility Industry Law did not provide the government with the legal authority to enforce energy supply increases, as noted by government interviewee G4, Japanese policymakers recognized the importance of cooperation with the electric utilities. The Japanese government could

¹⁰³ Peter Navarro, 1996.

only ask the electric utilities to construct power plants. In return, the electric utilities earned greater clout in the policymaking process, as well as government compliance with requests for electricity rate increases.¹⁰⁴

Informal institutional features like the *amakudari* system and political donations also shaped policymakers' relationships with the electric utilities, as did formal institutional features such as policy advisory committees (*shingikai*). Some government and electric utility interviewees highlighted the *amakudari* system as contributing to policymakers' cooperation with the electric utilities until the Fukushima accident occurred. In the *amakudari* system, each utility hired a former high-ranking government official to serve on their boards. The *amakudari* system is well-documented in existing literature, including Chalmers Johnson's work, which examines Japan's energy sector as a case study. An explanation by G16, a former government official, supports the notion of *amakudari* existence in Japan's energy sector:

It's a very well adjusted and well managed custom administered by the ministry in consultation with the utilities. If he retires, a new one from ministry comes...of course, always the government says no formal [rule], but just the electricity company wants to hire some useful person, something like that, and the company will say the same thing. But if you look at the record of who succeeds who, you can see that was the custom.

This custom fostered trust, shared interests, and policy coordination between policymakers and the electric utilities' management after the oil crises. It did so by

¹⁰⁴ Several electric utility and government interviewees described this give-and-take relationship. In his book, Samuels notes that "In 1976, apparently as compensation for earlier cooperation, MITI had approved another 21 percent rate hike for the utilities, bringing Japanese electric rates to the highest levels in the industrialized world." Samuels, 1987, 163.

offering policymakers retirement positions within the utilities, as well as input into utilities' energy supply decisions. This tradition also encouraged policymakers to choose post-shock energy policies that would benefit the electric utilities.

The electric utilities also used political donations to increase their influence over politicians following the oil crises. Media interviewee M2 asserted that “relatively the power companies' position went up...they were better supporters and lobbyists for the LDP than they had been” before the oil crises. Observing that “power companies invested much money for nuclear plants in 1970s after oil shocks...based on the government's nuclear power policy,” the interviewee suggested that this rise in influence resulted from the electric utilities' desire to protect these investments in nuclear plants. The electric utilities needed pro-nuclear politicians to perpetuate nuclear power policies that would enable them to recoup their large start-up investments through a long period of low-cost plant operation. The more they funded these politicians, the stronger the electric utilities' clout over them grew.

The policymaking structure itself represents a formal institutional feature that has fostered close cooperation between Japan's bureaucratic policymakers and the electric utilities. Policies are developed based on formal, direct input from advisory committees (*shingikai* or *bukai*). As electric utility industry interviewee I7 summarized, “In Japan, most energy policy, I mean the laws concerning energy policy, are enacted based on the conclusions of *shingikai*.” These committees typically include industry representatives as formal members, and electric utility company executives served on energy advisory committee and its subcommittees since the inception of the committee.

Government official G4 confided that from the time of the oil crises, “It seemed to me, still it’s not clear who is actually leading the Japanese energy policy.” This ambiguity over energy policymaking clout is due in part to institutional features such as the advisory committees (*shingikai*), which empower industry representatives by enabling their direct, formal input in the policymaking process.

In 1965, the Japanese government established an energy *shingikai*, the General Committee on Energy (*sougou enerugi chousakai*/総合エネルギー調査会), with the mission of discussing long-term energy demand and supply. The 1975 membership list for the advisory, general, and electricity supply subcommittees housed under this committee included TEPCO executives, as well as Keidanren representatives.¹⁰⁵ The electric utilities were powerful members of Keidanren. As electric utility interviewee I1 summarized, “Under the LDP, energy policy and government policy was made by the General Committee on Energy. All of the utility companies put their opinions into this committee, and industry, which includes the utilities, also put their opinions in. And they made policy by making all of these views into one policy.” Former bureaucrat G16 confirmed the importance of this feature in the electric utilities’ influence on energy policy:

I think by international comparison, in Japanese policymaking, especially in energy, influence from industry is very prominent. And in order to emphasize my point, I would like to point out one major factor in Japanese policymaking. Japanese policymaking including in energy, its major direction is normally based on a report from a government panel, called *shingikai*...A great difference from other countries, especially the U.S., is that panel includes as crucial members, the top executives from electricity companies.

¹⁰⁵ Ministry of International Trade and Industry, Government of Japan, 1975, 106-107.

G16 highlighted these electric utility executives' ability to influence the contents of these policy agenda-setting committee reports. This formal cooperation through *shingikai* paved the way for an increase in electric utility clout once policymakers established the goal of more rapid nuclear power expansion following the oil shocks.

In addition to institutional features, alignment of policymakers' and electric utilities' risk perceptions and priorities contributed to cooperation after the oil shocks. Government and electric utility interviewees uniformly asserted that a heightened focus on energy supply risk and energy security prevailed across the groups. However, some interviewees believe that energy security was the only priority at the time, while others think that economics emerged as a complementary priority, especially efficiency of power plants and cost of supply sources. Policies to promote nuclear power and rationalize electricity use support this assertion. A few interviewees suggested that the "3Es" -- energy security, environmental concerns and economics -- all became priorities after the oil crises, but they provided little evidence of the importance of environmental concerns in Japanese energy policymaking. Official energy policies during the period following the oil crises also do not support this claim. The primary government document from this period, the MITI advisory committee's 1970s Policies for Energy Stabilization: Choices to Stabilize Supply, recommends energy supply stabilization as the top priority. MITI's policy response includes measures to achieve this goal, and neither document mentions environmental concerns.

Several government and electric utility interviewees partially attributed continuation of cooperative policymaker-electric utility relationships after the oil crises to

the fact that these shocks did not involve a domestic technological component, so no distrust arose across these stakeholder groups. On the contrary, the oil crises engendered a shared perception of external risk. This shared risk perception promoted cooperation across the groups toward energy system change to address the energy security and economic concerns resulting from the shocks.

Bureaucrats' and politicians' cooperative relationships with the electric utilities were strengthened by these groups' shared priorities and mutually reinforcing actions to promote these post-oil crises energy goals, according to all government and electric utility company interviewees. Interviewees' perceptions of mutual priorities are consistent with scholarly accounts by Samuels, Johnson, and newer scholars such as Daniel Aldrich. Both government and electric utility interviewees referred to the two groups as one, using "we" in describing policy priorities. As former government official G21 explained,

We, the government, and private energy companies including oil companies...are going hand in hand to work together on a plan on where we get petroleum and gas. They are always talking about the strategy, or tactics, for getting energy sources. So anyway, so there was zero conflict between government and private companies after the crisis, or around the crisis.

Electric utility executive I12 similarly voiced the coordination and unified view of the electric utilities and policymakers on expansion of nuclear power use after the oil crises:

Before the oil shock, just after World War II, we were using coal and hydro and started to use nuclear power. But after the oil shock, we changed our mind. We have to diversify our sources. So we – the government and Japanese electric power companies – ought to increase nuclear power as a percentage and natural gas.

This shared goal of diversification through nuclear power expansion facilitated energy policy change and deepened cooperation as policymakers and the electric utilities worked together to achieve it.

Government and electric utility interviewees explained that the two groups needed one another to achieve the shared energy security goal through expansion of nuclear power. The Japanese bureaucrats and politicians crafting energy policy depended on electric utilities' cooperation to diversify away from oil use and expand nuclear power. Electric utility companies' investments in nuclear power supported the bureaucrats' and politicians' nuclear power promotion policy. These investments increased the electric utilities' interest in supporting bureaucrats and politicians who would perpetuate the future use of nuclear power. Interviewees' observations are consistent with scholars' assessments. In an analysis of TEPCO's role in shaping Japan's coal and LNG policies, Roger Gale asserts, "Besides regulating the utilities, MITI also promotes them, especially their nuclear power plant programs. It and the Science and Technology Agency are avowed partisans of nuclear power."¹⁰⁶

MITI also relied on the electric utilities to invest in electricity infrastructure to support the expanding electricity network. I6, an electric utility executive during the oil crises, noted that "sometimes when the economy was not so good, at that time, MITI asked for additional investment from utility companies, and the utility companies responded to that." I6 recalled of the period after the oil crises, "At that time, based on my memory, every year, I think 5 trillion yen for the investment, such big investment by

¹⁰⁶ Roger Gale, 1981, 95.

utility companies...to extend transmission lines or something like that.” He and other government and utility interviewees explained that the rate structure established by MITI enabled the utilities to pay for their investments through rate increases approved by MITI, thus passing the electricity infrastructure investment costs to consumers.

The oil crises thus deepened the bureaucrats’ and politicians’ cooperation with the electric utilities, while bolstering electric utility clout in energy policymaking.

Economic Regulators and Electric Utilities

Comments from several government and electric utility interviewees (e.g., I1c and G4) offer evidence to support existing literature that suggests that since the electric utilities’ formation in the 1950s, tensions burgeoned over economic regulation and control of the electricity industry. Richard Samuels’ seminal work on the subject has been cited by many subsequent scholarly accounts, and Chalmers Johnson’s equally well-known book reflects the electric utilities’ resistance to government control.¹⁰⁷ The battle for clout coexisted with the need to cooperate on energy system development, a dichotomous trend reflected in the decades to come.

While the oil crises had little effect on economic regulators’ relationship with the electric utilities, institutional features and priorities did contribute to cooperation and clout in the relationship. As previously mentioned, a struggle over economic control of the electric utilities took place when they were created.¹⁰⁸ Once this struggle concluded, the economic regulators’ relationship with the electric utilities remained cooperative

¹⁰⁷ Richard Samuels, 1987, and Chalmers Johnson, 1978.

¹⁰⁸ See Chalmers Johnson, 1978, and Richard Samuels, 1987.

through the decade following the oil crises. Samuels describes the relationship as “predominantly nonadversarial,”¹⁰⁹

Formal institutional arrangements gave the electric utilities clout over regulators in some ways that also promoted cooperation. First, existing literature and comments from government and electric utility interviewees indicate that MITI and the electric utilities collaborated on economic regulation during and following the oil crises. As Samuels explains, “regulation is structured largely in collaboration with the regulated companies,” such that the electric utilities “serve as the principal architects of the regulatory process rather than as the victims of it.”¹¹⁰ The electric utility interviewees confirmed this arrangement, citing this jointly crafted regulatory framework as a support structure that enabled the electric utilities to invest in energy infrastructure. As electricity industry executive I6 explained, “I think MITI closely worked together with FEPC on policy related matters, and they prepared for the very comfortable regulation for utility companies’ management.” MITI’s approvals of the electric utilities’ 21 percent rate increase in 1976 and 50 percent rate increase in 1979 also reflect cooperation and institutional support for the electric utilities, at the public’s expense.¹¹¹

The institutional structure of MITI itself empowered the electric utilities. Government and electric utility interviewees observed that MITI’s dual responsibility as energy policymaker and regulator allowed the utilities to seek regulations that enabled them to fulfill MITI’s energy policy goals. Samuels and Gale depict MITI’s regulatory

¹⁰⁹ Samuels 1989, 636.

¹¹⁰ Richard Samuels, 1989, 636.

¹¹¹ Gale and Samuels also cite these examples.

style as protective of electric utility interests. Gale observes that “unlike the domestic oil companies -- over which MITI wields considerable legislative and extralegal clout – the ministry is more of an arbiter between the utilities and the contending interests of other industries and the consumer, rather than a regulator.”¹¹² Samuels explains that, as a result,

To the extent that there have been disagreements between MITI, the EPCs, and consumers about consumption of domestic coal, electricity rates, industry structure, and nuclear power development, these disagreements have usually been resolved in a manner congenial to the EPCs, with side payments to industrial consumers.¹¹³

MITI’s role as both policymaker and regulator thus contributed to the electric utilities’ clout over economic regulators after the oil crises, until economic liberalization coincided with the next set of energy system shocks.

While some government and electric utility interviewees cited economic efficiency and costs of supply sources as priorities as a result of the oil crises, they did not suggest that policymakers prioritized electricity liberalization at that time. Although economic regulators and the electric utilities conflicted over control of various aspects of energy, the oil crises encouraged cooperation between the two in order to realize national energy security and economic goals.

Safety Regulators and Electric Utilities

The oil crises themselves did not contribute directly to cooperation or conflict between nuclear safety regulators and the electric utilities. However, electric utility interviewees indicated that policymakers’ cooperation with the utilities to expand nuclear

¹¹² Roger Gale, 1981, 85-86.

¹¹³ Samuels 1989: 636.

power after the oil crises simultaneously pressured and empowered the utilities to deemphasize safety concerns, exacerbating tension with regulators. Government and electric utility interviewees' comments indicate a worsening of this tension in future decades.

Institutional features, risk perceptions and priorities also strongly influenced cooperation and clout in the relationship. Interview data, existing literature, and government documents indicate that from the inception of Japan's civilian nuclear program shortly after the regional utilities' creation, the structure of the regulatory body, safety regulations and liability concerns have placed the electric utility companies in conflict with regulators.

Throughout shifts in regulatory authority, government and electric utility interviewees could not recall a time when safety regulators and electric utilities had a cooperative relationship. This tension between regulators and engineers existed alongside close cooperation between policymakers and electric utilities. Government and utility interviewees' comments suggest that this policymaker-utility cooperation more strongly influenced energy policymaking than regulator-engineer conflict from the time of the oil crises until the Fukushima accident.

Institutional features such as the regulatory structure contributed to conflict and the struggle for clout. The AEC's dual role as regulator and promoter of nuclear power until the Mutsu accident created a conflict of interest within the AEC and an awkward, close relationship with the electric utilities. The Cabinet Office document that explains MITI's inheritance of responsibility for both nuclear power plant promotion and initial

regulatory assessments of nuclear power plants also emphasizes the independence and supporting regulatory role of the NSC created as an offshoot of the AEC in 1978. Former government official G24 noted that public concern engendered formal blame of STA, leading to the change in regulatory authority. This transfer of both promotional and regulatory roles to one agency perpetuated the problematic relationship between nuclear safety regulators and electric utilities. MITI's consolidated authority enabled the electric utilities to ask policymakers or politicians involved in energy policy to intervene on their behalf in safety regulation issues, according to several government interviewees. Safety regulators thus viewed the electric utilities as having clout through relationships with politicians and bureaucrats. At the same time, the electric utilities viewed regulators as having clout because they made the regulations.

While only a few interviewees personally recalled interactions between the electric utilities and safety regulators during the 1970s and 1980s, electric utility engineers expressed a general view that government regulators never had enough experience or expertise to effectively regulate nuclear power plants. They cited problematic institutional arrangements that enabled policymakers to serve as regulators. Interviewees with regulatory experience conversely expressed frustration over their perceptions of electric utility engineers' historical disobedience and arrogance. Media revelations of data falsifications by the electric utilities dating from the late 1970s support government and utility interviewees' perceptions of tensions over safety regulations.

Liability for nuclear accidents posed an additional challenge to the electric utilities' relationship with the Japanese government – both policymakers and regulators.

Government interviewee G4 and electric utility interviewee I1 discussed the haggling that took place between the electric utilities and the Ministry of Finance over limited vs. unlimited liability for nuclear accident compensation when nuclear power development laws were established in the 1950s. Ultimately, the utilities agreed to accept unlimited liability to preserve public confidence in nuclear power. As G4 explained,

...there was a debate, but the utilities said fine, because we explained to the public that there would be no accident. The utilities said if we publicly oppose the unlimited liability of the nuclear accident, the public may suspect that we think there will be a serious accident. So finally the utilities accepted no upper limit to liability.

The electric utilities' acceptance of liability for accidents minimized public perceptions of nuclear risk and promoted public confidence in the Japanese government's ability to manage an energy system shift toward nuclear power and away from oil. These interviewees cited Dick Samuels' account of the conflict between the government and the electric utilities, but they did not mention one key point highlighted by Samuels: the Atomic Power Indemnification Law passed in 1961 required the electric utilities to carry an insurance policy of only five billion yen, and the government became responsible for any amount of damage in excess of it.¹¹⁴ More than safety regulator- electric utility tensions, this stipulation reflects the electric utilities' clout over economic regulators during this period, which continued until the reintroduction of the economic liberalization movement in the 1990s.

¹¹⁴ Richard Samuels, 1987, 240.

Government and Public

The oil crises, institutional features, and risk perceptions and priorities yielded conflicting impacts on cooperation and clout in the government's relationship with the public. Public opinion polls reflect dissatisfaction with the Japanese government following the oil crises (Table 6). A dramatic decline in support for then-Prime Minister Tanaka arose from the rapid land and consumer price increases arising from the first oil crisis. Public dissatisfaction continued to rise until a scandal involving financial land price speculation came to light, precipitating Tanaka's resignation.¹¹⁵

Table 6: Public Opinion of Japanese Leadership after the Oil Crises

Month/Year	Cabinet	Support Rate (%)	Opposition Rate (%)
7/1973	Tanaka	25	49
11/1973	Tanaka	22	60
11/1974	Tanaka	12	69
6/1978	Fukuda	24	43
10/1978	Fukuda	28	36
12/1978	Ohira	42	29
3/1979	Ohira	31	30
6/1979	Ohira	33	31

Source: *Asahi Shimbun* public opinion polls, 1973-1979.

¹¹⁵ For more on the scandal, see, for example, Tomohito Shinoda, 2000, or Malcolm Trevor, 2013.

Several institutional features contributed to government-public cooperation and government clout after the oil crises. All government, NGO and media interviewees indicated that the public thought of the government as one entity, with no distinction between bureaucrats, politicians and regulators. Public trust and distrust were aimed at the government as a whole. The poll data and comments by interviewees across all stakeholder groups suggest that the land speculation and later scandals engendered public distrust in the Japanese government. And yet, the interview data also indicates that this public frustration, compounded by economic and energy insecurity arising from the oil crises, somehow did not alter the government's paternalistic relationship with the public.

This relationship, a cultural feature that has persisted through numerous crises in many sectors, has enabled the Japanese government to undertake policy changes and protections that might incite a public outcry in nations with different relationships. It created in the public a trust and an assumption that the government would take measures to ensure Japan's energy security. Former government interviewee G21 described the Japanese public's view of the government — not the energy industry — as responsible for energy supply: "...the last resort for energy supply was regarded as...the government. To the eyes of the public, it was not the responsibility of the oil company, but the government's responsibility. " The public expected that the government would take the appropriate steps to fix Japan's energy insecurity without public involvement in policymaking, in keeping with the paternalistic government-public relationship. I6, an electric utility executive during the oil crises, recalled, "Japanese energy policy changed from depending on oil, shifting to coal, gas, and nuclear. But the Japanese general public

was also not so much concerned about such change. So they didn't know what's going on in the central government.” Public trust in the government's energy policymaking ability consequently diminished public involvement in energy policymaking.¹¹⁶ This public deferral of energy policymaking power and responsibility to the government resulted in a lack of public clout.

In fact, NGO and media interviewees' comments suggested that underlying public trust in the government was the public's view of the government as superior, and thus better equipped than the public to make energy policy decisions for the public. As P2 explained,

the Japanese government, in consultation with industries, was in charge of creating energy policy without virtually any...authorization, dialogue, discussion with the public, because... maybe you have heard of the word in Japanese 'okami'...So okami is something lower people are using to indicate the upper government, right? So that kind of relationship has been there in Japan for many, many years.

P2 asserted that because of this view, the public willingly ceded clout to the government in energy policymaking. Japanese energy policymaking, along with policymaking in other sectors, was founded on a model in which the public believed that “...the government is a kind of noble and upper people who are smarter, and more knowledgeable, and have more power to change things, and they...have the sole responsibility of creating good policies for lower Japanese people.” As a result, P2 explained,

¹¹⁶ Other factors also may have played a role in lowering public support rates for the Japanese government during and after the oil crises. One media interviewee attributed these downturns in public support to rapidly rising consumer prices and financial scandals. Other potential factors include financial scandals and renewed confidence in new leadership that declined over time.

the government had no interest in getting people's opinion, or feedback, because they believed that they are the persons or the organization which have more knowledge and information, and power to create better policies for all Japan. And in return, our people were not interested in getting involved in politics. Because we Japanese people just believed in the government.

Other government and NGO interviewees echoed this view that the government retained clout in energy policymaking after the oil crises based on public preference for this arrangement.

Public trust and belief in the government's superior decision-making capability enabled the government – with the media's help -- to develop public awareness of energy security as a new national priority. This shared priority further promoted public support for and compliance with the government's energy policy changes after the oil crises. As government official G13 recalled, "Japanese people at that time did understand the need for energy saving and some shift from oil consumption to another form of energy consumption." The Japanese government and public shared prioritization of energy security concerns over other risks, including nuclear safety concerns. G13 asserted that the oil crises' influence overshadowed the impact of nuclear accidents at Three-Mile Island, and later Chernobyl, on public risk perceptions of nuclear power. However, a number of scholars, including Suttmeier, Lesbirel and Aldrich, have found that public opposition to nuclear power plant siting did arise in the 1970s, but government clout and incentives for cooperation grounded in general public trust overcame this resistance. These scholars also suggest that the regulatory and policymaking process offered limited

opportunities for public influence on energy policymaking.¹¹⁷ NGO interviewees suggested that the general public did not object to this limitation on clout, so the policymaking process continued to constrain public input during the energy system shift after the oil crises.

Shared risk perceptions further contributed to government-public cooperation. Interview data suggests that the public largely viewed the Japanese government's policy responses to the oil crises as logical reactions to the shocks and resulting public needs. For example, P2, the same NGO representative who characterized the public's belief in the government's superiority, also posited that "the Japanese government has been creating their energy policy as a very serious response to the social changes or the events that happened. So the first one is the oil crisis, so they diversified." Belief that the government made logical policy changes in response to the oil crises appears to have deepened public trust in the government's energy policymaking ability. This trust enabled further policy changes that strengthened the energy system shift and contributed to the new system's momentum.

Impact of relationships on energy system change

Government-electric utility cooperation, public trust in the government, alignment of priorities, and government clout made major energy supply policy change possible after the oil crises, transforming Japan's energy system. No immediate policymaking

¹¹⁷ See Daniel Aldrich, 2005, and Linda Cohen, et al., 1995.

process changes took place. However, as the electric utilities gained clout from the government's reliance on them to implement the policy changes, policymaking process change codified this relationship shift. This formal institutionalization of the electric utilities' clout later contributed to the government's inability to change energy policy when new shocks to the energy system occurred.

Electricity supply changes

The government's cooperative relationship with the electric utilities and public, government clout, and shared priorities across groups enabled policymakers to collaborate with the electric utilities. This collaboration aimed to bolster resilience of the existing energy system by diversifying oil supply sources and building petroleum stockpiles. At the same time, the government coordinated with the electric utilities and the public to promote a dramatic energy system transformation. Government interviewees linked changes in public priorities, namely heightened sensitivity to energy security concerns, with the government's long-term energy policy shift. Government official G13 explained, "After the oil crisis in the 70s, the public did not anymore trust long-term reliability of such inexpensive oil. And naturally, the government changed its policy so that it may place the greatest priority on saving energy and employment of non-fossil energies such as nuclear and renewables." G13 observed that this priority change and the government policies codifying it after the oil crises shifted Japan's energy system to a path that continued for decades. "The issue of overseas dependence of energy is so crucial in Japan, and basically, since the 70s, the government policy of save energy and employ non-fossil fuel has not much changed." Japanese policymakers' and politicians'

cooperation with and clout over the electric utilities and the public impacted the transitions toward and away from specific electricity supply sources.

Oil

The government's cooperative relationship with the electric utilities appears to have played a role in the policy to preserve energy security and oil use. In 1974, the interim report of the Petroleum Subcommittee of MITI's Advisory Committee for Natural Resources and Energy stated the need for public-private coordination to create a planned 90-day oil stockpile.¹¹⁸ The Japanese government pursued this and other oil supply security policies with electric utilities' and public support. This public support was based on public trust in the government's ability to reestablish energy security after the oil crises.

Nuclear power

At the same time, the Japanese government's cooperation with the electric utilities enabled sweeping policy changes that replaced oil use with nuclear power, natural gas, and coal in the electricity sector. While the Japanese government's energy supply diversification plan included several types of sources, some government and electric utility interviewees perceived a more narrow focus on nuclear power expansion as the key to Japanese energy security. Former electric utility executive I23 observed that "after the oil shock...should have had a big impact on energy policy. So, for example, whether or not to do solar...in reality, while we're saying diversification, we're saying do

¹¹⁸ The report states, "it is needless to say a level of 60-day oil stockpiling should be held; on top of this, the level should be built up to 90 days in a planned manner to develop a reinforced oil stockpiling system through joint efforts of the public and private sectors." Petroleum Association of Japan, 2013, 20.

nuclear.” Government interviewees indicated that bureaucrats and politicians co-led the policymaking shift to prioritize nuclear power expansion. As government official G18 explained, “Nuclear development is not only driven by bureaucracy, but the politicians of the LDP. That’s why the LDP has an institutional memory of favorably regarding nuclear energy.” This collaboration between bureaucrats and politicians to pursue nuclear power development and build public acceptance for it predates the oil crises, according to this interviewee and others. Another government official, G21, stated, “Of course, we – I mean the government – started to introduce nuclear power in the 1950s, but the oil shock accelerated the speed of introduction of nuclear power after ‘73.” G21 and other government and electric utility interviewees believe that this earlier cooperation set the stage for the shift toward prioritization of nuclear power after the oil crises.

Government and electric utility interviewees indicated that during and following the oil crises, the Japanese bureaucratic policymakers and politicians coordinated with the electric utilities to escalate plans for increased nuclear power use in the electricity supply. As former government official G16 stated, “...there was a time, even under the close relationship, when after the oil shock, there was a clear shift of energy sources from fossil fuels to nuclear. That was, I think, under a very close relationship with government and industry, they changed the course.” The official believes that the government did not force this shift on the electric utilities, suggesting that “they cooperated very closely.”

MITI’s clout and the cooperative relationship between MITI bureaucrats and the electric utilities supported this expansion of nuclear power. Government and electric utility interviewees explained that after the oil crises, the government and the electric

utilities began to coordinate the national energy policy and the electric utilities' electricity supply plans. In the national energy policy, the government set numerical targets for particular electricity supply sources. The electric utilities developed their 10-year electricity supply plans based on these targets, and MITI approved the plans. Government official G4 highlighted the role of these coordinated policies and plans in promoting public trust in the government's energy policymaking authority and the electric utilities' ability to execute it.

The official connected this coordination of official energy policies and electric utilities' supply plans with a series of government incentives for local communities hosting nuclear power plants. These policies further strengthened cooperation between the government and the public, as well as government clout over the public in energy policymaking.

G4 noted that following government approval of the supply plans, "it's interesting, because the law says, once it is approved by the government...then *kofukin*, subsidies, will be distributed to local communities. So there was a legal meaning of the utilities' plans." Government approval of the supply plans enabled the electric utilities to secure public approval for nuclear plant siting, "because the utilities also can tell the local communities this is the national government policy approved program, so it's not just for our profit purposes, it is for national energy policy, so please accept this power plant. So the plans and the subsidies are linked." LDP politicians and MITI bureaucrats thus utilized public trust in them to build support for nuclear plants. Aldrich and other scholars examining Japanese public opposition to nuclear plant siting posit that

politicians and bureaucrats also made visits to local communities to create a public perception of legitimacy regarding nuclear plant construction.¹¹⁹

While NGO, media and government interviewees did not recall widespread public opposition to nuclear power expansion, existing work by Suttmeier, Murota and Yano, and Aldrich suggests that the catalyst for the subsidies emerged from local opposition to nuclear plant siting.¹²⁰ Between 1973 and 1980, local residents filed administrative lawsuits against siting of six nuclear power plants, including Fukushima unit 2.¹²¹ This local opposition was overridden by the central government. All of the plants ultimately were constructed and operated until the Fukushima accident. This outcome reflects government clout over the public in energy policy decision-making.¹²² Government and utility company interviewees indicated that the electric utilities exploited this clout in securing public support for nuclear plant siting, framing nuclear power plant construction as a government mandate, rather than a for-profit enterprise.

The linkages between national energy policies, electric utilities' supply plans and siting subsidies created momentum in an energy system more focused on nuclear power by deepening electric utilities' and local politicians' vested interests in perpetuating nuclear power operation and expansion. Broad public trust in the government's ability to manage an energy system transition and lack of public clout in concrete energy policy decisions further fostered acceleration of this energy system shift. Economic gains for

¹¹⁹ E.g., Aldrich, 2008.

¹²⁰ Suttmeier, 1981; Aldrich, 2008; Y. Murota and Y. Yano, 1993.

¹²¹ Murota and Yano, 1993, 114.

¹²² Reasons cited for this lack of clout include insufficient representation of the local majority view in informal negotiations, and exclusion of public opinion in formal environmental impact assessments. Aldrich, 2008.

local communities strengthened government clout and public trust during this period of nuclear power expansion after the oil crises. However, later chapters of this dissertation show that following future shocks resulting in a loss of public trust, the public rejects economic compensation and expansion of nuclear power.

The Japanese government's cooperative relationships with the electric utilities and the public also helped to shape a crucial element of Japan's nuclear power policy: nuclear fuel reprocessing. Bureaucrats and politicians viewed reprocessing as a policy solution to both energy security and nuclear waste concerns. As G13 indicated, "the utility companies and government were strongly committed with how to do with spent fuel arising from each site from nuclear power production. Those spent fuels will go somewhere else. Nuclear power production business is ongoing, so how to manage spent fuel is a question. That is a kind of promise." The Japanese government promised the electric utilities and localities hosting nuclear power plants that the spent nuclear fuel would not remain on the reactor sites. This promise propelled the government's nuclear fuel reprocessing program policies, despite economic challenges.

While the reprocessing program's high costs should have constrained its development, the official intimated, "my understanding was that government decision we had in the 70s and 1980s was not so serious, you know. Just they wanted to continue the program. That's my understanding." Rather than balancing energy security and economics in making the decision, as many government and electric utility interviewees suggested was the case, the official cited public trust and acceptance as the reason the government downplayed program costs: "For the government, you know, as far as

nuclear energy is concerned, you know, it's so socially controversial, and therefore, they just to the public the government wanted to say that nuclear energy is a must because of energy security." The Japanese public generally accepted the energy security argument for nuclear fuel reprocessing, according to NGO and government interviewees. As a result, the official suggested, Japan's "nuclear fuel recycling policy...has been constantly pursued, with sufficient public support, aiming at reducing imported uranium for strengthening energy independence." In later decades, other bureaucratic policymakers and politicians also would raise the question of Japan's fuel cycle economics.

Continuation of the program would depend in large part on the role of the central government's relationships with the electric utilities, local governments, and the public.

The government's clout and cooperative relationships with the electric utilities and the public after the oil crises thus enabled nuclear power expansion, defying the high costs of initial investment and fuel reprocessing, as well as safety concerns arising from the Three-Mile Island and Chernobyl accidents.

Natural gas

While many government and electric utility interviewees mentioned the planned expansion of LNG use as part of a list led by nuclear power and followed by coal, their comments suggested a prioritization of nuclear power in describing Japan's strategic shift away from oil. Former government official G21 referenced the high start-up costs for LNG plants. Government and electric utility interviewees also explained that concerns over the energy insecurity associated with fuel imports led the utilities to raise LNG use gradually, importing from a variety of sources.

MITI's cooperative relationship with the electric utilities played a role in mitigating these concerns and fostering the increase in LNG use. Prior to the oil crises, only Tokyo Electric Power Company invested in LNG. TEPCO's leadership on LNG imports, combined with its close relationship with MITI, contributed to development of a regulatory and financial environment conducive to investment in costly LNG infrastructure. The decision to build LNG terminals to supply local electricity consumers protected the electric utilities' and gas companies' regional monopolies, given constraints on moving LNG between regions. This protection encouraged the electric utilities' long-term investment in LNG projects and infrastructure.¹²³ JNOC and MITI support for the electric utility companies' investments further incentivized expansion of the electric utilities' LNG use. In addition, the Japanese government granted the electric utilities and gas companies access to government-owned roads under which pipelines were constructed.

¹²³ For more on this issue, see Mark Hayes and David Victor, 2006, 327.

Government clout and public trust in the government's policy decisions also enabled expansion of LNG use. LNG plant and terminal siting faced little public opposition, according to Gale, who attributes LNG's trumping of nuclear power to this phenomenon in the decade following the oil crises.¹²⁴ This lack of opposition was accompanied by a related lack of tension between safety regulators and the electric utilities over gas plant and terminal siting. Government cooperation with and clout over the electric utilities and the public thus facilitated the considerable shift toward LNG after the oil crises.

Coal

Government-public cooperation also incentivized the Japanese government's pursuit of coal use expansion. Following the oil crises, the public did not express opposition to coal plant siting, in comparison to concern over nuclear power plants.

The oil shocks also encouraged MITI to alter a previous focus on pollution control toward energy security and diversification away from oil, according to electric utility executive I1 and some analysts of Japanese environmental policy.¹²⁵ This priority shift should have supported expansion of coal, as well as nuclear and natural gas. However, while government-electric utility cooperation supported nuclear power expansion and increased LNG use, the electric utilities' disinterest in pursuing coal use stymied the government's plans for coal use expansion following the oil crises. Existing literature and interview data reveal three reasons for the relatively lethargic increase in coal use compared to nuclear and natural gas use expansion: expensive domestic coal

¹²⁴ Gale 1981, 97.

¹²⁵ See Yukiko Fukasaku, 1995, 1075, and Katrin Jordan-Korte, 2011, 210.

procurement, reluctance to import coal, and energy conservation measures' displacement of the need for increased coal use.

According to several government interviewees, the domestic coal industry's cooperation with and clout over politicians led to a domestic coal procurement policy. As G21 explained, "about coal, we had a kind of domestic industrial problem. We had a domestic coal industry, and the labor union of the coal industry was very strong and made good ties with the socialist party at that time. And the management layer of the coal industry made good friends with the LDP." The interviewee suggested that while the government still retained clout over the electric utilities, the coal industry had clout over the government, enabling the domestic coal procurement policy: "So the political power of the coal industry was very strong, so we could not neglect their demand or request for energy policy." Since domestic coal prices exceeded import prices, the electric utilities lost interest in expanding coal use. This reluctance followed a long effort by MITI to control Japan's domestic coal market.¹²⁶

Gale's analysis indicates that the electric utilities also did not express strong interest in imported coal after the oil crises, due to siting constraints and pollution controls, as well as a discomfort regarding pressure from MITI to import coal.¹²⁷ The Japanese government made efforts to mitigate siting concerns through the same mechanism employed for nuclear power plants, but coal use did not expand as rapidly as MITI had planned.

¹²⁶ For more details, see Samuels, 1987.

¹²⁷ Samuels, 1987, 101-104.

Government interviewee G9 attributed cancellation of the government's coal liquefaction and gasification projects to successful energy conservation measures that displaced the need for these technologies. While this assertion may be partially true, Gale's assessment of electric utility opposition to coal expansion suggests that the electric utilities also may have expressed disinterest in commercializing these technologies, especially after large investments in nuclear power. G21 supported this scenario, indicating that "coal was not appealing to the management of electric companies before 1990, when the domestic coal industry was blown out of the water." The electric utilities' growing clout throughout the 1980s enabled them to limit the government's coal expansion plans in exchange for development of nuclear power.

Renewables

Interview data and existing literature suggest that the government's relationships with the electric utilities and the public played a role in the small increase in renewables following the oil crises. An assessment by the Central Research Institute of Electric Power Industry (CRIEPI) states that development of solar PV, geothermal and hydrogen technologies took place "under close cooperation of industry, government, and academic organizations."¹²⁸ Despite this cooperation, many government and electric utility interviewees suggested that a greater focus on cooperation to promote nuclear expansion overshadowed growth of renewables. G9 summarized this dismissal of renewables: "Having so much effort of energy conservation and nuclear, between the two, they think to have this nuclear power supply is good enough for the Japanese economy." The

¹²⁸ The report also notes that the project included coal as a fourth area of research as an alternative to oil. Osamu Kimura, 2009, 1.

official explained that MITI officials thus did not believe that government support for renewables development was necessary: “...once we started the renewable projects, photovoltaics and wind and geothermal, the government did not need to support too much, because of having this stable nuclear power supply.” Gale’s analysis supports this notion that the electric utilities remained uninterested in adding more renewables to their electricity supply portfolios. He observes, “TEPCO...has made only a minimal commitment...to funding the development of alternative forms of renewable energy.”¹²⁹ Gale adds that this disinterest expressed by the leading electric utility led other utilities to disavow renewables development, as well.

Conservation

G9’s depiction of conservation measures as crowding out renewables development may hold some truth. While we would expect the electric utilities to oppose conservation and promote greater electricity use, Gale observes that following the oil crises, TEPCO ceased its advertising campaigns encouraging electricity use and implemented a conservation program.¹³⁰

Public trust in the government’s decisions, coupled with the joint shift in the government’s and public’s energy policy priorities, also contributed to broad public compliance with new government mandates on consumers’ energy conservation after the oil crises. Several NGO and government interviewees referenced this link between public understanding of government priorities and compliance with new energy conservation policies. Government clout over the public facilitated this policy shift. As

¹²⁹ Gale, 1981, 94.

¹³⁰ Gale, 1981, 94.

government official G4 observed, “It’s easier actually to mandate reduced energy consumption than to mandate increased energy supply, right?”

Thus, broad public acceptance of the Japanese government’s energy conservation goals and the electric utilities’ compliance with them supported a national reduction in energy consumption after the oil crises. At the same time, cooperation from Japan’s manufacturing industries also proved crucial to this shift.

Summary: Policy, Process and Lock-In Linkages

Following the oil crises, Japanese policymakers’ clout over and cooperative relationships with the electric utilities and the public supported the transition away from an oil-based energy system to growth of an energy system based largely on nuclear power expansion. The electric utilities cooperated with the government in exchange for incentives and increasing clout in the energy policymaking system. The electric utilities’ clout over and cooperation with economic regulators further supported this energy system shift. This policy coordination on nuclear power expansion trumped electric utilities’ tensions with safety regulators. Policymakers’ clout over and cooperation with the electric utilities following the oil crises enabled a policy shift without any policy process change.

By contrast, while the government encouraged public cooperation through incentives, public compliance with the energy system transformation also was grounded in public trust in the government’s goals.

These same relationships contributed to difficulties in responding to future shocks to Japan’s energy system, especially as the electric utilities gained clout in energy

policymaking while continuing the battle with safety regulators. The electric utilities' clout increased in tandem with a deepening of the utilities' interest in perpetuating and expanding nuclear power use to recoup start-up costs and achieve economies of scale. This institutional shift contributed to Japan's movement from oil-based energy system lock-in to diversification, then toward nuclear-based system lock-in. In short, a policy change to exit the incumbent system led to an institutional shift, and this shift catalyzed a policy process change that contributed to new system lock-in in the future.

CHAPTER SIX: 1990S AND 2000S: NUCLEAR ACCIDENTS AND SCANDAL: SHOCK ABSORPTION

“Sometimes we asked the utilities to cooperate on nuclear policy, and in order to get that help or cooperation...we somehow had to consider the current situation of the utilities, especially the financial situation of the utilities so that they can introduce more nuclear. So in such a situation, the nuclear accidents gave us some impact on the relations with the utilities. You know, the people asked for a more strict and neutral attitude of the government towards the utilities for the nuclear regulation, and so we have to be very tough with companies.”

-- Government official (G12)

“Staff of NISA or METI feels like nuclear engineers in utilities are too arrogant and won't hear voices from outside. Nuclear engineers in the utilities even said to me that staff in the NISA and NRA do not know so much about nuclear, do not have so much knowledge.”

-- Government official (G9)

“Sometimes, to the general public, the utility company said, this was approved by the government, and that means this is the right thing, and we have to follow, and you, the general public, have to understand it.”

-- Former electric utility executive (I6)

“After the 1990s accidents, the public didn't change their mind. They still trusted the government. It is difficult for me to tell why, because I wrote something, I myself wrote some articles about the risk of nuclear repeatedly, but the response is very rare. So I didn't understand why people trusted the Japanese government so strictly or so strongly.”

-- Media representative (M2)

Beginning approximately two decades after the oil crises, a series of prominent accidents and a data falsification scandal occurred involving nuclear power plants and facilities in Japan. As these accidents continued, exogenous shocks literature would predict a shift away from nuclear power promotion policies and the share of nuclear power in Japan's electricity supply. Kingdon and other scholars applying his frameworks of focusing events also might predict increased regulation of nuclear power.

In fact, Japan's energy policy direction and policymaking process following these shocks continued relatively unchanged, preserving and promoting nuclear power growth. Nuclear energy's share of Japan's electricity supply generally followed an upward trend until the Fukushima accident occurred in 2011. Government and electric utility interviewees described the Japanese government's "nuclear power renaissance" initiative after the accidents and scandal. The capstone policy statement of this initiative, the government's 2010 Basic Energy Plan, contains an appendix that called for an increase in nuclear power to at least 50 percent of Japan's electricity supply by 2030.¹³¹ Policy process and structural changes after the accidents and scandal appear largely cosmetic. Changes to safety regulations and authority preserved the role of nuclear power in Japan's energy system.

Scholars of evolutionary institutional change such as Pierson, Mahoney and Thelen might have predicted these outcomes. However, this approach alone also does not completely account for the changes that did occur. The interview data suggests a holistic view that incorporates both shocks and evolutionary influences. The

¹³¹ Ministry of Economy, Trade and Industry, Government of Japan, 2010.

government's cooperative relationships with the electric utilities and the public, coupled with increasing electric utility clout, can help to explain these seemingly paradoxical outcomes. Concurrent trends in electricity liberalization and global climate change policy also created institutional influences that affected these relationships' impact on energy policy and process change. In examining institutional relationships that would promote change, we might expect tensions to increase between policymakers and the electric utilities, coupled with a decline in public trust. Interview data, public opinion polls and government documents reflect relationships in which the electric utilities gained increasing clout over time, while tensions with safety regulators worsened. Public trust in the government remained relatively high, though gradually declining. Public clout also remained weak. This combination of relationships contributed to a situation in which the series of technological and institutional failures in the 1990s and early 2000s did not result in Japanese energy policy directional change, policymaking process change, or significant regulatory change. The regulatory change that did take place aimed to appease conflict between the government and the public, though the government retained clout.

1990s and 2000s Accidents: Multiple sequential shocks

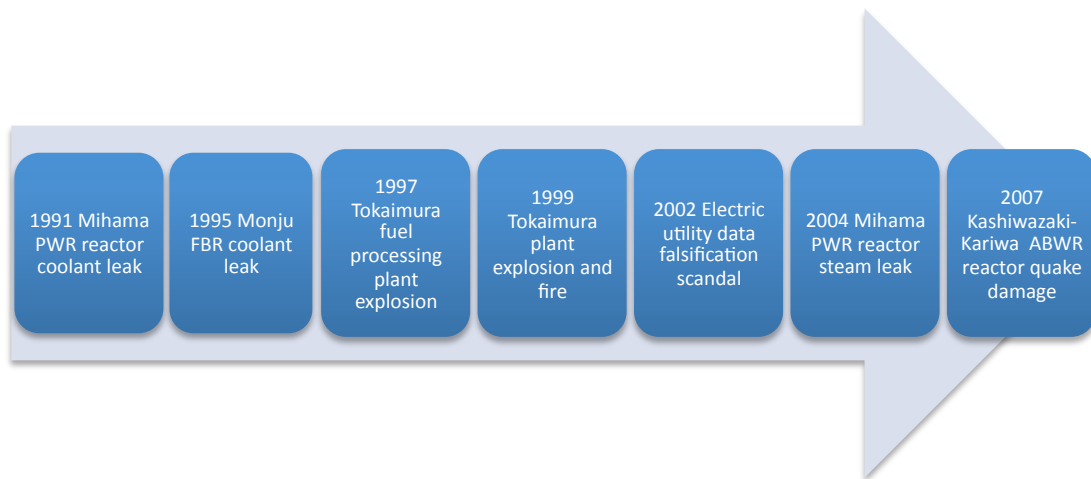


Figure 2: Timeline of 1990s and 2000s Accidents

The series of high profile accidents at Japanese nuclear power facilities began in 1991 and punctuated every few years throughout the next two decades, as shown in Figure 2. The accidents ranged from minor to major and affected both commercial and research facilities.¹³²

In February 1991, 55 tons of cooling water leaked into the secondary cooling loop at Kansai Electric Power Company's Mihama pressurized water reactor (PWR) unit 2 after a heat transfer tube in the steam generator broke off due to improper installation. A

¹³² Some existing literature references several accidents – at the Sendai reactor in 1991, the Fukui reactor in 1991, and the Fukushima reactor in 1993 -- not included here for two reasons. First, interviewees did not mention them, and second, much of the existing literature and many of the publicized lists of nuclear incidents do not include them, either.

small amount of radiation was released. No casualties occurred, and the Japanese economy was not affected. In December 1995, 700 kg of molten sodium coolant leaked within the Monju prototype fast breeder reactor after a measuring device ruptured. Monju was operated by the Power Reactor and Nuclear Fuel Development Corporation (PNC), a government-funded research and development organization. The reactor had reached criticality for the first time only one year before. No casualties, radiation leakage or damage to the Japanese economy occurred. However, facility operators attempted to conceal the extent of the accident by falsifying reports, editing a videotape, and issuing a gag order prohibiting employees from revealing the edits.¹³³

In March 1997, a fire and explosion at the Tokaimura nuclear fuel processing plant's bitumen waste facility exposed approximately 40 workers to radiation. PNC also managed this facility. No evacuation of residents took place, and the Japanese economy was not affected.

In September 1999, another explosion occurred at Tokaimura's uranium reprocessing facility, operated by JCO, a subsidiary of Sumitomo Metal Mining Company. Three employees violated procedure by mixing uranium oxide and nitric acid in buckets instead of tanks, then placed seven times the recommended amount of the mixture into a precipitation tank, generating a chain reaction that lasted 20 hours. The radiation killed two of the three workers directly involved in the accident and exposed 66 other workers and emergency responders to excess radiation. An IAEA report released shortly after the Tokaimura criticality accident states that the Ibaraki prefectural

¹³³ Johnston, Eric. *The Japan Times*, 8 December, 2000.

government evacuated residents within a radius of 350 meters from the accident site for 48 hours. Officials also advised residents within a 10 km radius to stay indoors for 24 hours and closed schools within the same distance. The governor suspended harvesting of agricultural products for 24 hours. The report notes that monitoring of water supplies and produce took place “to reassure the public.” Testing did not detect radiation in water within 10 km of the accident site.¹³⁴

The IAEA report found that the primary cause of the 1999 accident was “human error and serious breaches of safety principles.” The report cites accounts of indirect harm to local industries and businesses, potentially due to mistaken assumptions of radioactive contamination. In addition, the report mentions accounts of public concern regarding the accident’s effects on real estate prices and potential links to falling prices of agricultural products.¹³⁵

In September 2002, a scandal surfaced involving hundreds of counts of TEPCO engineers’ falsification of inspection records and reports on integrity of various reactor parts between 1977 and 2001. While not an accident, the scandal represents a similar shock that disrupted Japan’s nuclear expansion and disturbed the government’s relationships with the electric utilities and the public.

In August 2004, a corroded, ruptured pipe and resulting steam leak at the Mihama-3 reactor resulted in the death of four plant workers and injury to seven others.

¹³⁴ International Atomic Energy Agency, 1999, *Report on the Preliminary Fact Finding Mission Following the Accident at the Nuclear Fuel Processing Facility in Tokaimura Japan*, 27.

¹³⁵ International Atomic Energy Agency, 1999: 33.

A NISA report notes that “harmful rumors spread and produced a serious impact on economic activities.”¹³⁶ KEPCO shut down the reactor and restarted it in 2007.

In July 2007, the Chuuetsu earthquake shook the Kashiwazaki-Kariwa Advanced Boiling Water Reactor (ABWR) -- the largest nuclear power plant in the world --beyond the parameters of its design. Radioactive water leaked into the Sea of Japan. TEPCO, the operating electric utility, shut down the reactor for 21 months to undertake seismic readiness upgrades. Idling the plant was predicted to impact global oil and gas prices, but a study by the IEEJ found little actual effect.¹³⁷ While TEPCO faced financial challenges due to the shut down, the local and national economy did not. By 2009, four of the reactor’s seven units were restarted.

This series of accidents represents a set of multiple shocks that individually had varying impacts on Japan’s energy security and economy. Collectively, they resulted in little change to Japan’s energy supply profile and policymaking process.

Shock absorption: Electricity supply and policy process changes

Japanese energy policy changes after the oil shocks suggest that policymakers would make efforts to shift away from electricity supply sources that threaten energy security or the Japanese economy. After each of the nuclear power accidents, we might expect Japanese policymakers to implement policies to bolster nuclear reactor safety while reducing dependence on nuclear power. We might expect increased policy emphasis on renewable energy and coal, as well as natural gas. We might also expect a

¹³⁶ Nuclear and Industrial Safety Agency, Government of Japan, 2005.

¹³⁷ See Tomoko Murakami et al., 2008.

change in the policymaking process that limits the electric utilities' influence on the energy policymaking process and strengthens the role of safety regulators.

Instead, we can observe a surprising continuation in the upward trend in nuclear power use and policies supporting it. Complementing this trend is a notable absence of renewable energy increases. We also find a steady increase in coal use. This development seems rational in response to the accidents, but puzzling in the context of government and electric utility claims of emerging prioritization of global climate change. During this period, we also see an equally surprising preservation of electric utility clout in the policymaking process and little substantive empowerment of safety regulators.

As in the aftermath of the oil crises, institutional relationships and influences during this period can help to explain these shocks' impact on energy policy and process change, or relative lack thereof. The interview data reveals informal and formal institutional influences that affected the electric utilities' relationships with policymakers and regulators, as well as the government-public relationship. In contrast to the post-oil crises period, these influences appear to have overshadowed the impact of the accidents and scandal on these relationships, rather than compounding them. Two concurrent trends particularly emphasized by all interviewees, electricity market reform and global climate change policy, created incremental institutional change that shaped relationships and their impact on energy policy and process as the accidents and scandal occurred.

The interview data for this period reflects a strengthening of electric utility clout over policymakers and politicians, as well as continued cooperation between these

groups, with a few exceptions. The data also reflects their continued prioritization of nuclear power expansion. Conflict between the electric utilities and regulators – both economic and safety – underlies both the shocks during this period and the responses to them. While conflict between the government and the public increased, it subsided quickly after each accident, enabling continuation of or a return to increasing nuclear power production as a percentage of the total electricity supply.

Energy System Changes

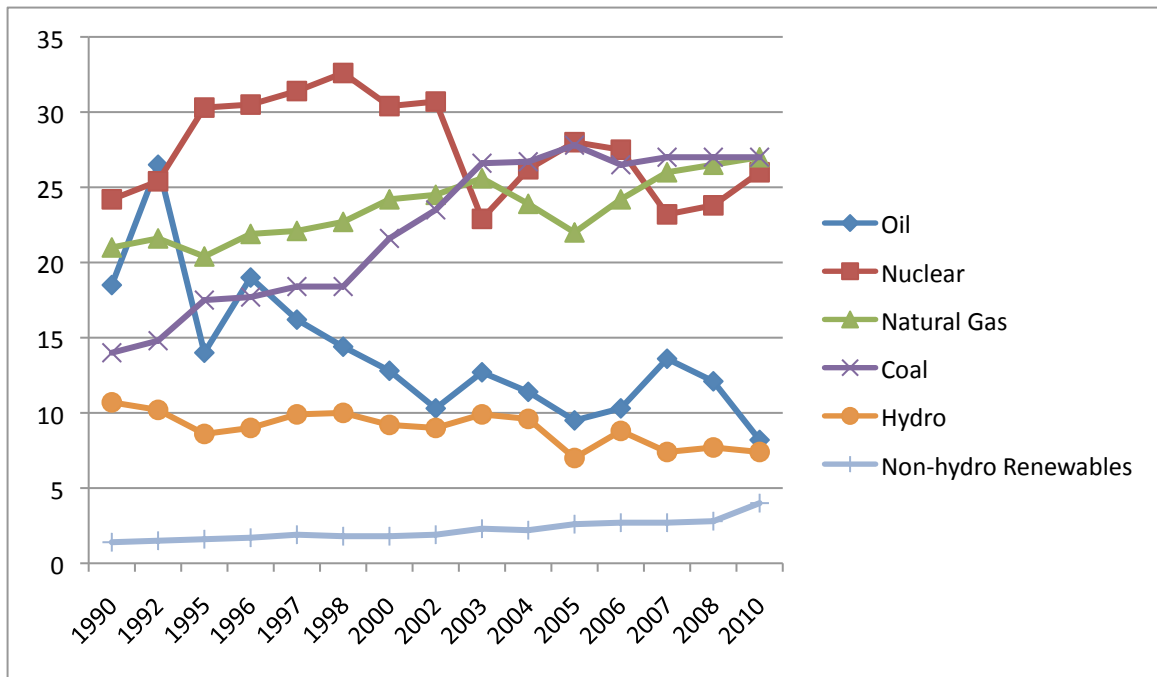
Japan's electricity supply source trends reflect this influence of institutional relationships and priorities. As Figure 3 demonstrates, after many of the accidents, nuclear power's share of electricity production continued to climb throughout the 1990s and 2000s. It declines slightly in 2000 and again in 2007, after the 1999 Tokaimura accident and 2007 Mihama accident. In both cases, nuclear power quickly returns to an expanding role in electricity production. The most precipitous decline in nuclear power production occurred in 2003, after news of TEPCO's data falsifications emerged. This scandal did not occur in a vacuum. Conflict and a struggle for clout between policymakers, safety regulators, and utility company engineers and executives contributed directly to the causes and revelation of the scandal.

Concurrently, coal and natural gas use rose, but not as rapidly as nuclear power. These two sources replaced nuclear power during the two periods of decline in 2003 and 2007. We would expect more rapid growth in natural gas use, given the advantages of gas over nuclear power presented in the previous chapter, compounded by the nuclear accidents. We also would expect renewable energy use to advance based on the

government's policies to promote renewable energy as an answer to energy security challenges. Renewable energy use did rise, but at a barely visible pace. As expected, oil use continued to decline, reflecting the lasting effects of post-oil crises policies.

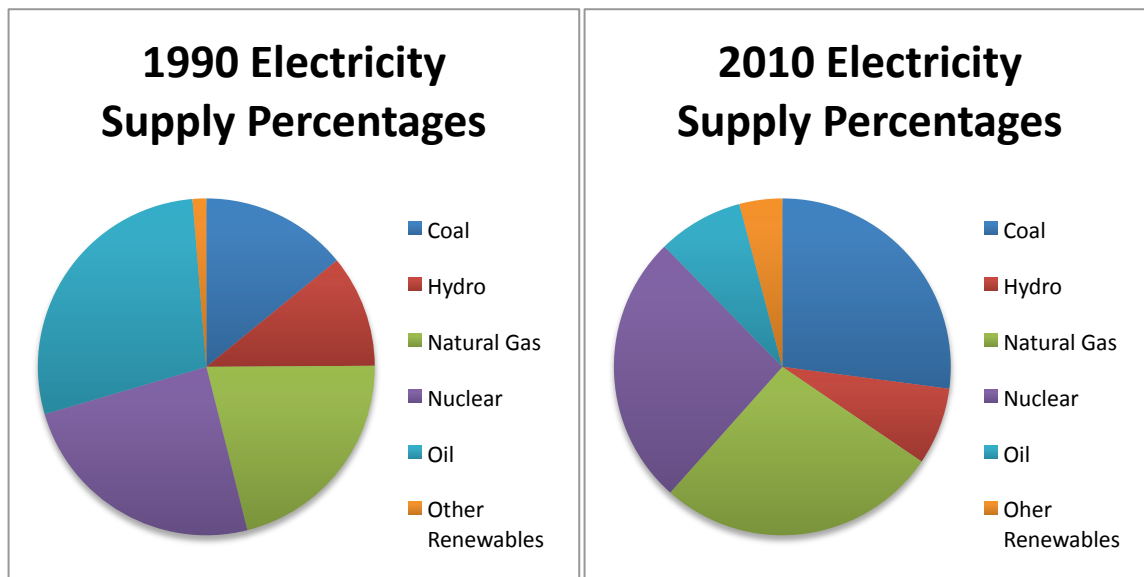
Examination of institutional relationships reveals their impact on these trends. Policymakers' and politicians' relationships with the electric utility companies affected the impact of the nuclear accidents on electricity supply source ratios. The government's relationship with the public also had an impact. Examination of the continuation, declines and returns of public trust reflect an influence on the valleys and peaks in nuclear power's percentage of the electricity supply.

The interview data also highlights two additional institutional influences that emerged in parallel with the accidents: global climate change concerns and electricity market liberalization.



Source: International Energy Agency
<http://www.iea.org/statistics/statisticssearch/report/?country=JAPAN&product=electricityandheat&year=1990>

Figure 3: Trends in Electricity Supply Fuel Percentages, 1990-2010



Source: International Energy Agency
<http://www.iea.org/statistics/statisticssearch/report/?country=JAPAN&product=electricityandheat&year=1990>

Figure 4: Comparison of Electricity Supply Fuel Percentages, 1990-2010

Little change occurred in the direction of Japanese energy supply source trends throughout the 1990s and the first decade of the 21st century, despite a decline in oil prices and the series of nuclear accidents and the scandal. Policymakers' and politicians' cooperative relationships with the electric utilities, coupled with efforts to retain or regain public trust, contributed to this continuation of policies supporting nuclear power expansion.

Nuclear powerhouse

We would expect nuclear power's share to decline or plateau as accidents occurred, with a policy shift toward increased safety protocols and away from technologies perceived as a threat to safety and energy security. And yet, nuclear power use continued to rise steeply through most of the 1990s, growing from 24.2 percent of Japan's electricity supply in 1990 to its peak of 32.6 percent in 1998. The only dramatic downward movement occurred in 2002, when nuclear power's share of Japan's electricity supply dropped more than 7 percentage points from just over 30 percent to just under 23 percent. The steep decline was due to the scandal caused by institutional failure in the relationships between the electric utilities, safety regulators and policymakers. TEPCO shut down all 17 of its reactors in 2002, and only five of these were restarted in 2003. By 2005, all 17 reactors had restarted with government approval.

This plummet was followed by a return to an increasing share of electricity supply, even with the Mihama reactor idled for three years after the 2004 accident, until the 2007 Kashiwazaki-Kariwa accident. Nuclear energy's share fell again to just over 23 percent, but even with this huge reactor, which supplied approximately 16 percent of Japan's nuclear capacity (8.2 GW) off line for almost two years, nuclear power's share of Japan's electricity supply increased, reaching 26 percent by 2010.

The Japanese government did not implement any new policies to reduce nuclear power use after any of the accidents. However, government and electric utility company interviewees broadly agreed that none of the accidents in the 1990s or early 2000s garnered enough public attention to warrant a policy shift away from nuclear power. Given that Monju was a prototype reactor, the government had an early opportunity to

discontinue plans for this technology and transfer resources to development of a different electricity source after the 1995 accident. At the very least, policymakers could have shifted away from plans to recycle nuclear fuel. Former METI official G3 explained why the Monju accident did not result in such a technology switch:

To change the technology paradigm is really difficult, so always the light water reactor with more enrichment, light water reactor spent fuel reprocessing of plutonium, or for the fast reactor or for MOX, or whatever, it was the paradigm. And all of the technologies were built alongside this paradigm. So even though there is something better, it is very difficult to switch...Monju was not a really serious disaster, just some small accident, so it did not generate this shift.

While Monju was shut down for 15 years, Japanese policymakers implemented measures that preserved Japan's nuclear fuel recycling program plans. In early 1996, the AEC adopted the Advisory Committee on Energy's Nuclear Energy Subcommittee's recommendations for government approval of mixed oxide fuel (MOX) utilization and plutonium recycling. Included in the Commission's policy was a requirement that each of the electric utilities use MOX in at least one LWR by the year 2010. The Cabinet approved the policy shortly thereafter, and the government presented the MOX use plan as part of a long-term FBR development strategy.¹³⁸

The cooperative relationship between METI and the electric utilities, including their role in advisory committee decisions, helps to explain the puzzling continuation of Japan's nuclear fuel recycling program.

In 2002, the Diet passed the Basic Act on Energy Policy. This law defined three pillars of Japanese energy policy: energy security, environmental suitability, and

¹³⁸ For more details, see The Citizens' Nuclear Information Center, 1997.

utilization of market mechanisms. These pillars appear consistent with Japanese policymakers' post-oil crises goals. At the same time, the law prioritizes the pillars in ways that indirectly favor nuclear power without mentioning it anywhere. In particular, the description of the third pillar reflects Diet members' cooperation with the electric utilities:

With regard to economic structural reforms concerning energy supply and demand such as the liberalization of energy markets, deregulation and other similar measures shall be promoted in a manner such that business operators can fully demonstrate their initiative and such that creativity and the interests of energy consumers are sufficiently secured, while giving due consideration to the policy objectives prescribed in the preceding two Articles [securing of stable supply and environmental suitability].¹³⁹

This stipulation does not sound unreasonable, given Japanese policymakers' post-oil crises goals. However, the condition that market liberalization measures proceed only if they do not hinder energy supply stability and environmental considerations protects the electric utilities' nuclear power investments. Japanese government officials confidentially confirmed this interpretation of the legislation during Japanese electricity market liberalization negotiations with the United States government at the time.¹⁴⁰ The 2003 Basic Energy Plan built on this legislation.

In 2005, the Cabinet approved the Fundamental Principles for Nuclear Energy Policy established by the Atomic Energy Commission of Japan (AEC). These principles cited three main objectives: to “increase the contribution of nuclear energy to the stable

¹³⁹ Government of Japan, 2002, 2.

¹⁴⁰ Author's personal conversations during participation in bilateral electricity market liberalization negotiations, 2002.

supply of energy and to the reduction in carbon dioxide emission;”¹⁴¹ to “make the share of nuclear power in electricity generation after the year 2030 similar to or greater than the current level of 30-40%,”¹⁴² and to employ reprocessing and commercialize FBRs as part of a strategy for “utilizing nuclear power as a long-term and major method of power generation.”¹⁴³ Referencing this framework, the Japanese government’s 2006 Nuclear Energy National Plan and 2007 Strategic Energy Plan embed attention to safety concerns in a broader context of continued promotion of nuclear energy and the nuclear fuel cycle. The plans frame nuclear energy as a primary power source contributing to a stable energy supply and global warming mitigation goals.¹⁴⁴ The 2010 revision of the Strategic Energy Plan contains an appendix that includes the goal of nuclear power generation equal to 50 percent of Japan’s electricity supply by 2030. Specific measures call for construction of 9 new nuclear plants by 2020 and more than 14 new plants by 2030.

Japanese policymakers’ and politicians’ continued cooperative relationships with the electric utilities and the public during this period of accidents and scandal facilitated the dramatic rise in nuclear power and policies to support it. The official commitment to global climate change mitigation complemented these policies in promoting nuclear power.

Oil’s downward slide

As expected based on the Japanese government’s commitment to bolster energy security by reducing oil use, oil’s share in Japan’s electricity supply generally continued

¹⁴¹ Shunsuke Kondo, 2005, 2.

¹⁴² Shunsuke Kondo, 2005, 3.

¹⁴³ Shunsuke Kondo, 2005, 6.

¹⁴⁴ See Tadao Yanase, 2007.

its downward trend despite the series of nuclear accidents and low oil prices. Oil's share of Japan's electricity supply declined relatively steadily from 1997 through 2010. It spiked three times -- to 26.5 percent in 1992, again to 19 percent in 1996, and in 2007 to 13.6 percent, but dropped steeply again afterwards each time. The 1997 increase was due to TEPCO's replacement of idled nuclear plants with oil and gas-fired plants after the Kashiwazaki-Kariwa accident. In 2010, oil accounted for only 8.2 percent of Japan's electricity supply. After 1997, climate change commitments further incentivized oil use reduction.

Natural gas hike

Also as expected, the share of natural gas continued to rise slowly but steadily from 21 percent in 1990 to 27 percent in 2010. The slight decline in 2003-2005 coincides with increased nuclear and coal use. We would expect more rapid growth, given the advantages of gas over nuclear power presented in the previous chapter, compounded by the Mihama accident. We also would expect natural gas use to rise more rapidly than coal, given the government's emphasis on climate change mitigation beginning in the late 1990s. Japanese policymakers' relationships with the electric utilities shed light on this trend.

King coal

Coal use grew more rapidly than natural gas, rising from 14 percent of Japan's electricity supply in 1990 to 26 or 27 percent by 2003 and remaining there through 2010. Coal appears to have replaced the idled nuclear plants in 2002-3. This rise in coal use

becomes puzzling in the context of the Japanese government's stated prioritization of environmental commitments following the COP-3 meeting in Kyoto in 1998.

Policymakers' and politicians' cooperative relationships with the electric utilities played a role in this coal growth in Japan's electricity supply. The interview data reveals that these two groups' actual prioritization of energy security, economics and environmental issues differs from official rhetoric. While global climate change emerged as an official priority, influence from electricity market liberalization, which encouraged the electric utilities to opt for the cheapest fuel sources, boosted coal use. These institutional influences and relationships help to explain the upward coal use trend, despite the government's stated commitment to environmental priorities and climate change mitigation during this period.

Renewables' non-renewal

The renewable energy numbers reflect a continuing enigma of very small increases after each nuclear accident, despite a growing array of policy measures to advance renewables, particularly after COP-3. Hydropower hovered at around 10 percent of Japan's electricity supply from 1990 through 2005, when it dropped to about 7 percent and remained there through 2010. Other renewables (biofuels, waste, and geothermal) represented less than two percent of Japan's electricity supply until 2003. Solar PV and wind power were too small to count until the year 2000, when they totaled 0.04 percent combined. Non-hydro renewables accounted for four percent of Japan's electricity supply in 2010.

An IEA report on Japan's 1990s renewable energy programs notes that Japan's renewable energy RD&D comprised only three percent of total energy-related RD&D, adding a parenthetical that "most of Japan's energy RD&D funding is funding for nuclear power research."¹⁴⁵ Examining the government's relationship with the electric utilities offers insight into this continued trend of slow renewables growth.

Motivated more by the desire to further reduce oil use than by the nuclear accidents, METI and NEDO did introduce several policies to advance renewables during the early 1990s. In 1993, the "New Sunshine Program" integrated the Sunshine Project, the Moonlight Project, and an RD&D system focused on environmental technologies. The first phase of the program aimed to develop PV technology that could produce electricity at a cost competitive with conventional electricity rates by 2000. In 1994, the Japanese government implemented a subsidy program for individual households and owners and developers of housing complexes installing new PV systems. The subsidy covered half of the cost of PV modules, equipment, distribution lines and installation work from 1994 to 1996, and one-third of the cost from 1997 to 1999.

According to government documents and existing literature, an array of measures implemented after 1996 supported the Japanese government's goals of reducing oil use, and they also responded to commitments made at COP-3 in Kyoto in 1997.¹⁴⁶ That year, METI enacted the Law on Promoting New Energy (New Energy Law) to accelerate the introduction of renewables. Other measures to increase renewables uptake ranged from

¹⁴⁵ International Energy Agency, 2012.

¹⁴⁶ For example, see Donat-Peter Häder, et al., 2005; Tatsuya Ohira, 2005; and Agency for Natural Resources and Energy, Ministry of Economy, Trade and Industry, 2009.

local promotion subsidies and incentives for private firms' renewables investment to specific support for PV system introduction. In 2001, the Japanese government revised its Long-Term Energy Policy, emphasizing promotion of energy efficiency and conservation measures, additional introduction of renewable energy, and fuel switching.¹⁴⁷

The 2003 Basic Energy Plan focused on nuclear power rather than renewable energy. The same year, the Japanese government introduced a renewable energy portfolio standard (RPS), with a national target of 12.2TWh from renewable sources by 2010, equivalent to 1.35 percent of Japan's electricity supply.¹⁴⁸ The RPS focused on wind, PV, geothermal heat, hydropower (less than 1000 kw) and biomass. In 2007, the government increased the target to 16TWh, or 1.63 percent of total electricity supply, by 2014. The amount of renewable energy generation the RPS obligated for each electricity provider was equal to the provider's supply volume from the previous year multiplied by the usage target rate (the national target rate divided by the national electricity volume), multiplied by an "adjustment rate." This adjustment rate accounted for "voltage variation that necessarily accompanies the installation of new energy generation facilities."¹⁴⁹ The RPS allowed electricity suppliers to meet their obligations via generation, purchases of renewable electricity from other suppliers, or purchases of tradable "new energy certificates," Japan's version of renewable energy credits.

¹⁴⁷ International Energy Agency, 2015.

¹⁴⁸ Government of Japan, 2015.

¹⁴⁹ Government of Japan, 2015.

The 2010 revision of the Strategic Energy Plan appendix called for an increase in renewable energy to 20 percent of Japan's electricity supply by 2030. To accomplish this goal, the plan lists several general measures, including expansion of the planned feed-in tariff and increased financial incentives.

Japan's RPS aimed at a very low target for renewables increases, especially given the government's climate change mitigation goals. Other measures passed during and after the time of COP-3 in Kyoto should have led to more dramatic increases in renewables use. Policymakers' and politicians' cooperation with the electric utilities on nuclear power appears to have suppressed RPS targets and limited the effectiveness of these other policies in spurring renewable energy investment, as did electric utility clout.

Policy Process and Structural Changes

After the accidents and scandal, we would expect policy process changes to strengthen safety regulatory authority and diminish electric utilities' clout in the policymaking process. However, no enduring policy process changes occurred as a result of the nuclear accidents. Policymakers' and politicians' cooperative relationships with the electric utilities, as well as increasing utility clout, perpetuated a policymaking process in which the electric utilities played a direct role. Public input in the policy process remained minimal due to the paternalistic relationship with the government and other institutional features.

Several structural changes took place, including agency reorganizations, but these appear cosmetic rather than substantive, designed to preserve or regain public trust in the Japanese government's ability to oversee nuclear power development. Some of these

changes seem to reflect expected tightening of safety regulations and increased regulatory authority. However, continued tensions between regulators and engineers, coupled with cooperation between electric utility executives and policymakers, led to repeated accidents and data falsifications that reveal the inadequacy (whether intended or unintended) of these reforms.

After the 1997 Tokaimura explosion, PNC was recreated as the Japan Nuclear Cycle Development Institute (JNC) in 1998. The functions of JNC did not differ dramatically from the functions of PNC. One academic recalled receiving a holiday card from a JNC friend whose message noted that only the organization's name had changed, a view corroborated by the dissertation author's own conversations with officials at JNC and STA after announcement of the reorganization. After the 1999 criticality accident at Tokaimura, the Japanese government decided to merge JNC with the Japan Atomic Energy Research Institute (JAERI) to form a new entity housed under the Ministry of Education, Culture, Sports, Science & Technology (MEXT). The resulting organization, the Japan Atomic Energy Agency (JAEA), was established in 2005 by the Japan Atomic Energy Agency Act of 2005.

Safety regulator changes also resulted from the 1999 accident, when the NSC received a personnel increase, and a transfer of its Secretariat to the Prime Minister's Office elevated its stature in 2000. The Japanese government also established the Act on Special Measures Concerning Nuclear Emergency Preparedness. The interim report by the Cabinet Office's Investigation Committee on the Accident at the Fukushima Nuclear Power Stations of Tokyo Electric Power Company describes the Act's mandates as

presenting “the obligations of a nuclear operator to prevent a nuclear disaster” and providing for “the declaration of a nuclear emergency situation, the establishment of a Nuclear Emergency Response Headquarters, the implementation of emergency response measures, and other countermeasures.”¹⁵⁰ This Act did not limit nuclear power expansion, and the same Cabinet Office report faults TEPCO for violating the first of these provisions in the years leading up to the Fukushima Daiichi accident.

Most interviewees and government documents attribute the ensuing 2001 creation of the Nuclear Industrial Safety Agency (NISA), housed within METI, to then-Prime Minister Koizumi’s broad government reorganization agenda. However, two interviewees (G12 and I6) hinted at a connection between the 1999 accident and creation of NISA. Based on the relationships between the electric utilities, policymakers, politicians, and this new safety regulator, this process change did impact energy policymaking and safety regulations following the accidents that occurred after NISA’s inception. Under the same reorganization, the NSC’s Secretariat moved to the Cabinet Office. The 1999 accident also prompted measures to codify NSC oversight of NISA. An NSC document describes a “newly established Subsequent Regulation Review [that] aims to observe adequacy of regulatory activities of NISA at each stage after issuing establishment licenses.”¹⁵¹ These reviews empowered the NSC to supervise and audit NISA’s regulatory oversight of reactor construction, operation and decommissioning. In October 2003, the Japanese government created the Japan Nuclear Energy Safety

¹⁵⁰ Investigation Committee on the Accident at the Fukushima Nuclear Power Stations of Tokyo Electric Power Company, 2011, 55.

¹⁵¹ Nuclear Safety Commission of Japan, 2001.

Organisation (JNES), endowed with a staff of 460, to provide technical support to NISA's 300 regulators.

This increased oversight, staffing and expertise should have curbed future data falsifications and safety violations, but it did not. These continuing problems arose from NISA's tense relationships with policymakers, politicians and the electric utilities, combined with the electric utilities' cooperative relationships with policymakers and politicians.

No regulatory changes occurred after the 2004 accident at the Mihama nuclear plant. NISA ordered KEPCO and six other electric utilities to review their inspection records of cooling pipes.¹⁵² Local officials and NISA approved the reactor's restart in 2007, following KEPCO's "safety culture improvements," which a NISA report cites as "face-to-face discussions between the management and workers at sites to improve the safety culture", "reinforcement of personnel working at power plants," and review of all periodic inspection processes."¹⁵³ No government-led regulatory changes accompanied these measures developed by the electric utility. We would expect a change in safety regulations at the minimum, if not a shift away from nuclear power.

After the 2007 Kashiwazaki-Kariwa accident, METI established a committee to investigate the impact of the earthquake and identify necessary measures for the government and electric utilities to "ensure" nuclear plant safety. This focus on "ensuring" safety reflects the Japanese government's sensitivity to the public's zero

¹⁵² CBC News, 2004.

¹⁵³ Nuclear and Industrial Safety Agency, 2005.

tolerance for risk. NISA, THE NSC, TEPCO and the IAEA collaborated on a safety report released in September 2007. In May 2008, TEPCO adopted increased earthquake resistance standards. NISA and the NSC reviewed and approved these standards. While we would expect revised standards, the development and framing of these standards emerged from safety regulators' tense relationships with the electric utilities and the government's need to bolster public trust.

During the same period of accidents and scandal, momentum behind electricity market liberalization grew, then waned. According to some government, electric utility, and academic interviewees, the accidents and scandal impacted both the rise and fall of liberalization efforts. While market liberalization seems an unlikely fix for accidents and scandals, the effect of these incidents on policymakers' relationships with the electric utilities helps to explain the connection. The same relationships also influenced the halt of METI's liberalization efforts before introduction of any measures that would have affected the electric utilities, such as unbundling of transmission and generation.

The Role of Institutional Relationships

The accidents and scandal that occurred in the 1990s and early 2000s did not occur in a vacuum. They took place in an environment created by institutional relationship changes after the oil crises. Interview and secondary data reveal that the government's relationships with the electric utilities and the public influenced the accidents and the policy responses to them. The accidents themselves also affected the government's relationships with the electric utilities and the public. These changes, institutional features inherent in these relationships, and risk perceptions and priorities of

the stakeholder groups impacted the ways in which each relationship influenced energy policymaking throughout the two decades during which the accidents and scandal punctuated Japan's energy system development following the oil crises.

Table 7: Changes to Japanese Government's Relationships and Energy Policy, Process, and Structure after 1990s/2000s Accidents and Scandal

Indep. Variable		Mediating Variables				Change in Dependent Variable	
Shock	Relationships	Change in Cooperation/Conflict		Change in Clout		Policy	Policy Process/Structure
Accidents and Scandal		Before Crises	After Crises	Before Crises	After Crises		
	Bureaucrats-Utilities	Cooperation	Some cooperation	Bur. = Util.	Bur. < Util.	No	Yes: safety, regulator and market structure change, but not significant
	Politicians-Utilities	Cooperation	No change	Pol. = Util.	Pol. < Util.		
	Economic Regulators-Utilities	Some cooperation	Conflict	Reg. < Util.	Reg. = Util.		
	Safety Regulators-Utilities	Some conflict	Conflict	Reg. > Util.	Reg. = Util.		
	Government-Public	Cooperation	Some cooperation	Gov. > Public	No change		

• The highlighted relationships' change or stasis most strongly influence whether changes to policy and/or the policy process and structure occur.

Nuclear Accidents and Scandal vs. Institutional Factors: Impact on Relationships

No interviewees identified the nuclear accidents and scandal in the 1990s and early 2000s as turning points in Japan's energy system, in alignment with a study by Pickett.¹⁵⁴ Instead, institutional features, risk perceptions and priorities defined cooperation and clout in the government's relationships with the electric utilities and the public. These relationships contributed to the accidents and scandal while limiting these shocks' impact on energy policy and process change.

Government and electric utility interviewees broadly agreed that throughout this period, energy policymakers and electric utilities cooperated to preserve nuclear power expansion and trust in their ability to oversee and execute it. Global climate change mitigation commitments aided this cooperation, serving as a priority jointly presented by electric utilities and policymakers as validation of the need to continue nuclear power expansion. At the same time, some tension existed over whether the government or the electric utilities should take responsibility for promoting public acceptance of nuclear power.

Government official G12 suggested that NISA's efforts to tighten regulations after the accidents and scandal also added some tension to METI's relationship with the electric utilities, but this shift alone did not cause many ripples. As a result of the Monju shutdown, some policymakers also began to question the validity of Japan's nuclear fuel recycling policy. This emergence of doubt regarding a key feature of Japan's nuclear

¹⁵⁴ Pickett, 2002.

program should have deepened pressure for a shift away from nuclear power, but this shift did not occur.

Another concurrent shift introduced greater friction between the two groups. Economic regulators undertook liberalization of the electricity sector, which heightened tension between them and the electric utilities, according to interviewees from both groups. The liberalization movement also sapped clout from the electric utilities for a short period, as regulators showed less interest in the utilities' policy inputs. After several years, ousting of the fuel cycle doubters and many of the regulatory reformers from METI's energy policymaking unit precipitated a return of electric utility clout and cooperation with policymakers.

Interviewees' depiction of the relationship between safety regulators and the electric utilities offers the most interesting story. While many critiques of Japan's policymaking structure characterize this relationship as regulatory capture, interviews of safety regulators and electric utility executives and engineers reveal a much more nuanced relationship involving tension and battles for clout that precipitated the accidents and scandal while limiting meaningful regulatory change.

Shifts in clout across all groups played an important role in limiting the shocks' impact on energy policymaking and process change. Government and electric utility interviewees generally agreed that the electric utilities wielded increasing clout during the 1990s. Scholarship by Lesbirel, Aldrich, and others on the government-public relationship describes rising public tension over nuclear plant siting, with little outlet for

influence on policies.¹⁵⁵ NGO and media interviewees' comments support the notion of compromised public clout. However, despite the distrust portrayed in the literature, public opinion polls reflect surprisingly little disapproval of Japanese government leadership after each accident. NGO, media, and government interviewees suggested that the government and the electric utilities cooperated to minimize public concern and rebuild trust after each accident, leading to periods of very short-lived distrust embedded in continuation of the paternalistic relationship.

The interview data thus suggests that overall, electric utilities' tension and battle for clout with safety regulators contributed to the shocks. The data also indicates that the electric utilities' cooperation with energy policymakers, coupled with public trust in the government and little public clout, constrained energy policy and process change after these shocks occurred (Table 7).

Bureaucrats, Politicians and Electric Utilities

The accidents and scandal, institutional influences, and risk perceptions yielded different impacts on the electric utilities' relationships with energy policymakers. While the accidents and scandal had little effect on cooperation between the electric utilities and policymakers, institutional influences had a mixed effect. Market liberalization efforts injected tension over process change, while global climate change and a variety of institutional mechanisms promoted cooperation on a priority shift. Joint disbelief in – or downplaying of -- the potential for a serious nuclear accident also contributed to cooperation between electric utilities and policymakers.

¹⁵⁵ For example, see Lesbirel, 1998, and Aldrich, 2008.

Accidents and Scandal Impact

Consistent with existing literature, all energy policymaker and electric utility interviewees agreed that the two groups' cooperative relationship broadly continued through the 1990s and early 2000s, regardless of the accidents. Government interviewee G17 noted that when accidents occurred, especially those involving facilities operated by the electric utilities, the relationship between the electric utilities and METI's Nuclear Energy Policy Planning Division became a bit strained, but it recovered quickly. The Monju accident did not affect policymakers' relationships with the electric utilities at all, since it did not involve utility-operated facilities. In fact, G17 explained that then-MITI and the electric utilities jointly distanced themselves from the government-affiliated operator, PNC. The official said that MITI and the electric utilities cited PNC's lack of intelligent operators as the cause of the accident: "It was because PNC was not the smartest people. Therefore, when PNC had the accident, everyone in the electric utilities and METI looked down on them." MITI and the electric utilities thus conveyed a coordinated message that the more capable electric utility engineers would not have suffered such an accident.

Government official G13 indicated a similar response to the 1999 accident at the Tokaimura facility operated by JCO. Since JCO was a private company unaffiliated with the electric utilities, "government and industry dealt with the JCO accident as not connected with the LWR business, but specific for JCO process. This was simply because the industry and government didn't want to have significant impact from the accident." MITI and the electric utilities thus cooperated to preserve public trust in commercial nuclear reactor safety and MITI's ability to manage it.

Policymakers also reacted to public distrust after the accidents by publicly cracking down on the electric utilities. After the 2004 Mihama accident, then-METI Minister Nakagawa announced that “punitive action” against KEPCO might result.¹⁵⁶ Still, government interviewees confided that this tough stance coexisted with continued cooperation on nuclear power expansion. As government official G12 explained, “Sometimes we asked the utilities to cooperate on nuclear policy, and in order to get that help or cooperation from the utilities, we somehow had to...consider the current situation of the utilities, especially the financial situation of the utilities so that they can introduce more nuclear. So in that sense, we have to somehow talk and compromise with the utilities.” The official observed that recognizing the utilities’ profit goals became more difficult when accidents occurred, leading to costlier regulations: “So in such a situation, the nuclear accidents gave us some impact on the relations with the utilities. You know, the people asked for a more strict and neutral attitude of the government towards the utilities for the nuclear regulation, and so we have to be very tough with companies.” Electric utility interviewees also noted this governmental shift toward increased regulation, after the accidents, but they generally still viewed the utilities’ relationships with policymakers as cooperative. Any policy or regulatory changes policymakers implemented after the accidents thus aimed to rebuild public trust in order to preserve nuclear power’s growing role in Japan’s energy system. While these changes perpetuated the tension between electric utility engineers and safety regulators, they did not halt

¹⁵⁶ Kyodo News, 12 August, 2004.

cooperation between policymakers and the electric utilities' management, which were removed from the engineer-safety regulator dynamic.

The 2002 data falsification scandal did force interaction between these two sets of relationships, however. While the scandal originated in problems between electric utility engineers and safety regulators (discussed below), METI policymakers' relationships with the electric utility management played a role in the timing of the release of information about the falsification. Several government and electric utility interviewees noted that METI knew about the data falsifications for some time before releasing the information to the public. Electric utility interviewee I1 explained that while junior METI officials with close ties to TEPCO did not want to reveal the scandal, one senior METI official made the decision based on his conflict with TEPCO. I1 described a hostile relationship between then-Vice Minister Murata and then President of TEPCO Nobuya Minami. Mr. Murata "who was really opposed to TEPCO's arrogant attitude," decided to release the data falsification to the public. When the scandal became public, Minami and four other senior TEPCO executives resigned. Several electric utility and government interviewees attributed this conflict to METI's electricity market liberalization efforts, discussed in the next section. Some interviewees suggested that the scandal enabled METI to gain clout by increasing public distrust in the electric utilities, which created public support for METI's market liberalization efforts. This said, G1 said of the scandal's impact:

I would say that maybe in the aftermath of that kind of nuclear scandal, the nuclear program in Japan has become more and more sophisticated. That means I don't think we had an impact so that the utility companies failed or abandoned their construction programs of new nuclear plants for

instance. Of course some were delayed, but I would say that impact was not so serious.

While the scandal led to the temporary shutdown of all of TEPCO's reactors, it thus did not have a lasting effect on policymakers' cooperation with the electric utilities on nuclear power expansion.

In contrast to this short-lived tension, some policymakers' questioning of the nuclear fuel recycling policy created longer-term conflict between these two groups. The prolonged shutdown of Monju after the 1995 accident sparked a debate between METI and Diet policymakers regarding whether Japan's fuel reprocessing policy could or should continue. This conflict emerged quietly in the early late 1990s and grew throughout the early 2000s. Monju's FBR technology was the prototype intended for commercialization that would enable Japan to close the fuel cycle. Monju's shutdown and the challenges that precipitated it led LDP Diet member Taro Kono and several junior METI officials to question the economics and viability of the closed fuel cycle plan. Kono explained that after the Monju accident, "we realized that we have found out that the nuclear fuel cycle is not going anywhere, because...there was a Monju accident in 1995, and development of the FBR has stopped, and a lot of people are questioning if we can actually get the FBR for commercial usage, even without the Monju accident. So with the Monju accident, it's kind of hopeless." Kono's position initially had no supporters and many opposers. Kono asserted that former TEPCO Senior Vice President Tokio Kanoh, an Upper House Diet Member, "was trying to juggernaut all the bills that are good for the power industry." Kanoh had many allies supporting his protection of the

electric utilities' investments. Kono said that when he began questioning the validity of the fuel cycle without commercial FBRs, Kanoh and other LDP politicians aligned with the electric utilities tried to suppress him:

I wanted to ask all the questions, and they don't seem to be able to answer my questions. And Kanoh-san really wanted to shut me up. So I asked questions, but the meeting usually adjourned after my questions no one answered. And there was a science minister... Matsuda Iwao¹⁵⁷...He actually came to see me, and he asked, "Why are you making such a noise?"

These politicians had more influence over other Diet members than Kono did, so they were able to perpetuate nuclear power expansion and the reprocessing program. Kanoh promoted MOX use in conventional reactors after Monju's shutdown. Even when Kono garnered support from several other Diet members in 2004 or 2005, Kanoh and his allies were able to pass legislation promoting use of the Rokkasho reprocessing plant. Kono explained that the electric utilities sought reprocessing as a way to remove spent fuel from their reactor sites, and Kanoh promoted legislation to accomplish this goal:

There were issues earlier, but I think the serious debate took place in the LDP when they were just about to finish the reprocessing plant. Because there were three or four others. Usually Taro Kono alone, but this time Taro Kono plus three or four other members, and that was like a big revolution to the mainstream...but Kanoh-san and his friends just decided [to promote reprocessing] and gave the green light. Then there was another law, and there was another nuclear promotion planning, and they even wanted to start exporting nuclear power plants.

While Kanoh was passing these pro-nuclear bills, a debate within METI arose over the same issue. Kono worked with several METI officials to calculate the cost of

¹⁵⁷ Iwao served as METI Vice Minister in 2001 and Minister for Science and Technology in 2005.

the reprocessing program. As government interviewee G12 explained, "...the confusion on the policy of the nuclear fuel cycle was there in the early 2000s. You may have heard a discussion of a so-called bill for 1.9 billion yen. That was some kind of paper...that criticized the nuclear fuel cycle policy. Within METI." According to Kono and several other government interviewees, the report they produced was squelched quickly, and the officials responsible were rotated out of METI's Agency of Natural Resources and Energy (ANRE) during the next personnel shuffle, while Sugiyama was vice minister.¹⁵⁸

In addition to the fluctuations this issue engendered in cooperation between the electric utilities and policymakers, the ongoing battle between the electric utilities and METI over responsibility for the reprocessing program also signaled an unresolved struggle for clout. One of the officials involved (G17) confided that many METI officials also quietly questioned the reprocessing program after Monju was shut down:

...no one seemed to understand or agree on the reason we had to do this reprocessing...even METI, when you talked to them, was saying that frankly speaking, it would be better to stop it...many METI people were saying that. They were saying that even if we burn fuel at Rokkasho, it doesn't mean anything, so that if possible they want to stop it.

The official also indicated that "even the utility company people, when they spoke frankly -- this isn't a rumor -- they want to stop it, because it cost so much money..."

¹⁵⁸ This transition explains the dissertation author's puzzling experience while a Mansfield Fellow in the METI division handling market liberalization during this time. ANRE denied her request to sit in on a nuclear policy meeting, which the author perceived as concern that a U.S. official hearing internal views could convey them to the U.S. government. A METI colleague confided that the refusal actually stemmed from concern that she might share ANRE's discussion with her METI division, which housed officials opposed to the nuclear fuel cycle.

The electric utilities thus expressed both support for reprocessing as a solution to their nuclear waste problem and opposition to the high cost of continuing the program.

Some electric utility and government interviewees indicated that the conflict over the reprocessing program stems from both sides' belief that the other should shoulder the cost. Electric utility executive I15 summarized the electric utilities' view:

Many people are against the fuel cycle program as long as industry will be responsible or in charge. But my opinion is that most of the people understand that the fuel cycle is needed. But the big question is why industry should take responsibility. So some people, even management people, sometimes say they want to get out of this program as an industry. I also believe that this so-called back end fuel cycle should be taken charge by the government, not only because of the economic reason but also the length of the program.

Government interviewees expressed similar sentiments in the reverse, citing the electric utility leadership's initial desire to assume responsibility for the program at its outset.

Despite policymakers' and electric utility executives' hesitation, both groups continued to promote the reprocessing policy as a central element of Japan's nuclear power expansion policy. According to G17, this mutual promotion did not originate solely in the desire to continue nuclear power expansion by solving the waste problem. METI and the electric utilities battled over who would back out of the reprocessing program first. Each side suggested that the other should take the initiative. The electric utilities claimed that they had no right to back out, according to G17, because "...the utility companies say that the nuclear fuel cycle plan or structure started as a national policy, and we are only following that national policy, so we can't say that we want to quit." METI did not want end the reprocessing program, either, G17 intimated, because if they did, the electric utilities would demand compensation for the 1.9 trillion yen they

had spent on construction of the reprocessing facility. G17 added that METI also asserted that the national policy was non-binding, and the electric utilities pursued reprocessing by choice and could start and end the program voluntarily. Electric utility interviewee I15 corroborated this portrayal of the battle over financial responsibility for reprocessing.

This portrayal of the METI-electric utility battle over responsibility for continuing or ending the reprocessing program reflects an entrenched path with no escape. The electric utilities and policymakers both wanted to shift responsibility or transition out of the program, but neither could do so because both parties were locked in politically and financially.

Another area of tension involved responsibility for public acceptance. Several electric utility and government interviewees asserted that METI and the electric utilities debated over which should assume the burden of convincing the public of nuclear power's benefits and safety. As G12 explained,

as for the way to promote nuclear, METI wanted utilities to play more positive role, more important role to persuade the local people and also make the investment. However, always the utilities complained that government should go forward and then persuade people, and show the people that our nation is determined to promote nuclear. So in that sense, even in the way of the promotion, sometimes the utilities' and METI's position is different.

Precisely during times when the nuclear-based system faced challenges, the government's sensitivity to public trust led policymakers to distance themselves from nuclear power. G12 observed that "sometimes with that public perception on the accident and other things, METI or the government wanted to be a little bit more neutral stance."

Several government and electric utility interviewees observed a dissipation of conflict and a return to cooperation in METI's relationship with the electric utilities between 2004 and 2006. The electric utilities' clout in energy policymaking also rose. G12 observed that "METI very strongly regained confidence in nuclear policy" during this period. G12 attributed this return to cooperation to the efforts of Tadao Yanase, director of METI's Nuclear Policy Division from 2004-2007. G12 explained that Yanase "restructured the nuclear policy, and since then, METI very strongly supported, promoted nuclear policy."¹⁵⁹ During this time, G12 noted,

I think METI came back to the very aggressive nuclear policy, and as for the nuclear safety regulation...maybe not so strict...Maybe neutral. But not affecting [or] bothering the utilities so much. And as for the market planning, METI was not so aggressive. In that sense, in general, the relation between METI and the utilities was, I think, managed.

Concurrent with this policy shift, pro-utility, anti-liberalization Vice Minister Sugiyama succeeded pro-liberalization Vice Minister Murata. This change in attitude among METI's senior and ANRE officials aligns with the timing of the halt in METI's pursuit of liberalization measures, as well as the departure of the METI officials who questioned Japan's nuclear fuel cycle policy.

This positive shift in METI's relationship with the electric utilities also overlapped with the 2004 Mihama accident and the 2004 Mihama accident and the 2007 Kashiwazaki-Kariwa earthquake-induced problems. These incidents should have hindered METI's nuclear expansion plans, especially because they occurred after the data falsification scandal, and because the 2007 incident revealed the nuclear reactors'

¹⁵⁹ Yanase became Prime Minister Abe's administrative aide in 2012. The next chapter will discuss the post-Fukushima implications of this appointment.

vulnerability to earthquakes. Instead, several government and electric utility interviewees asserted that these incidents resulted in intensification of nuclear promotion efforts. Several government and electric utility interviewees highlighted a “nuclear renaissance” initiative, in which METI officials cooperated with the electric utilities to rebuild public support for nuclear power expansion. Government official G9 cited the scandal and the 2004 and 2007 incidents as “the reasons why the ANRE tried to create the so-called nuclear renaissance plan in the year of 2005 or 6, how to overcome the problems.” The nuclear renaissance embodied a joint effort by METI and the electric utilities to preserve and continue the nuclear power program and rebuild confidence in it.

Institutional Effects

While the nuclear accidents and scandal did not have lasting effects on policymakers’ relationships with the electric utilities, institutional features, risk perceptions and priorities contributed to cooperation and clout in these relationships. Institutional mechanisms fostering cooperation between the electric utilities and policymakers became increasingly important for nuclear power expansion during this period. Several government interviewees explained that the 2010 Basic Energy Plan did not contain energy supply source targets. These targets appeared in the appendix and were non-binding. This non-binding status differed from the plans of the previous two decades, which were officially linked to the electric utilities’ supply plans. Government official G4 described the process as “no longer an official process of this is the energy policy, this is the utilities’ plan, and then approval of the program.” Because the targets were no longer formally linked to the electric utilities’ plans, responsibility for meeting

the government's targets became ambiguous. G4 said of the 2010 Basic Energy Plan, "the question, even at that time, was that there was no legal enforcement by the government to ask the utilities to reach some sort of nuclear share. There is no guarantee. So who is responsible for reaching the target of a nuclear share of 50 percent by 2030? It's not clear." This ambiguity over the responsibility for meeting the government targets mirrors the debate over the fuel cycle. Formal and informal institutions to foster cooperation between policymakers and the electric utilities enabled them to jointly promote nuclear power development in the face of these challenges.

Institutional features that influenced policymakers' relationships with the electric utilities during this period included two parallel policy trends, global climate change mitigation policy and electricity market liberalization. In addition, these relationships responded to informal institutions such as the *amakudari* system, university cohort relationships, and political donations. Finally, formal institutions, including subsidies, advisory committees (*shingikai*), and the personnel rotation system, also guided the relationship.

Most interviewees cited global climate change mitigation policy and electricity market liberalization as important influences on energy policymaking during the 1990s and early 2000s. These two trends affected priorities and relationships in contradictory ways, empowering different groups.

Market liberalization could have strengthened the transformational ability of the 1990s nuclear accidents and scandal on energy policy and policymaking processes. As NGO interviewee Tetsunari Iida observed, "In the 1990s, nuclear promotion became

challenged by a more market-oriented approach, combined with the fact that nuclear became less popular to the public.” G12 asserted that because of market liberalization efforts, “for the first time in history...we entered the era of confrontation with the utilities.” This conflict posed problems for METI’s nuclear power expansion agenda. Affirming METI policymakers’ internal drive to expand nuclear power, G12 observed that this commitment required METI’s capitulation on market liberalization: “at that time, our policy was to accelerate new construction of the nuclear power plants. That’s why we have to think about the market scheme which can facilitate capacity and promote such new construction.” METI’s nuclear power expansion priority thus bolstered the electric utilities’ clout in policymaking.

Government interviewees described how the electric utilities framed market liberalization as a threat to new nuclear plant construction and the reprocessing program. G17 recalled that “at the final point of electricity industry reform...electricity companies strongly insisted that we also have to think about nuclear waste.” The electric utilities argued that liberalization would prevent them from recouping spent fuel reprocessing costs through higher electricity prices. Given the emergence of doubts regarding the viability of reprocessing, market liberalization could have provided a further catalyst for shifting away from this program. Instead, the electric utilities’ concern contributed to the stoppage of market liberalization. Reflecting strong cooperation with the electric utilities, Diet members noted the linkage between electricity reform and the nuclear waste

problem in the liberalization legislation and called for a reform hiatus until the end of 2004 to examine measures for the back end of the nuclear fuel cycle.

METI's Yanase cited market liberalization efforts as the source of a "three-way stand-off" between the Japanese government, the electric utilities and plant operators over the responsibility for long-term nuclear energy strategy and investment.¹⁶⁰ This view echoes electric utility interviewees' assertions of market liberalization's negative impact on incentives for electricity grid and plant investments, reflecting the reconvergence of METI's and electric utilities' perspectives during Yanase's tenure as director of the Nuclear Policy Division.

Concurrent with the pursuit of market liberalization, the Japanese government also announced climate change mitigation goals to address commitments made at COP-3 in Kyoto in 1997. Policymakers and the electric utilities agreed on nuclear power as the best fuel source to meet these goals. As electric utility industry interviewee I6 recalled, "I think there was some sort of broad consensus to promote nuclear so that Japan can reduce CO2 emissions drastically at a minimum economic burden and securing energy supply."

G12 described how METI's focus on nuclear power as the key to meeting these goals conflicted with market liberalization aims. He explained that on one hand, market liberalization created tension with the electric utilities and a debate over new nuclear construction. At the same time, because of climate change mitigation priorities, "we had to promote nuclear, anyhow, and in order to promote nuclear, we need a close

¹⁶⁰ Tadao Yanase, 2007.

relationship and cooperation between the industry and METI. So these two things are somehow contradictory.” Framing of nuclear power as the key to achieving Japan’s climate change mitigation goals thus increased the clout of the electric utilities and pro-nuclear policymakers.

Several informal institutional influences also affected policymakers’ relationships with the electric utilities. As in the period following the oil crises, the *amakudari* system played a central role as an informal institutional feature contributing to the electric utilities’ cooperation with and clout over energy policymakers. Government interviewees’ accounts of *amakudari* influence support similar depictions in existing literature.¹⁶¹ As government official G17 explained, “As for the nuclear policy people, some of them...work for almost their whole life in the nuclear division. Their predecessors work at the nuclear power plant division at the electricity companies after graduation, after they graduate from METI.” In addition to METI officials’ retirement to electric utility positions, electric utility executives became Diet members, as Kanoh exemplified. The *amakudari* system built cooperation and electric utility clout that fostered government policy support for the electric utilities’ profits from nuclear power. This policy support included the Basic Act on Energy Policy, which protected nuclear investments, the nuclear renaissance, and halting electricity market liberalization before separation of generation and transmission took place.

In addition to *amakudari*, a reverse trend also deepened cooperation between policymakers and the electric utilities. *Amaagari* enabled industry executives to hold

¹⁶¹ See, for example, Daniel Aldrich, 2011.

government posts while retaining roles in industry. The most influential example of *amaagari* occurred in 1998, when the LDP appointed TEPCO's Kanoh as both chairman of the parliamentary committee overseeing MITI and parliamentary secretary of MEXT

The *amakudari* and *amaagari* systems complemented another informal set of relationships formed through universities. G17 asserted that graduates from the same universities maintained strong bonds even after they dispersed to government positions and electric utility jobs. G17 offered his boss, a former director of the Nuclear Policy Planning Division, as an example: "He graduated from Kyoto University's nuclear department. So because he is from the nuclear engineering department, he had a very good relationship with the nuclear electricity's nuclear power people, and he had a very good relationship with the nuclear power people at the electric utilities." These long-term bonds between government officials and electric utility engineers and executives enabled cooperation and coordination on nuclear power promotion policies even after accidents and the scandal.

Political donations provided a third informal institutional mechanism that fostered cooperative relations between the electric utilities and policymakers, and affected energy policymaking. According to G17, "officially, energy policy has three parts. Economy, environment, and energy supply. Officially we think these three, but I think the truth is that political contributions have an extremely strong influence." While these donations did not directly impact relationships between the electric utilities and METI's junior officials, senior officials in Japan's ministries are political appointees. Influential pro-utility Diet members also pressured METI officials to craft policies supportive of the

electric utilities. Former government official G21 described a “pressure cycle” in which the electric utilities pressured the LDP, the LDP pressured METI, and METI pressured the electric utilities. Political donations played an important role in the electric utilities’ pressure on the LDP. Diet member Kono affirmed that “a lot of politicians have received money from TEPCO, and not only TEPCO, but all the power industries.” He also noted that the electric utilities are influential members of regional business organizations that donated to LDP politicians.

Kono characterized the electric utility-politician relationship as follows: “A lot of LDP politicians try to create good relationships with power companies, because...they might give you money, their management will help you in your campaign, and they have a lot of companies that are related to the power company.” While political donations contributed to the electric utilities’ cooperative relationship with and clout over the LDP, government interviewees stated that the electric utilities wielded influence over opposition party DPJ members through donations from the electric utilities’ labor unions. However, G17 believes that fewer DPJ members took donations from the electric utilities, while all LDP members except Kono took them. In fact, some DPJ members accepted donations from organizations that fought electric utility influence, such as law associations and local civic associations. G17 suggested that these members supported nuclear power in the absence of accidents. Since the DPJ did not serve as the majority party during the 1990s or early 2000s, anti-utility sentiment among DPJ members during this period had little effect on government policies. Differences between the institutional

influences on the LDP and the DPJ became more apparent in the aftermath of the Fukushima disaster, discussed in the final empirical chapter.

Political donations were linked to formal institutional influences such as subsidies to electric utilities for nuclear power plant construction, as well as the subsidies to local government (*kofukin*) for nuclear plant siting. Kono recalled attending LDP nuclear policy meetings that focused primarily on allocation of these subsidies, rather than on the policy implications of nuclear development. “He said he was surprised to find that most of the meeting attendees were from districts hosting nuclear plants. “The meeting was how to divide the money, the government subsidies, among all the districts where nuclear reactors were being built. So it wasn’t really a policy discussion. It’s like a pork barrel meeting.” The siting subsidies propelled Diet-backed policies to promote nuclear power expansion. At the same time, suggested a media interviewee, subsidies for nuclear plant construction were one impetus behind the electric utilities’ interest in building more nuclear plants. These subsidies served as an important mechanism to encourage electric utility cooperation with METI’s nuclear power expansion goals.

As in the previous period, advisory committees (*shingikai*) also continued to serve as an official vehicle for electric utilities’ cooperation with and clout over policymakers. Until the Fukushima accident occurred, electric utility executives served on energy-related advisory committees, including those for electricity supply policy and market reform. One NGO representative who served on several of these committees related:

I got some secret document...during that energy committee I was on...At the next committee meeting, a draft report is supposed to be proposed by the secretary, than means bureaucrat. But I got some draft from the electricity industry association’s people who dropped it in the Parliament,

and I got a copy, and already the draft was there. It was very detailed negotiations between the secretary of METI and the electricity industry association, text by text, full of red lines and full of inserts and deletions. So the electricity industry and METI are completely in very hard negotiation in between behind the scenes, but the publicly open committee's members had no idea what draft will be shown at the next committee, so those kind of operations were up until 2000. Or even until March 11, the committee controlled by METI was operated like that.

This anecdote supports existing literature that broadly characterizes *shingikai* as influential bodies that balance stakeholder interests.¹⁶² It also reveals the extent of electric utility-METI coordination, as well as the struggle for clout.

The Japanese government's personnel rotation system (*jinji idou*) also impacted the electric utilities' cooperation with and clout over METI policymakers. In this system, officials rotate to different ministry offices and divisions every several years. This personnel rotation system enabled pro-nuclear METI officials to return repeatedly to positions of policymaking power. G17 explained that "it isn't necessarily the case that there are that many people deeply involved in nuclear power, so the nuclear people keep coming and going to the same kinds of posts many times." G17 added that because these pro-nuclear officials continually rotated into nuclear-related roles in METI, they "were a little bit isolated from the people at METI who are saying 'let's deregulate the electricity sector,'" and they maintained cooperation with the electric utilities even when liberalization was proceeding.

The electric utilities also used *jinji idou* to oust pro-liberalization officials and regain clout over METI policymakers. With the transition within METI from pro-liberalization officials to pro-nuclear, anti-liberalization officials, electric utility

¹⁶² For example, see Paul Scalise 2010, 10.

supporters within METI regained clout, which also empowered the electric utilities again. Some government interviewees divulged that they had made efforts to resurrect liberalization measures after 2005, but resistance from the electric utilities and their supporters within METI stymied these efforts.

Government, electric utility, and some NGO and media interviewees all suggested that institutional features during the 1990s and 2000s primarily enhanced electric utility clout in the policymaking process. The *amakudari* system, university cohort relationships, and political donations provided the electric utilities with informal channels for influence. The formal institutions -- subsidies, advisory committees, and the personnel rotation system -- codified official electric utility influence. Iida, the former member of several METI advisory committees, characterized the relationship in this way: “electric utilities have much, much larger political power compared to METI, but they are officially controlled or regulated by METI. So, it was a very stressful relationship with each other.” Other interviewees corroborated this view.

Risk Perceptions and Priorities

In addition to institutional influences, risk perceptions also shaped cooperation between the electric utilities and policymakers. Several government interviewees asserted that LDP and DPJ politicians and METI officials did not believe a serious accident could occur. Former government official G16 attributed this governmental view to electric utility influence: “Before Fukushima...ignorance of safety problems was, I think, very prominent in government. So why is a problem and the reason is a problem, and I think that is also, you can say, the influence of industry. Because industry doesn’t

like to spend much money.” G16 indicated that because the electric utilities did not want to invest in safety upgrades, they did not share the risks with government officials, and “also the government itself did not take it seriously enough.” Diet member Kono also noted LDP politicians’ lack of knowledge regarding nuclear power safety issues. Existing literature supports this depiction of the utility companies’ awareness of safety risks, but it also suggests that METI’s safety regulators had access to safety risk assessments, as well, as discussed below.¹⁶³ Since METI’s Nuclear Policy Planning Division officials included nuclear engineers, they should have shared the electric utilities’ awareness of safety risks.

Economic Regulators and Electric Utilities

While risk perceptions had little impact on economic regulators’ relationships with the electric utilities, the accidents and scandal and institutional influences had a mixed effect. The 1990s accidents occurred concurrently with MITI’s pursuit of electricity market reform, with little impact on an already increasingly tense relationship. The 2002 scandal, however, became a turning point. As government interviewee G9 asserted, “In the middle of 2002 and 3, or maybe 4, the Agency of Energy and Natural Resources...needed to handle the falsification scandal. So, you know, all this effort of the deregulation of the utilities stopped. Nobody could do that.” Electric utility interviewee I1 and three government interviewees (G16, G21, and G23) linked the handling of the scandal and the aforementioned conflict between TEPCO President Minami and METI Vice Minister Murata to METI’s electricity market liberalization

¹⁶³ For example, see Jeff Kingston, 2014, 9-58.

efforts, but with contradictory views. I1 said of METI, “At that time, they were discussing how they are going to liberalize the market. And they didn't like the way of TEPCO, and not only TEPCO, but all of the nine utilities, ten utilities way to respond to METI’s idea. So Mr. Murata decided to make [the scandal] public.” This account suggests that METI used the scandal to build momentum for liberalization by drawing negative attention to the electric utilities. Little literature describes the scandal, but some press accounts also depict Murata as pro-liberalization.¹⁶⁴

In contrast, all three government interviewees suggested that TEPCO President Minami alone voiced some resignation regarding METI’s liberalization plans, while other utility executives opposed any further liberalization measures. The government interviewees’ version thus suggests the possibility that while METI’s regulatory reformers used the scandal to malign TEPCO, METI supporters of the electric utilities and nuclear power may have exploited the scandal to oust Minami. The government interviewees’ account further suggests that the METI officials did so in order to eliminate the sole electric utility voice less opposed to regulatory reform measures that would have weakened momentum on nuclear power expansion. At the same time, announcing the scandal created the impression of distance between METI and the electric utilities.

.Joint utility-policymaker pursuit of nuclear expansion continued through this period of accidents and scandal. However, as the story behind the scandal’s release demonstrates, electricity market reform introduced short-lived tension in policymakers’

¹⁶⁴ For example, see Fukushima News Online, 16 April, 2011. <https://fukushimanewsresearch.wordpress.com/2011/04/16/japan-government-considering-plan-to-dismantle-tepco-2/>

relationships with the electric utilities. This tension resurfaced with the resurrection of market liberalization policies after the Fukushima disaster.

In addition to these two broad institutional trends, informal institutional influences such as *amakudari* and political donations affected economic regulators' relationships with the electric utilities through pro-utility Diet members such as Kanoh. Government interviewees cited the personnel rotation system as an even greater influence on clout and cooperation during this period. Several government interviewees emphasized the significance of rotations of pro-nuclear and pro-liberalization officials in and out of senior METI positions and the Nuclear Policy Planning Division. Former government official G21 described how "many people in the power industry hated Murata and his subordinates" because they were promoting electricity market liberalization, "So industry talked to the LDP to influence the *jinji idou*" to oust pro-liberalization officials within METI, including Murata and his subordinates.

Safety Regulators and Electric Utilities

We would expect that the accidents and scandal would have created tension between safety regulators and the electric utilities, resulting in stricter regulations. While some government officials noted tightening of safety regulations during this period, most of the interview data indicates that institutional influences and risk perceptions played a greater role in the relationship than the accidents and scandal. Offering one explanation for this phenomenon, existing literature and recent government documents on the relationship frame it as one of regulatory capture. This literature asserts that Japan's regulators and the electric utilities coordinated to craft ineffective regulations and weak

enforcement.¹⁶⁵ The Diet's investigation commission's report on the Fukushima accident states that in the decades leading up to the Fukushima disaster, "it became clear that the necessary independence and transparency in the relationship between the operators and the regulatory authorities of the nuclear industry of Japan were lost, a situation best described as "regulatory capture"—a situation that is inconsistent with a safety culture."¹⁶⁶ The report also describes a "cozy relationship between the operators, the regulators and academic scholars."¹⁶⁷ Comments from electric utility and government interviewees, including former regulators, did reflect informal communication between regulators and the electric utilities, but they also revealed a problematic set of relationships. They confirmed regulatory independence and transparency concerns, but they also provided other details that depict a scenario very different from regulatory capture.

Viewed holistically, the interview data suggests a much more nuanced relationship involving three sets of interactions: electric utility engineers and regulators, electric utility executives and policymakers, and policymakers and regulators. Government and electric utility interviewees' descriptions of these relationships suggest that the first two operated in relative isolation from one another, while the third both linked and stressed the other two. Thus, lack of effective communication compounded existing transparency and interdependence issues. Based on interviewees' comments,

¹⁶⁵ E.g., see Kingston, 2013.

¹⁶⁶ The National Diet of Japan Fukushima Nuclear Accident Independent Investigation Commission, 2012, 15.

¹⁶⁷ The National Diet of Japan Fukushima Nuclear Accident Independent Investigation Commission 2012, 43.

this problematic trifecta that contributed to the 2002 scandal did not change, even after the Fukushima disaster.

G12 summarized the trade-off between policymakers' cooperative relationship with the electric utilities and the need for stricter safety oversight as follows:

Sometimes we asked the utilities to cooperate on nuclear policy, and in order to get that help or cooperation from the utilities, we somehow had to consider the current situation of the utilities, especially the financial situation of the utilities so that they can introduce more nuclear. So in that sense, we have to somehow talk and compromise with the utilities. So in such a situation, the nuclear accidents gave us some impact on the relations with the utilities. You know, the people asked for a more strict and neutral attitude of the government towards the utilities for the nuclear regulation, and so we have to be very tough with companies.

This need for compromise between regulatory oversight and cooperation on nuclear power expansion hints at the tension between policymakers' focus on nuclear power expansion and regulators' need to respond to safety concerns.

Rather than cooperation indicative of regulatory capture, interviewees' comments revealed strong tension between electric utility engineers and regulators that served as a key factor in regulatory dysfunction during the 1990s and 2000s. Electric utility interviewee I1 suggested that regulatory capture might have described the electric utility-regulator relationship until the 1990s, but the emergence of regulatory challenges created friction, since the regulators did not respond in alignment with utilities' interests as they had done in the past. Engineers and regulators battled for clout over safety regulation revision and compliance. Interviews of electric utility engineers and government officials involved in safety regulation revealed hostility and lack of respect between these groups. A former regulator, G9, summarized, "Between the nuclear engineers in the industry --

utilities and vendors -- and the staff of the nuclear regulation body in METI, both do not trust one another.” Meanwhile, electric utility executives and policymakers cooperated on nuclear expansion and pressured regulators to refrain from enforcement actions or regulatory changes that would constrain nuclear power production. These regulator-electric utility tensions combined with policymaker-utility cooperation to create the chain of events leading to the 2002 scandal.

According to government interviewees, safety regulators viewed engineers as condescending and disrespectful of regulatory guidelines. Former regulators complained that electric utility engineers did not respect regulations or the regulators’ authority to oversee them. G9 explained that “staff of NISA or METI feel like nuclear engineers in utilities are too arrogant and won't hear voices from outside.” NSC documentation of NISA’s reports supports this depiction. A 2008 NSC document describes NISA’s depiction of “repeated malicious conduct of unreported alteration and concealment” by four electric utilities.¹⁶⁸ NISA apparently directed these companies to “revise their operational safety programs for recurrence prevention at their seven power stations, where the cases in evaluation criteria “Level I” had been experienced,”¹⁶⁹ citing non-compliance with regulations.

Former regulators also complained that politicians controlled by electric utility company management and pro-nuclear bureaucrats stifled the regulators’ ability to

¹⁶⁸ The Nuclear Safety Commission of Japan, 2008.

¹⁶⁹ Level I describes “cases that impaired, or could have impaired, nuclear safety, by failing to comply with the requirements specified by the Law for the Regulation of Nuclear Source Material, Nuclear Fuel Material and Reactors or the Electricity Utilities Industry Act.” The Nuclear Safety Commission of Japan, 2008.

enforce existing regulations or impose new ones. G9 explained that “once NISA finds some issues, it might affect against energy policy, so the head of ANRE can direct them not to do it. That is the concept of NISA.” However, I1 described how electric utility engineers and regulators communicated informally at times, without informing ANRE or the utilities’ top management. This informal engineer-regulator communication kept problems from reaching the attention of the top management in the electric utilities and METI, preserving cooperation in the latter relationship even as tension escalated in the former.

Electric utility engineers apparently reciprocated the regulators’ disdain. In their interviews, electric utility engineers and executives described safety regulators as lacking knowledge of nuclear reactor technology and operation. G9 recalled that “nuclear engineers in the utilities even said to me that staff in NISA...do not know so much about nuclear, do not have so much knowledge.” These electric utility engineers argued that when they requested changes to regulations they perceived as overly strict or outdated, regulators did not respond. I6 recalled that “during that time, we are majorly focusing on the fact that the Japanese regulatory requirement is too strict. Too much detailed. Preparation of documentation was too detailed.” I6 asserted that the electric utilities also felt that the reactor outage times for safety inspections were too long, and they complained that the regulations for plant safety did not account for degradation over time. The utilities were “struggling for discussing with the regulatory body in MITI/METI,” but the regulatory agency refused to modify the regulations. I6 concluded, “That is the basis for the falsification problem, the regulatory system.” This disagreement over the

stringency of existing regulations created a situation in which the utilities did not feel obligated to comply with the regulations, much less exceed them to create a safety culture.

Several government and electric utility interviewees cited NISA's creation within METI in 2001 as an exacerbating factor in the tension between regulators and electric utilities. G13 observed that "NISA was formed as an agency of METI, and it seemed to me that this administrative change to a large extent deteriorated the independence of regulations, because it weakened the commitment of the third administrative party like NSC and MEXT with the nuclear regulations." This lack of regulatory independence from energy policymaking contributed to the impression of regulatory capture. Electric utility industry representative I9 supported the notion of regulatory capture created by policymakers' pressure on the regulators. He confided,

Somehow, if NISA makes rules and inspects, then I think the real problem was not identified. And somehow there was not sufficient tension between utilities and regulators. I think we should have such a sound tension. And clearly, I think regulators should listen, but they should make an independent decision after they listen. After they understand what were raised by stakeholders.

This compromising of regulatory independence, asserted other government interviewees, limited the regulator's authority due to METI policymakers' cooperation with the electric utilities. Interviewed former regulators expressed frustration with pressure from politicians and policymakers that prevented them from addressing violations and tightening regulations. At the same time, they did not respond to the engineers' request to modify regulations to account for degradation of reactor parts over time. ANRE was

unaware of the request and did not intervene on behalf of the electric utilities. According to I1, NISA “did not respond to TEPCO’s request for many years, many years...But TEPCO’s issue was that some of the engineers falsified the data.” I1 suggested that TEPCO, NISA and METI held informal discussions once policymakers became aware of the data falsification, but ANRE officials did not want to make the situation public.

Regulator-engineer tensions culminated in the 2002 announcement of TEPCO’s data falsification, based on Murata’s hostility toward TEPCO and the actions of a disgruntled GE whistleblower. TEPCO’s case is well described in existing literature and government documents. Other electric utilities also falsified data, according to electric utility interviewees, but their cases did not receive much publicity. As a result of the tension over regulations and the ensuing data falsification and its revelation, I1 stated that “regulation itself did not change at that time. The communication, relationship did change. To get worse.” Electric utility interviewee I11 described the regulators’ attitude after the scandal as increasingly strict. “I think the government mind’s changed to we have to regulate and we have to supervise the power companies more and more.” At the same time, METI proclaimed NISA’s independence from policymakers after the scandal. However, G9 related a telling anecdote from a few years later:

I made the decision to stop the nuclear power plants due to some troubles two to three times. When I decided, I did not talk to anyone in ANRE. Then, after two or three of my decisions, I was told by the director-general to please meet the ANRE director. When I met him...the intent was that I had stopped the plants too many times.

This pressure from ANRE on NISA to continue reactor operations reflects the continuation of policymaker and electric utility clout over safety regulators after

the scandal. The final report issued by Japan's Nuclear Safety Commission following the 2004 accident at Kansai Electric Power Company's Mihama reactor also reflects this ongoing tension between regulators and plant operators. The report criticizes the electric utility for an attitude of neglect regarding inspections. The report also cites NISA's complaint that KEPCO personnel prioritized efficiency over safety.¹⁷⁰

Several government and electric utility interviewees cited open communication between regulators and engineers as necessary for an effective regulatory system. I1 conveyed that NISA and the AEC engaged in informal hearings with the electric utilities. He explained that "from the utilities' point of view, it's very important to obtain information before it was disclosed, because they may have had time to elaborate. From the regulators' point of view, it is better for them to listen to the utilities' idea before it was made official. So there was a benefit on both sides." However, the media and public began to view this coordination as illicit cooperation.

We would expect that communication between regulators and electric utilities would have included discussion of safety risks, especially during this period of accidents and scandal. Shared risk perceptions would have mitigated tensions and fostered cooperation on maintenance of public trust. Existing literature, government documents and interview data yield four different scenarios, all indicating a problematic electric utility-regulator relationship.

¹⁷⁰ The Nuclear Safety Commission of Japan, 2005, 4-5.

Government documents posit that the electric utilities and safety regulators both had knowledge of risks, but they did not apply this knowledge effectively. For example, the Diet's independent commission's report on the Fukushima disaster states:

Through study groups and other sources, both TEPCO and NISA were aware that if a tsunami higher than that predicted by the Japan Society of Civil Engineers (JSCE) hit the power plant, there was a risk of reactor core damage from a malfunction of seawater pumps. They were also aware that if a tsunami higher than the ground height of the premises hit the nuclear power plant, there was the possibility of a station blackout. They were also aware that no basis existed for assuming that the probability of such a tsunami hitting the power plant was extremely low.¹⁷¹

Press accounts also cite records indicating that NISA avoided implementing tougher regulations despite awareness of risks, because regulators feared lawsuits over reactor design.¹⁷² This perspective suggests a scenario of regulatory capture, in which safety regulators and the electric utilities cooperated to suppress and ignore risks in crafting and complying with regulations.

In contrast, interviewees' comments suggest three alternative scenarios.

Academic interviewee A5 asserted that the electric utilities were aware of safety risks, while regulators were not. He described the electric utilities' efforts to understand nuclear accident risk during the early 2000s, but he cited a communication gap between the electric utilities and NISA. A5 asserted that the findings of academic studies funded by the utilities were "not well communicated to the people working in the nuclear reactor design and safety community. Those were academic experts, but they were sitting in the

¹⁷¹ The National Diet of Japan Fukushima Nuclear Accident Independent Investigation Commission, 2012, 2.

¹⁷² Tatsuyuki Kobori, *Asahi Shimbun*, 24 March, 2012.

advisory committee of MEXT, but that kind of discussion was not well communicated to the people in the industry, or the nuclear safety regulation.” A5 further suggested that compared to the electric utilities, regulators expressed little interest in risk assessments. “So the industry people were relatively sensitive to the new development, but safety regulation people who should be more sensitive to that kind of development are not so sensitive, actually. That’s one of the issues. Especially NISA people.” This perspective suggests that regulators and the electric utilities did not cooperate well, leading to different risk perceptions that affected regulations and compliance with them.

A third perspective identifies this communication gap, but blames the electric utilities for failing to convey risk information. G3 cites the utilities’ perceptions of the stringency of regulations as the reason for this communication failure. G3 claims that “METI was not well informed by utilities about nuclear technologies and its risk, because utilities do not want to tell METI the reality or details, because by doing so they just get tougher regulations from METI if they inform the truth. If utilities inform METI, tougher regulations come back. So didn’t say anything.” This third perspective suggests that conflict and a lack of trust contributed to faulty regulations.

Finally, government interviewee G9 asserted that when NISA regulators requested surveys of fault lines, “utility company board members sometimes called director-generals of ANRE or NISA...and asked us not to do it. ANRE or director-general of NISA asked us to stop.” This depiction of the relationship reflects regulators’ interest in and awareness of potential risk, but action to address this risk was stymied by electric utility clout over regulators.

Regardless of their differences, all of these perspectives on risk perceptions indicate regulatory dysfunction that contributed to perpetuation of nuclear power expansion by enabling the electric utilities to avoid investing in safety upgrades and select reactor sites that regulators might have rejected. Along with the accidents and scandal, this regulatory dysfunction should have provoked public distrust in the government's ability to regulate nuclear power. However, other factors averted this result.

Government and Public

While the 1990s and 2000s accidents and scandal may have temporarily sapped public trust in the government, institutional features perpetuated trust and suppressed public clout. These institutional features also mitigated the shocks' effect on public risk perceptions and enabled coordination of government-public priorities.

Shock Effect

Interviewees did not have a unified view on the short-term vs. long-term impacts of the accidents and scandal on public trust in the government. Some government and NGO interviewees supported existing literature's portrayal of a decline in public trust in the 1990s and 2000s.¹⁷³ Iida asserted that "each accident...very much shocked the public and also bureaucrats. He argued that the government and electric utilities cooperated to "control the national agenda" for energy policy, despite public perceptions of the seriousness of the accidents and scandal. Government interviewee G13 agreed that the accidents negatively impacted the public's trust in the government's ability to manage

¹⁷³ Scholars such as Aldrich and Lesbirel also note waning public trust in the government's ability to manage nuclear power in the 1990s.

nuclear power. G18 also agreed that public trust in the government declined during this period, but he attributed this decline to a series of scandals in a range of sectors, not just energy.¹⁷⁴ At the same time, G18 suggested that “if there is just distrust from the public, that will not create power of change in the society. Some sort of sympathy for anti-nuclear sentiment is coming from inside government and politicians in the ruling party.” This perspective indicates that the accidents and scandal did not increase public clout in energy policymaking; the government continued to lead without much public input.

Other government and NGO representatives did not perceive this decline in public trust at all. As shown in Table 8, public opinion polls also reflect little to no change in public support and disapproval of Japanese government leadership after each accident. Several government interviewees suggested that economic priorities more strongly influenced public confidence in the government than energy concerns during this period. The poll data reflects no loss of public trust after the 1991 accident. Prime Minister Murayama resigned shortly after the Monju accident, but not because of it.¹⁷⁵ The poll data reflects trust in the new Hashimoto government shortly after the accident, a pattern later repeated in Prime Minister Abe’s support rate after the Fukushima disaster. Prime Minister Hashimoto’s support rate actually rose after the 1997 Tokaimura accident. After the 1999 Tokaimura accident, Prime Minister Obuchi’s support rate declined due to a new political coalition. Prime Minister Koizumi’s support rate rose dramatically following both revelation of the TEPCO scandal and the 2004 Mihama accident, but

¹⁷⁴ Examples of other scandals include financial scandals such as the Recruit scandal and medical scandals such as the HIV blood transfusion scandal.

¹⁷⁵ Murayama was blamed for Japan’s continuing recession.

press reports and existing literature indicate that the public was focused on foreign policy issues,¹⁷⁶ Prime Minister Abe's support rate also rose after the 2007 Kashiwazaki – Kariwa accident from a historic low caused by a series of financial scandals perpetrated by his Cabinet members.

¹⁷⁶ Existing literature and press reports cite Koizumi's efforts to resolve the case of Japanese citizens abducted by North Koreans as the source of his popularity in 2002. For example, see Kim Sung Chull, 2012, 84.

Table 8: Public Opinion of Japanese Leadership after 1990s/2000s Accidents and Scandal

Month/Year	Cabinet	Support Rate (%)	Opposition Rate (%)
12/1990	Kaifu	49	32
2/1991	Kaifu	47	34
6/1991	Kaifu	50	32
10/1995	Murayama	35	47
12/1995	Murayama	33	46
1/1996	Hashimoto	61	20
2/1997	Hashimoto	42	37
3/1997	Hashimoto	43	38
4/1997	Hashimoto	44	38
9/1999	Obuchi	51	26
10/1999	Obuchi	46	28
11/1999	Obuchi	41	36
08/2002	Koizumi	43	42
10/2002	Koizumi	65	24
07/2004	Koizumi	36	48
08/2004	Koizumi	39	43
09/2004	Koizumi	45	35
06/2007	Abe	30	49
08/2007	Abe	41	40

Source: *Asahi Shimbun* public opinion polls, 1990-2007.

Media representative M2 summarized the public's relationship with the government during this period of accidents and scandal: "After the 1990s accidents, they didn't change their mind. They still trusted the government." M2 expressed puzzlement over this continued public trust, asserting, "It is difficult for me to tell why, because I wrote something, I myself wrote some articles about the risk of nuclear repeatedly, but the response is very rare. So I didn't understand why people trusted the Japanese government so strictly or so strongly. Even some electric utility interviewees commented on the continuity of public trust, confiding that lack of public awareness of the extent of accidents and cover-ups averted the need for change in government policies that would have altered the energy system.

Tsunoda Katsuya's study of public opinion after the 1999 Tokaimura criticality accident found that while trust in nuclear power safety had declined, the accident elicited virtually no increase in public distrust in the government. The study also found a moderate correlation between distrust in the government and trust in nuclear power operation. He attributes this incongruity to the commercial nature of the accident, which he determines could have led to distrust in nuclear power without eliciting distrust in the government.¹⁷⁷

However, government, media, and NGO interviewees provided different explanations for the preservation of public trust in the government after the Tokaimura accident and other accidents preceding it. Many interviewees' comments suggest that the government and the electric utilities cooperated to instill in the public the impression that

¹⁷⁷ Katsuya Tsunoda, 2001.

the accidents did not involve nuclear power generation. Media representative M1 observed,

Monju or Tokai JCO did not a lot to change the policies. It's hard to understand for the general public. And METI's strategy at that time was to accuse STA or PNC severely. And they protected their light water policies. They distinguished between their policies and Monju, which is still in the R&D stage, and it is completely different from the conventional light water reactor. That was the logic of METI at that time.

Interviewees also posited that the relatively small impact on the broader population prevented a decline in public trust in the government. Academic interviewee A1 noted that “the 1990s nuclear accidents were serious, for sure, but they never got to the level of the general public is involved. They didn't have anybody being evacuated and relocated, and that sort of thing, right? This accident really happened inside of the compound.” A1 explained that although “there is human error and showed some danger,” the government was “able to say, well, still nuclear power is safe, because they never had any effect outside of the compound, the big concrete wall, so the public never really got involved.” Iida also linked public trust to lack of clout. He asserted that the government regarded the lack of explicit public distrust as trust, and “as a result, Japanese energy policy before March 11, and maybe even right now, is far from democracy or openness.” The accidents thus did not affect the general public's trust strongly enough to force the government to change the energy system.

The 1990s and 2000s accidents did affect local communities' attitudes toward the central government, according to government and NGO interviewees. G4 recalled that due to the accidents, “it was clear the local public no longer trusted what the utilities or

the government said. But that happened...well before Fukushima.” In alignment with scholarly analyses by Aldrich, Lesbirel and others, interviewees asserted that this local decline in public trust led to government efforts to reinforce trust at the local level. Some of these efforts worked, and some backfired. In 1993, PNC created an animated video that PNC officials intended for use by local Japanese government offices to build public confidence in nuclear power. Negative reactions from the U.S. Department of Energy (DOE) and NGOs with whom DOE shared the video resulted in the opposite effect, to PNC’s surprise.¹⁷⁸ The Japanese public became more distrustful of government involvement in nuclear power promotion. Public relations campaigns and regulatory tweaks after accidents and the scandal aimed to rebuild trust from the public as a whole, but also within plant host communities. For example, government interviewee G13 suggested that regulatory and policy changes after the 1999 Tokaimura accident reflected “more attention to the relationship with the local communities.” G13 added that these changes “implicitly indicate that the nuclear policymaking process has become more complicated with the increased number of stakeholders.” This view represents a perceived increase in local public clout in energy policymaking. NGOs did not share this view of empowered local communities, asserting that the government largely ignored opposition to nuclear power.

A third group of government, NGO and media interviewees identified middle ground between uninterrupted public trust and loss of trust, asserting that public trust declined after each accident but rose again over time. Some interviewees and NGO

¹⁷⁸ From dissertation author’s personal observations while employed in the PNC Washington office in 1993.

documents attributed this return of public trust to government efforts to rebuild it. For example, after the Monju accident, an NGO publication cited a government decision to “make public most of the nuclear policy decision-making meetings of its relevant ministries and agencies.” The Citizens’ Nuclear Information Center asserted that this decision came “in response to the outcry from the public and NGOs over the government’s handling of the accident.”¹⁷⁹ The government also initiated a 1999 Nuclear Power Awareness Campaign to build public trust and encourage public support for nuclear plant construction. In 2004, the government established the Nuclear Safety Public Relations and Training Division within NISA in response to the scandal. In 2005, then-Chairman of the AEC Shunsuke Kondo cited the Policy Planning Advisory Council’s concern over renewal of public trust as a foundation of the Framework for Nuclear Energy. He noted the advisory council’s recognition of “the need for the recovery of the public confidence in both the plant operators’ safety management and the effectiveness of regulators activities for the assurance of nuclear safety.” Kondo highlighted first among the Framework’s short-term actions “activities for maintaining the public confidence in the safety management of existing nuclear power plants and related facilities.”¹⁸⁰ Some government interviewees confided that the real aim of the nuclear renaissance was public confidence-building. Explaining this goal, G9 intimated that “the falsification scandal by TEPCO and the [nuclear accident] problem in Kansai caused the loss of reliability by the public to the nuclear power operations. At that time, the ANRE needed to create, you know, a plan of the future, how to do nuclear technology

¹⁷⁹ The Citizens’ Nuclear Information Center, 1997.

¹⁸⁰ Shunsuke Kondo, 2005, 4.

and nuclear power plants.” All of these measures in response to the accidents and scandal, combined with institutional influences, prevented public distrust from sustaining enough momentum to pressure the government to alter the energy system.

Institutional Features and Influences

Institutional influences mitigated the negative impact of the accidents and scandal on public trust in the government. The focus on global climate change enabled the government to build a shared environmental priority with the public, fostering trust. Informal and formal institutional factors also contributed to public trust in the government. The government’s paternalistic relationship with the public played the most important informal role in maintaining public trust and minimizing public clout in energy policymaking. Meanwhile, formal institutions such as siting subsidies, town hall hearings, and an ineffective public comment process also promoted trust and suppressed public clout.

Government, NGO and media interviewees cited global climate change mitigation as a priority shared by energy policymakers and the public after COP-3. Several government interviewees added that the public accepted METI’s portrayal of nuclear power as an exportable solution to other nations’ climate change challenges. G1 summarized this coordinated view as follows:

I cannot say that Japanese people did not take importance of safety, but the first priority thinking was that energy business is very promising for Japan, and also greenhouse gas emission reduction is very important for Japan. That was the thinking before the Fukushima crisis. Government and public generally thought this direction, and social communities have variety of opinions, but generally they agree.

A perception that the government was implementing nuclear and renewables expansion policies to meet climate change mitigation goals contributed to public trust in the government's energy policymaking. The public did not appear to notice the incongruous rise in coal use throughout this period, which should have raised public doubts about the government's commitment to climate change mitigation.

Underlying public trust in the government was the paternalistic relationship between the two, an informal institution that framed public expectations that the government would act in the public's best interest without a need for public input. G17 related that "before Fukushima, the public had little or no impact" on METI's decisions. Government officials largely assumed they could make better decisions on behalf of the public than average citizens. Government interviewee G18 bluntly stated of the government's view of the public, "Government officials see the public in the past as idiots. I don't want to say idiots, but..." G7 described an environment in which "the government had the guts to say no to the public." Meanwhile, public trust in the government ceded public clout. NGO leader P2 contended that "many people...related that we had so much confidence in the government, because of that trust in government – confidence -- the government took control, and they didn't believe they should listen to people. So this is kind of a vicious cycle. Of dependency and more control kind of things." While the accidents and scandal whittled away at public trust and disinterest in policymaking input, the paternalistic relationship enabled rapid recovery of trust after each shock.

As a result of this relationship, policymakers also felt pressure to meet public expectations regarding safety and security. Government official G7 contended that starting in the mid-1990s, “even if we don’t have any strong influence from the political side...we more and more have the tendency to take into account public opinion.” He asserted that METI policymakers have gradually begun to be concerned about public reactions to their policies, in part due to a decline in METI’s clout over the public. NGO and media interviewees did not perceive this accommodation of public views, nor the relative rise in public clout,¹⁸¹

Formal institutions also affected public trust and clout in the government’s energy policymaking. Subsidies to nuclear plant host communities perpetuated cooperation between the local and central governments, encouraging them to cooperate to recover public trust after shocks. At town hall hearings, government officials connected with local citizens to build support for nuclear plant siting. The government’s nuclear renaissance plan also aimed to rebuild public trust after the scandal and 2000s accidents.

Formal outlets for public opinion to influence policymaking also constrained public clout. NGO interviewees mentioned the ineffectiveness of the public comment system, P2 asserted that “the government has to have a public hearing period of receiving feedback from the people. But to my knowledge, that kind of public hearing didn’t

¹⁸¹ The Japanese ban of imported beef in 2004-5 due to mad cow disease concerns represents another shock that reflects the paternalistic relationship. The dissertation author’s personal observations while a Mike Mansfield Fellow revealed that MOFA feared public backlash against lifting of the ban. A public hearing on the issue mostly consisted of government explanations, rather than a quest for public input. Consumers in attendance demanded that the government do a better job of protecting citizens, without demanding public involvement in the policymaking process.

work.” P2 explained the ways in which the public comment mechanism yielded minimal public impact on policymaking during the period of accidents and scandal:

It’s kind of just formality. The government has a one-week public hearing website, and nobody knows, and the only feedback they receive is from industries. And if the issue is a very hot issue, for example, global warming -- hot issue means different opinions from government, industries and NGOs --, then if the government had the public opinion period, they have thousands of emails from industries, the same text. Actually the public hearing or this kind of feedback route between the government and the people didn’t exist or did exist but didn’t work. That is my opinion.¹⁸²

The public comment system thus bolstered public trust by appearing to serve as an outlet for public opinion. In reality, it constrained public clout by avoiding impact of public opinion on energy policymaking.

The overall effect of these institutional influences appears to be continued public trust in the government, albeit with periods of doubt, coupled with constrained public clout, despite some government perceptions of public influence. on energy policy decisions.

These institutional features also mitigated the 1990s and 2000s shocks’ effect on public risk perceptions and enabled coordination of government-public priorities. The paternalistic relationship led to public trust in the government’s assessment of risk, despite short-term doubts after each accident and scandal occurred. NGO and media interviewees asserted that to preserve this trust, the government avoided informing the public of potential risks, and the general public did not ask for details. Media interviewee

¹⁸² This view is corroborated by the dissertation author’s personal observations during participation in discussions between U.S. and Japanese government officials during the Cross-Sectoral Regulatory Reform Working Group negotiations in 2000-2003.

M2 suggested that before the Fukushima accident, “I think the lack of education about nuclear energy in Japan is the reason why people didn't pay attention to the risks before. So the traditional way of Japanese governing of people is not to tell them or educate them or tell them the truth about complicated matters. In my opinion, many people in Japan don't know what nuclear power is.”

Risk Perceptions and Priorities

The public also expected the government to take responsibility for protection from risk. According to some government and academic interviewees, the Japanese public's extremely low tolerance of risk led to government suppression of risk communication for fear that local communities would reject nuclear plant siting. As academic interviewee A5 noted, “even though academics were discussing about the necessity for increasing the scope of the severe accident, including the earthquake and tsunami, that kind of discussion was not well incorporated in the regulation also. Partly because of the concern, especially the concern of the regulatory people for the so-called public acceptance issue in the local area.”

The shared set of risk perceptions focused on energy security that developed after the oil shocks did not shift toward safety after the accidents and scandal.

Impact of relationships on energy system change

Continued electric utility cooperation with and increasing clout over policymakers perpetuate the existing energy system, despite the occurrence of a series of nuclear accidents and a scandal in the 1990s and early 2000s. Continued public trust in the government, alignment of priorities, and government clout – the same factors that

enabled major energy policy change after the oil crises – contributed to the preservation of Japan's energy system during this next period. The electric utilities' conflict with regulators played a role in the accidents and scandal, with little effect on energy system change. Policy and policymaking process changes focused on safety regulations within the existing system. These changes, including creation of NISA, sustained and deepened momentum of the existing system.

Electricity supply changes

Nuclear power

The 1990s and 2000s nuclear accidents and scandal, in combination with electricity market liberalization movement, should have shifted Japan away from nuclear power. Instead, they contributed to the reverse trend. Japanese policymakers and electric utilities cooperated on a nuclear renaissance to preserve nuclear expansion and rebuild public confidence lost due to the accidents and scandal.

During this period, institutional arrangements between policymakers, safety regulators and the electric utility companies contributed to perpetuation of nuclear power expansion, as well as challenges to it. Public trust in the government and constrained clout compounded these effects. The electric utilities' cooperative relationship with policymakers promoted nuclear power, while conflict over the nuclear fuel cycle emerged. Policymakers' cooperation with the electric utilities also affected the utilities' relationships with economic and safety regulators, as well public acceptance of nuclear power.

This cooperation contributed to the electric utilities' dysfunctional relationship with both economic and safety regulators. The tension generated by electric utilities' conflict and battle for clout with both economic and safety regulators should have destabilized nuclear power's advancement. However, the relative strength of the electric utilities' relationship with policymakers squelched market liberalization efforts that might have derailed nuclear power expansion. To protect nuclear power, the 2002 Basic Act on Energy Policy relegated market liberalization to third on the priority list, after energy security and environmental concerns. The electric utilities and pro-utility policymakers later used the personnel rotation system to oust pro-liberalization officials and officials questioning the viability of the nuclear fuel cycle. The officials that replaced them halted regulatory reform measures and implemented policies designed to build public support and perpetuate nuclear power.¹⁸³ The accidents and scandal might have impacted the future of nuclear power in Japan's energy mix if electricity market liberalization had proceeded, or if questions about reprocessing arising from the Monju accident had led to policy change instead of an ongoing stand-off between policymakers and the electric utilities over funding and responsibility. Policymakers' cooperation with the electric

¹⁸³ As an example, the 2006 Nuclear Energy National Plan contains five guidelines for nuclear energy policy: I. Establish a firm national strategy and policy framework that does not waver over time. II. For individual policy measures and time frames, maintain a "strategic flexibility" to adjust to global realities and technology trends. III. Break down the three-way standoff among government, electric power utilities, and plant makers, to achieve true communication and a shared vision among players. The government must take the first step by indicating the overall direction. IV. Place importance on policy measures of individual regions along the lines of national strategy. V. Ensure policy stability by basing strategy decisions on open and even-handed discussions. Ministry of Economy, Trade and Industry, Government of Japan, 2006.

utilities also constrained meaningful safety regulation, a trend that would contribute to the Fukushima disaster and ultimately challenge the future of the energy system it aimed to protect.

At the same time, the electric utilities' cooperation with policymakers combined with public trust in the government to foster public support for nuclear power. The aforementioned conflict between the policymakers and the electric utilities over responsibility for public acceptance arose in part because the electric utilities recognized that public trust in the government could facilitate acceptance of nuclear power more effectively than the electric utilities' promotion. Several electric utility interviewees explained that the utilities exploited the public's perception of government clout over the utilities. I6 described how the electric utilities used this strategy in nuclear plant siting discussions with local communities: "to the general public, the utility company said, this was approved by the government, and that means this is the right thing, and we have to follow, and you, the general public, have to understand it." This tactic worked until the Fukushima disaster occurred. Public trust in the government also enabled METI to garner public acceptance for nuclear power expansion by voicing support for it as a policy for the good of the nation. Electric utility interviewee I15 relayed that local governments sought this rationale: "It's always been the case, even before the [Fukushima] accident. Any new construction, including Rokkasho, the local government always wants to have the commitment of the central government." The central government continued to overtly support local governments' and electric utilities' nuclear plant siting plans throughout the 1990s and 2000s, despite the accidents and scandal.

Underlying public acceptance of nuclear power expansion was the paternalistic relationship between the government and the public. Public trust in the government's ability to oversee nuclear power should have waned after the accidents and scandal, leading to movement away from nuclear power. G13 observed that "that kind of argument was already done, you see, made before Fukushima Daiichi, already in Japan. We had a lot of arguments like that. Once we lose the trust in regulation and once we have such a serious accident, we would not be able to continue to use nuclear energy." Despite this repeated debate, public trust did not decline steeply enough or long enough to seriously challenge the government's nuclear power expansion policy. Even if it had, the lack of public clout generally enabled policymakers to proceed as planned. When a decline in public trust did force regulatory changes or program postponements, such as the delay of FBR commercialization, the government also implemented policies to preserve nuclear expansion policies, including the introduction of the MOX program.

From the time of the oil shocks, the government established a shared prioritization of energy security that developed public support for nuclear energy expansion policies. Government, electric utility, NGO and media interviewees suggested that the focus on global climate change starting in the 1990s created an additional priority shared by the government and the public, enabling promotion of nuclear power as a solution. G3 described this link between nuclear power and prioritization of energy security and climate change:

Nuclear was considered to be self-sufficient energy, so Japan is starting the nuclear fuel cycle options, and that warrants the future energy security of Japan. This argument was strengthened by the climate change discussion after the Kyoto COP meeting. Suddenly, nuclear was also

suddenly given a very important role to achieve the targets for CO2 emission reduction.

Media interviewee M1 asserted that the government conveyed these views to the public after COP-3, so “many people are getting awareness of climate change issues. That gave a very good reason for boosting nuclear power for the energy policies.” Policymakers framed nuclear power as “a very strong and effective way to reduce our emissions, to replace coal and fossil fuels. And that sounds very much persuasive for the general public and after that, they repeated that kind of theory repeatedly.” These arguments that resonated with public expectations of the government’s commitment to national interests deepened public trust in the government. G21 asserted that these shared priorities enabled rapid recovery of public support for nuclear power after the accidents and scandal, since “we had a problem with the policy priority for climate change at that time. So in the face of the public doubt about nuclear power plants, we could promote further the nuclear. The government could, because of climate change.” This trajectory continued until the Fukushima disaster, contributing to the nuclear renaissance’s successful culmination in the 2010 Strategic Energy Plan.

Prime Minister Hatoyama’s 2009 announcement of a CO2 emissions reduction target of 25 percent below 1990 levels by 2020 propelled METI’s nuclear expansion goals beyond even the electric utilities’ expectations, according to at least one government interviewee.¹⁸⁴ The appendix to the 2010 revision of Japan’s Strategic Energy Plan called for a 50 percent share of nuclear power in Japan’s electricity supply

¹⁸⁴ Hatoyama’s surprising announcement came in the context of DPJ efforts to wrest control of policy issues from the bureaucrats.

by 2030. G12 confided that the 50 percent target “was too aggressive. Even the utilities felt so. So in the late 2000s...METI was beyond the utilities for the promotion of nuclear, I think.” Government official G7 suggested that this ambitious emissions reduction target dictated a steep increase in nuclear power use because “we cannot really use the coal-fired plants, and we would rely more and more on nuclear and renewable energy. But needless to say, we need time to have the good portion of new renewable energy, so we should rely on nuclear power.” Nuclear power expansion policies thus proceeded throughout the 1990s and early 2000s, partly in spite of the accidents and scandal, and partly due to enhanced public acceptance efforts emerging from them.

Oil

Maintaining cooperation begun after the oil crises, policymakers and the electric utilities coordinated to continue reducing oil’s role in Japan’s electricity supply.

Natural gas

Policymakers and the electric utilities continued to increase use of natural gas, but the steeper rise in nuclear power and the plethora of policies in support of it reflect coordination to prioritize the latter over the former. The comparatively steeper rise in coal use during this period of emphasis on climate change mitigation also reflects policymakers’ cooperation with electric utility prioritization of cheap electricity sources, especially as electricity market liberalization progressed.

Coal

Despite the government’s professed prioritization of climate change mitigation and environmental goals over market liberalization and efficiency, the share of coal rose

in Japan's electricity supply rose quietly and steadily throughout the first decade of the 21st century. Former government official G21 pointed out this inconsistency. Noting that coal replaced nuclear power during the reactor shutdowns after the 2002 scandal, he stated:

...in place of nuclear, coal had been promoted, to the extent that the Japanese government is worried about whether we can achieve the target of the Kyoto Protocol. So coal is the worst thing for climate change, right? So the second purpose of energy policy, which is economy, and the third purpose, which is environment...started to conflict with each other.

Several government and NGO interviewees suggested that coal use rose due to cheap coal prices, which benefited the electric utilities and large users. M1 asserted, "Economics is the champion. That's one of the reasons that we depend heavily on cheap coal plants, coal fired plants. In 1990s, the proportion of coal, electricity from coal was only 10 percent. Now, we have 24 percent."

NGO leader Iida noted the link between this trend and market liberalization, asserting that "climate change is a more central topic, but the real effort of combating climate change was rather poor because at the same time, coal power was strongly promoted since the early 90s because of more pressure on cheaper electricity." The electric utilities particularly sought to reduce costs as market liberalization proceeded, observed Iida. "A more competitive electricity market converted into cheaper electricity pressures. So it is more aggressive deployment of coal power since 1990. It extremely increased carbon emissions in the Japanese energy sector...in spite of the effort to promote nuclear." This rise in coal use thus suggests that policymakers cooperated in prioritizing electric utilities' and manufacturers' profits over climate change goals.

Renewables

Despite the Japanese government's policy attention to global climate change mitigation, renewable energy's share of Japan's electricity supply remained miniscule. Government measures to increase renewables use did little to change this trend. Subsidies, the RPS, and the 2010 Strategic Energy Plan appendix's call for a 20 percent renewables' share of Japan's electricity supply by 2030 resulted in minimal renewables penetration in Japan's electricity market. Electric utility industry representative I6 suggested that the RPS failed due to a lack of cost-effective resources in Japan. Electric utility interviewee I1 also cited utilities' concerns over technical problems with stability of the grid and renewable energy technologies. A third, I11, suggested that the need to recoup nuclear investments quelled the utilities' interest in investing in expensive renewables.

Regardless of the real reasons behind electric utilities' opposition to renewables, the interview data reveals that electric utilities' clout and cooperation with policymakers prevented renewable energy from making headway in Japan's electricity share, even after the 1990s and 2000s accidents and scandal. G17 noted, "I think before the Fukushima accident, most of METI's people are for nuclear energy rather than new energy." Former government official G21 asserted, "The political power of electric companies was extremely too big...it was very difficult for them [the government] to make a big introduction of renewable energy, because, even under the RPS, because they (the utilities) had political power." The electric utilities met the RPS goals for each year until the RPS was eliminated. The goal itself appears to have been set too low, and the

cooperative relationship between the electric utilities and METI suggests that this low target intentionally enabled the electric utilities to meet or slightly exceed it without significant renewables increases.¹⁸⁵

Several media and government interviewees noted the influence of the electric utilities on the RPS parameters. Media interviewee M1 explained that “in Japan, the electric utilities decide, basically the utilities decide the RPS. Actually they dominate the data, and they dominate the information on the grid, so they can decide how much energy they can get from renewables. It was very tricky, the political decision on RPS system.” M1 went on to describe how policymakers initiated the RPS as a way to stymie discussion of feed-in tariff. The feed-in tariff movement, which began shortly after announcement of the Kyoto Protocol commitments, was supported by a coalition of politicians and the citizens’ groups. According to M1, “the utilities and METI didn’t like that idea, and instead they introduced RPS system to kill that bill.” M1 asserted that policymakers’ and electric utilities’ desire to control and limit renewables entry into the market drove cooperation to implement an RPS, in which “the utilities and bureaucrats dominate the system,” instead of a FIT, in which “the market dominates the supply of renewables.” This decision reflected not only electric utilities’ clout over policymakers, but also the public’s lack of clout. The RPS shelved the publicly supported FIT until after the Fukushima accident occurred.

¹⁸⁵ This phenomenon is not unique to Japan. Research by the dissertation author finds that a number of U.S. states also selected low targets for renewable portfolio standards based on input from local electric utility companies. See Jennifer Sklarew, 2009.

G12 confirmed that while electric utilities had no interest in renewables increases, economic regulators attempted to encourage them to allow renewables and energy efficiency technologies to enter the market in order to revitalize Japan's manufacturing sector. "I explained to the utilities...if Japan successfully introduces renewable energy, maybe Japanese manufacturers can export this. So utilities can be the incubator for these industries." This argument also did not lead to immediate increases in renewables.

Policymaking Process and Structural Changes

While this period of accidents and scandal saw a continuation of energy supply trends initiated in the previous post-oil crisis period, little meaningful policy process change took place. Regulatory changes occurred, but they had little impact on the energy system. Some government interviewees cited electric utility clout over and cooperation with policymakers as the reason for the demise of regulatory reform prior to the Fukushima disaster. G12 observed of the first decade of the 21st century, "now that the Japanese nuclear people regained their power, I think that later in this decade, our main policy project was to facilitate nuclear, and so that's why in the fourth [regulatory] reform, that was very gradual." Reflecting both cooperation and electric utilities' clout, G12 confided regarding market liberalization discussions after 2005, "maybe if I say directly, I want to deregulate the market, maybe the utilities will never approve that, accept that." G12 revealed economic regulators' exploitation of a perceived linkage between market liberalization and increased renewables use to attempt to persuade the utilities. G12 told the electric utilities that "we need to introduce renewable energy anyhow, and so we already decided to intro the feed-in tariff and also smart meters, so if

we want to make the introduction of these policies very smoothly...I need your help.”

He explained to the electric utilities that these measures to support renewables development supported gradual introduction of market liberalization.

Interviewees’ depictions of policymakers’ and electric utilities’ cooperation on expansion of nuclear power and tension over electricity market liberalization are consistent with the dissertation author’s experience as a U.S. Department of Commerce official working on Japanese electricity deregulation during this period. Diet member Kanoh crafted and secured passage of the capstone 2002 Basic Energy Law that prioritized energy security and environmental concerns over market liberalization in Japan’s energy system policymaking. At that time, some METI officials confided that the law was intended to stall regulatory reform measures that would have threatened continued expansion of nuclear power and the electric utilities’ profits from existing nuclear plants. The timing of this legislation aligns with the ousting of Minami and the ensuing arrival of anti-liberalization officials to senior METI posts.

Several government interviewees suggested that the 2004 and 2007 accidents incurred a further shift away from market liberalization by siphoning clout from regulatory reformers and shifting METI’s focus toward safety reforms to preserve nuclear power. Other government interviewees highlighted these accidents’ role in spurring the nuclear renaissance, precipitating a decline in economic regulators’ clout during this period.

No significant safety regulatory changes occurred after the accidents and scandal. While some changes did take place, interviewees agreed that these changes did not result

in a revision of nuclear safety culture, nor did they force a shift away from nuclear power by raising the costs of compliance. Instead, policymakers' cooperation with the electric utilities inhibited real change toward tougher regulations. At the same time, tensions between the electric utilities and safety regulators led to non-compliance with existing regulations and failure to revise them to meet the electric utilities' expectations for realistic guidelines.

Several government interviewees and documents from the government and NGOs raised the issue of transparency in energy policy decision-making. The interviewees suggested that changes did occur after the accidents and scandal, but they also voiced concern that these changes were either insufficient or aimed at an inappropriately defined concept of transparency. They felt that the changes did not foster necessary open communication between regulators and the electric utilities, or between the government and the public. The Citizens' Nuclear Information Center cited a "commitment from the government to make public most of the nuclear policy decision-making meetings of its relevant ministries and agencies" after the Monju accident.¹⁸⁶ This transparency commitment arose due to public distrust in the government over the government's handling of the accident. Minutes of advisory committee meetings became publicly available, but this change sent policymakers' coordination with the electric utilities under the table. G13 offered the example of the Japan Nuclear Technology Institute (JANTI), established by the electric utilities after the scandal. JANTI aimed to facilitate knowledge sharing between the electric utilities, the government and academia. G18

¹⁸⁶ The Citizens' Nuclear Information Center, 1997.

asserted that this inclusion of participants from multiple stakeholder groups limited the information the electric utilities were willing to share. A 2004 NSC document states that the legal framework for safety regulations was “tuned to recover nuclear safety confidence” with the initiation of Subsequent Regulation Reviews after the 1999 Tokaimura accident.¹⁸⁷ One the main objectives the document cites is transparency of regulatory processes. However, subsequent accidents and revelations of falsified data reflect the inadequacy of these reviews in promoting transparency.

Summary: Policy, Process and Lock-In Linkages

During the 1990s and early 2000s, the series of technological and institutional failures did not result in changes to Japanese energy policy direction. They also did not yield significant policymaking process change or significant regulatory change. Instead, the policies that emerged during this period helped the existing energy system to gain momentum and move closer to energy policy lock-in.

The energy system reflected signs of path dependence: infrastructure development, institutional support, momentum, and mitigation of uncertainty and risk. As Japan’s nuclear infrastructure grew to accommodate shared policymaker and electric utility priorities, the utilities became increasingly focused on recouping the investment costs of this infrastructure by perpetuating its use. A network of nuclear-related industries grew around this infrastructure.

The government’s relationships with the electric utilities and the public contributed to this trend, providing institutional support. The electric utilities continually

¹⁸⁷ The Nuclear Safety Commission of Japan, 2004, 1.

increased clout over and sustained cooperation with policymakers. Relationships between the electric utility companies, politicians and METI pushed anti-nuclear people out, strengthening the relationship between METI and the electric utilities and further perpetuating nuclear power development. An electricity market liberalization movement that emerged concurrent to the accidents and scandal challenged nuclear power's dominance, but the same cooperative relationships quashed this effort. At the same time, global climate change emerged as a priority that solidified nuclear power lock-in and built momentum through the nuclear renaissance.

Meanwhile, tensions and the battle for clout between the electric utilities and safety regulators worsened throughout the period. Lack of risk communication perpetuated acceptance of the nuclear-based energy system, but it also injected a fatal weakness by establishing an opportunity to shatter public trust in the government. This problem, combined with the continued regulator-electric utility conflict that fueled the accidents and scandal, later would contribute to the most significant challenge to nuclear power lock-in.

Public trust in the government remained relatively high, though declining slowly over time. Public clout also remained constrained. Only a major catastrophe seemed likely to dramatically alter this government-public relationship and incite a broad-based public call for energy system and process change heard by policymakers.

CHAPTER SEVEN: 2011-PRESENT: THE FUKUSHIMA ACCIDENT: SHOCK TO THE SYSTEM

“ The LDP and METI and the utilities want to keep the nuclear policy, and nuclear policy doesn’t have popularity among the people. Nuclear is more important for these three than keeping the current market structure. These three have some kind of implicit consensus that we should further proceed on deregulation. Otherwise, we cannot have trust from the people. And then, with such regulatory reform efforts, maybe the LDP and METI or government can say we have a very confrontational stance toward the utilities, and the utilities also can say we are very strongly led by, or forced by deregulation. And so, with such a structure, now the three can proceed with nuclear policy.”

-- *Government official (G12)*

“The problem that mainly exists is that the government cannot clearly support these issues in public. Because of the politics. When they talk to industry, they say we support nuclear restarts, and in the future, they support new builds, and also fuel cycle. To the industry, but they cannot say that to the public, and they are saying that to the local government, sometimes, but it depends. They are comfortable to make a policy, but implementation of the policy should be done by the industry.”

-- *Electric utility industry executive (I15)*

“...you need cooperation from industry to radically expand the role of renewables. And I think still, it is a very solid, determined position of Japanese utilities not to expand renewables. So there is every effort by them to deemphasize the importance or feasibility of renewable energy. And also they have many reasons to claim it is the utilities network that can, that should manage the new world of renewable energy. So unless the utilities industry is a kind of positive or more welcoming stance, in general, you cannot expect the new, really meaningful progress toward renewable energy.

-- *Government official (G16)*

“...after Fukushima, many people lost confidence in governmental power to create policies, and many people started to want their control back, so to speak. So we have something to say to the government, and the government should listen to us. That is a very big movement after Fukushima among people.”

Until March 11, 2011, momentum was building in Japan for a vast expansion of nuclear power and the energy system it supported. Policymakers, the electric utilities and the public appeared to agree on nuclear power as a solution to energy security and environmental risks. Then-Prime Minister Hatoyama's 2009 call for a reduction in CO₂ levels of 25 percent below 1990 levels fueled this forward momentum, supported by the ruling and opposition parties at the time, the DPJ and LDP. Transmission grid infrastructure, new plant investment, and institutional support also bolstered plans for nuclear power expansion. A broad consensus across policymakers, the electric utilities and the public supported the 2010 Strategic Energy Plan's call for nuclear expansion to 50 percent of Japan's electricity supply by 2030. A nuclear-dependent path seemed locked in.

The Fukushima Daiichi nuclear disaster that began on March 11, 2011, should have shocked Japan's energy system, as well as the policymaking processes supporting it. The disaster seems to embody the focusing event described by Kingdon, accompanied by the institutional changes depicted by historical institutionalists. March 11 has been described in the media as the final blow to public trust in the government. The disaster set in motion government efforts to disconnect the "nuclear village" of government and electric utilities through institutional changes.

And yet, four years later, no policies have concretely codified this expected policy shift away from a nuclear-based energy system. While no nuclear reactors have returned to operation, post-disaster policy revisions have shifted from a zero-nuclear goal to an

assumed eventual return to use of nuclear power as a primary baseload fuel, supported by coal and natural gas. This direction does not differ significantly from the pre-Fukushima era. Initially, policies supporting a greater role for renewable energy emerged, but the government has tempered them as time has passed.

A deeper examination of the government's relationships with the electric utilities and the public after the Fukushima disaster illuminates this puzzle.

The Fukushima Daiichi Accident

The accident at TEPCO's Fukushima Daiichi nuclear power plant received worldwide news coverage. Countless articles have described how a 15-meter high tsunami flooded the plant on March 11, 2011. The Diet's Fukushima Nuclear Accident Independent Investigation Commission report describes how the flooding "totally destroyed the emergency diesel generators, the seawater cooling pumps, the electric wiring system and the DC power supply for Units 1, 2 and 4, resulting in loss of all power."¹⁸⁸ This loss of power prevented timely cooling of the reactors, and obstructed roads prevented delivery of external water supplies and repairs to the electricity system. Attempts to cool the reactor cores using external water supplies resulted in creation of steam pressure that led to hydrogen explosions and release of airborne radiation. TEPCO also released tens of thousands of tons of radioactive seawater from the plant into the Pacific Ocean.

Although the Fukushima Daiichi accident exposed 167 plant workers to more than 100 millisieverts of radiation, no casualties occurred as a direct result of the

¹⁸⁸ Independent Commission, 2012, 12.

accident. The health impacts on the surrounding population remain inconclusive in the short-term, though concerns regarding long-term effects of radiation exposure continue. However, the accident had widespread individual, regional and national economic impacts. According to the Diet's Investigation Commission report, "[a]pproximately 150,000 people were evacuated in response to the accident. It is estimated that as much as 1,800 square kilometers of land in Fukushima Prefecture has now been contaminated by a cumulative radiation dose of 5 millisieverts or higher per year."¹⁸⁹ The accident was assigned the same ranking as the Chernobyl accident, a level 7—severe – on the INES scale.

Since the country's eastern and western power grids split between 50 and 60 hertz frequencies, the utilities in the west were able to use converters to transfer only 1 GW of power to the stricken east side. To compound this challenge of transferring power to areas in need after the events of March 11, because each electric utility's grid was developed to be self-sufficient, the network of transmission lines within each service area far exceeds the interconnections between them.¹⁹⁰

Due to the accident, all 54 of Japan's nuclear reactors were shut down by September 2013, and none have resumed operation. TEPCO permanently shuttered Fukushima Daiichi units one, two, three and four. As a result, Japanese imports of fossil fuels increased steeply, contributing to Japan's trade deficit and raising electricity prices.

The economic impact of the Fukushima nuclear accident is intertwined with that of the tsunami and earthquake that caused it. This said, an academic report estimates

¹⁸⁹ Independent Commission, 2012, 19.

¹⁹⁰ Asia Pacific Energy Research Centre, 2004.

compensation to residents and decontamination efforts alone at \$105 billion.¹⁹¹ In addition, land, agricultural, and water contamination, fossil fuel imports, and rolling blackouts precipitated by the nuclear accident have added billions of dollars in lost revenue and additional costs.

In addition to the natural and technological aspects of the accident, the human contributions to the disaster received broad coverage nationally and globally. Official assessments and media reports criticized relationships between TEPCO and government safety regulators for failing to implement and enforce effective preventive measures. The Diet's Investigation Commission report finds that "The TEPCO Fukushima Nuclear Power Plant accident was the result of collusion between the government, the regulators and TEPCO, and the lack of governance by said parties."¹⁹² The report and media coverage also condemned emergency, communications, and investigative responses by TEPCO, safety regulators and policymakers. The Diet report finds that "The government, the regulators, TEPCO management, and the Kantei [Prime Minister's Office] lacked the preparation and the mindset to efficiently operate an emergency response to an accident of this scope. None, therefore, were effective in preventing or limiting the consequential damage."¹⁹³ The report and media coverage cite these problems as the reason for further troubles with communication to and evacuation of citizens.

We would expect that an accident of this magnitude would seriously challenge

¹⁹¹ Kenichi Oshima and Masafumi Yokemoto, 2012.

¹⁹² Independent Commission, 2012, 16.

¹⁹³ Independent Commission, 2012, 18.

continuation of the nuclear-based energy system. Widespread criticism of the relationship between the Japanese government and TEPCO as a contributing factor to their poor preparation for and mismanagement of the accident should have compounded this effect.

Energy System Changes

At first glance, the energy supply changes after the Fukushima disaster appear consistent with the expected complete shift away from nuclear power. However, this transition does not include a large leap in renewable energy use. Instead, the numbers reflect a dramatic increase in natural gas, as well as a return to oil use and a slight rise in coal use. Initial policy changes reflect efforts to boost renewables, but subsequent policy revisions have curbed the transformative effects. Efficiency and conservation efforts dramatically reduced electricity demand, easing the stress on a supply compromised by the absence of nuclear power.

All 54 of Japan's nuclear reactors were shut down in 2011. However, as shown in Figure 5, nuclear power accounted for 1.5 percent of Japan's electricity supply in 2012, since two reactors operated temporarily that year. Kansai Electric Power Company (KEPCO) shut down Oi units 3 and 4 in September 2013. As of April 2015, nuclear power does not supply any of Japan's electricity, down from 26 percent of the 2010 electricity supply. To make up for this shortfall, after a relatively steady two-decade decline, oil use rose from 6.7 percent in 2010 to 17.5 percent of Japan's 2012 electricity supply. Natural gas increased from 27 percent in 2010 to a whopping 38.4 percent in 2012. By contrast, coal grew slightly from 27 percent to 29.3 percent. Hydropower

remained unchanged at 8.1 percent from 2010 to 2012. Non-hydro renewable energy rose minimally from 4.6 percent of Japan's 2010 electricity supply to 5.1 percent in 2012.¹⁹⁴

Examination of changes to institutional relationships after the disaster reflects the role of these relationships in shaping these trends. The interview data reveals an initial fracturing of the government's relationships with the electric utilities and the public, followed by a rapid return of policymaker-electric utility cooperation and a slower restoration of public trust in the government.

¹⁹⁴ Many media sources and Japanese government documents state that renewables accounted for less than two percent of Japan's electricity supply prior to the Fukushima accident. These sources also state that renewables use accounted for only two percent of Japan's electricity supply in 2012. For consistency, and because these sources do not cite the original data sources for these numbers, IEA numbers are used here for all fuel types. The IEA numbers reflect a higher percentage of non-hydro renewables for both 2010 and 2012. Biofuels, which are included in the IEA's data, may account for this difference.

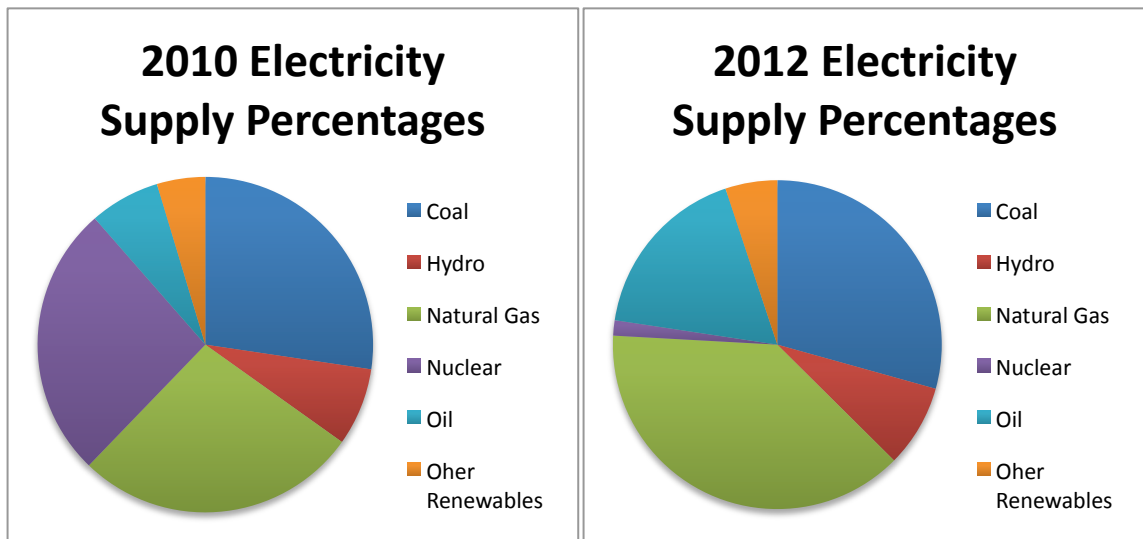
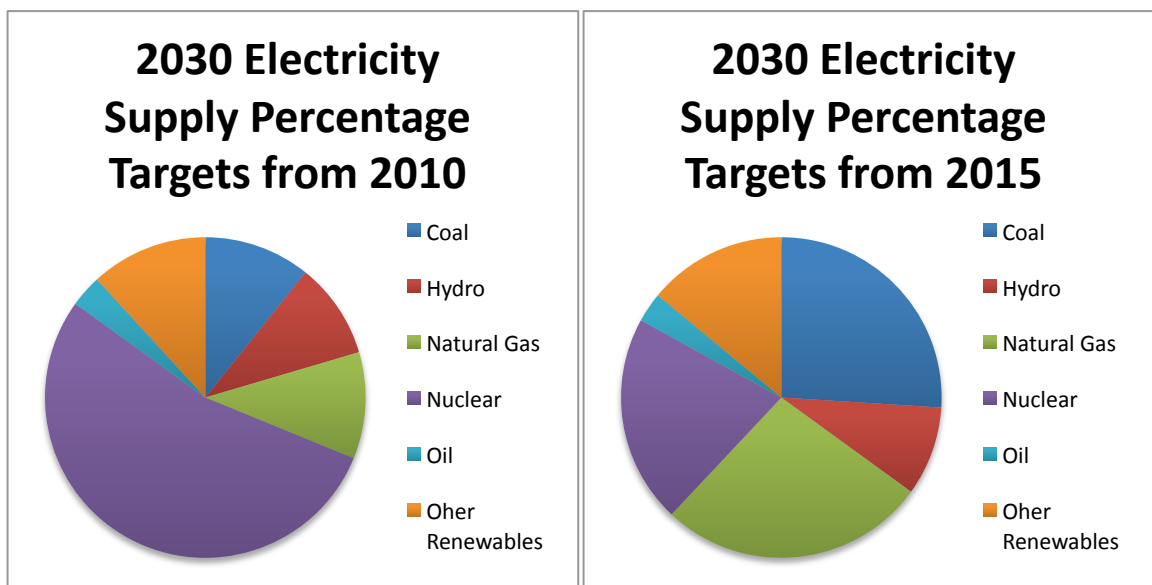


Figure 5: Comparison of Electricity Supply Fuel Percentages 2010-2012

Following the Fukushima nuclear disaster, the Japanese government declared reconsideration of the 2010 Strategic Energy Plan, including revision of the planned increase in nuclear power to 50 percent of Japan's electricity supply by 2030. A revised plan released in early 2014 notably lacked an appendix, which contained specific electricity supply source targets in previous plans. The 2014 plan's text lists all energy supply sources as important, while referencing nuclear safety concerns, fossil fuel import risks, the technical challenges associated with renewables, and the environmental problems with coal. After months of debate, METI's Fundamental Issues Subcommittee on Energy and Environment announced targets for specific fuel sources at the end of April 2015. As depicted in Figure 6, the 2030 targets announced in 2015 include 20 to 22 percent nuclear power, 3 percent oil, 27 percent natural gas, 26 percent coal, and 22 to 24 percent renewables. The plan also emphasizes a continued focus on energy

conservation and efficiency. Conservation and efficiency measures imposed after the Fukushima accident have reduced total energy consumption, compensating for the absence of nuclear power. As Figure 6 shows, the new renewables target does not differ significantly from the target announced in 2010. The nuclear target, while dramatically reduced from the 50 percent selected in 2010, still allows for a share close to pre-Fukushima levels. Coal and natural gas make up the shortfall between the pre-and post-Fukushima 2030 nuclear targets.



Source: Government of Japan.

Figure 6: 2030 Electricity Supply Percentage Targets

Nuclear nixed...or not?

Nuclear power represented 26 percent of Japan's electricity supply in 2010.

Nuclear's share dropped precipitously after the accident to two percent, and fell to zero in 2013. Unsurprisingly, all of Japan's nuclear reactors remain shut down as of April 2015.¹⁹⁵ The surprising news lies in the Japanese government's policy statements on the direction of Japan's future energy system. The 2014 Strategic Energy Plan includes contradictory statements on the future of nuclear power. One section states that "Japan will minimize its dependency on nuclear power. Needless to say, that is the starting point for rebuilding Japan's energy policy."¹⁹⁶ The report later caveats this statement by adding that nuclear energy use "will be lowered to the extent possible...taking Japan's energy constraints into consideration, from the viewpoint of stable energy supply, cost reduction, global warming and maintaining nuclear technologies and human resources."¹⁹⁷ This later section characterizes nuclear power as an "important baseload power source" to meet energy security, economic costs and efficiency and environmental goals.¹⁹⁸ The government's relationships with the public and the electric utilities can shed light on this incongruous policy language.

The formation of the Nuclear Regulatory Authority (NRA), a new regulatory agency created after the Fukushima disaster, is described in the policy process and structural change section below. The NRA's activities have impacted Japan's future

¹⁹⁵ As previously mentioned, in 2013, KEPCO shut down the two reactors that had restarted in mid-2012 after an initial shutdown following the Fukushima accident.

¹⁹⁶ Government of Japan, 2014b, 5.

¹⁹⁷ Government of Japan, 2014b, 24.

¹⁹⁸ Government of Japan, 2014b, 24.

nuclear power supply in positive and negative ways. In April 2015, the NRA approved restarts of two reactors at the Takahama nuclear power plant in Fukui prefecture, operated by Kansai Electric Power Company. However, the Fukui District Court approved an injunction filed by local residents against the restarts. The court criticized NRA standards as too lax, asserting that meeting the standards does not guarantee safety. Kagoshima residents filed a similar injunction against the restart of two NRA-approved reactor restarts at the Sendai power plant, but the district court rejected it.

Concurrently, the electric utilities have begun to respond to the NRA's new, stringent safety standards by planning to decommission older plants that would be costly to upgrade. As of April 2015, four electric utilities have announced decommissioning of five reactors in addition to the mandated decommissioning of the Fukushima Daiichi units.¹⁹⁹

The FBR program continues to face challenges associated with regulatory violations. In May 2013, the NRA ordered JAEA to suspend preparations for restarting Monju after discovery of neglected maintenance of thousands of components. In March 2015, the NRA secretariat found more evidence of neglected inspections that violate safety regulations.

Taken together, all of these changes yield an ambiguous future for nuclear power. The clearest policy signal, a government target, was announced at the end of April 2015. METI's Fundamental Issues Subcommittee on Energy and Environment proposed a

¹⁹⁹ These reactors include KEPCO's Mihama units 1 and 2, Japan Atomic Power Company's (JAPCO) Tsuruga unit 1, Kyushu's Genkai unit 1, and Chugoku's Shimane unit 1.

nuclear target of 20 to 22 percent of Japan's electricity supply by 2030. While this target is much lower than the 50 percent target announced in 2010, it falls within the range of nuclear power production provided during the 1990s and 2000s.

Oil's temporary rise

After a steep decline since the 1970s oil crises, oil use rose from 6.7 percent in 2010 to 17.5 percent of Japan's 2012 electricity supply. Oil partially replaced nuclear power after the Fukushima nuclear disaster. Looking ahead, the 2014 Strategic Energy Plan characterized oil as a "peaking power source, whose power output can respond quickly and flexibly to the situation of electricity demand in spite of high cost."²⁰⁰ The plan describes oil as politically risky, but useful as an alternative in emergencies. METI's advisory committee proposed that oil account for three percent of Japan's electricity supply by 2030.

Natural gas powers up

As expected, the shutdown of all nuclear reactors after the Fukushima disaster led to a massive natural gas increase. The percentage of natural gas in Japan's electricity supply rocketed from 27 percent in 2010 to 38.4 percent in 2012. And yet, the 2014 Strategic Energy Plan classifies natural gas not as a baseload source, but as an "intermediate power source." The plan cites the low emissions and flexibility of natural gas in responding to electricity demand, but it also cautions against overdependence due

²⁰⁰ Government of Japan, 2014b, 21.

to price fluctuations.²⁰¹ METI's advisory council proposed a return to 2010 levels with a 27 percent target by 2030.

Coal climbs

Coal use increased slightly from 27 percent in 2010 to 29.1 percent in 2012. However, the 2014 Strategic Energy Plan states that coal "it is now being re-evaluated as an important base-load power supply because it involves the lowest geopolitical risk and has the lowest price per unit of heat energy among fossil fuels."²⁰² Paving the way for this policy shift was MOE's 2013 agreement to expedite environmental impact assessments for coal plants, shortening them from three years to one year. A METI document explains that this policy shift aims to "create an environment that facilitates smooth investment by private enterprises in highly efficient thermal power generation."²⁰³ At the end of 2014, the electric utilities, gas companies, and large manufacturers announced plans for a major coal plant expansion, with 28 new plants expected to generate power by 2027.²⁰⁴ METI's advisory committee proposed a 26 percent target by 2030.

Renewables newly able...or not?

Despite media predictions and government policy changes, the Fukushima accident seems to have had little impact on growth of renewables to date. Renewable energy's share of Japan's electricity supply increased from 12.6 percent of Japan's 2010

²⁰¹ Government of Japan, 2014b, 25.

²⁰² Government of Japan, 2014b, 25.

²⁰³ Government of Japan, 2014a.

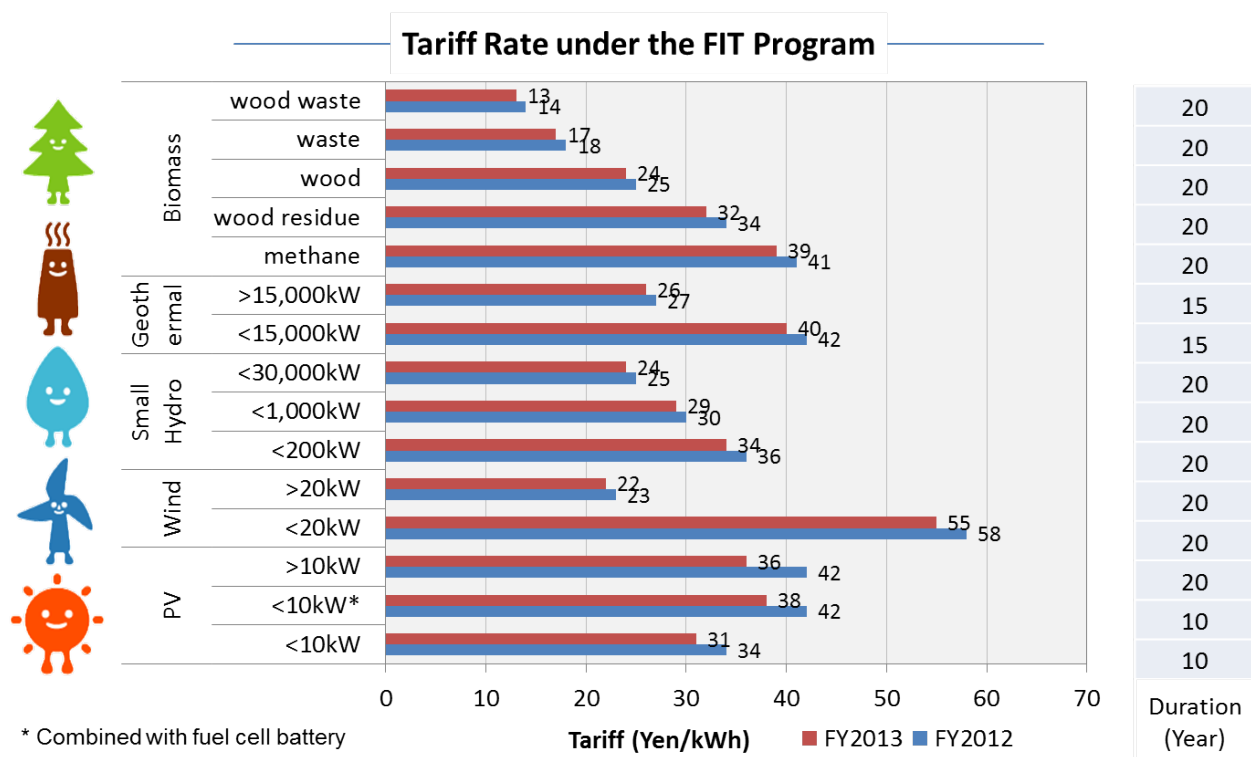
²⁰⁴ Construction plans for Japan's coal power stations. Reuters.

<http://af.reuters.com/article/energyOilNews/idAFL3N0TO23O20141211>

electricity supply to just over 13 percent in 2012. Hydropower's share did not account for any of the increase, remaining steady at 8.1 percent from 2010 to 2012. Non-hydro renewables sources increased from 4.6 percent of Japan's 2010 electricity supply to 5.1 percent in 2012.²⁰⁵

Government statements and policies after the Fukushima disaster appeared geared toward a large renewables increase to replace nuclear power. The most prominent measure was feed-in tariff (FIT) introduced in 2012. Media interviewee M1 asserted that the FIT “may not happen, if we don't have any Fukushima event. And after the Fukushima event is a huge incentive to have a FIT system.” The tariff covers solar, wind, geothermal, biomass and non-pumped hydropower. The initial rates are reflected in Figure 7.

²⁰⁵ Biofuels and waste accounted for the majority of this increase. Solar PV almost doubled, but it still accounted for on 0.67 percent by 2012.



Source: Agency for Natural Resources and Energy, Ministry of Economy, Trade and Industry.

Figure 7: 2012-13 Japanese Feed-In Tariff Rates

However, ensuing policy changes send mixed messages regarding renewables promotion. Citing excessive market entry and reduced equipment costs, the Japanese government subsequently has lowered the original 42 yen per kilowatt-hour (kWh) solar PV tariff three times. As of July 2015, the solar PV tariff for projects smaller than 10 kW will be 27 yen per kilowatt-hour (kWh). The tariff for projects larger than 10 kW will fall from 36 to 32 yen per kWh. The government also raised the tariff for woody biomass projects smaller than 2 kW from 32 to 40 yen per kWh in April 2015.

The 2014 Strategic Energy Plan also leaves an ambiguous impression regarding renewables growth goals. The plan includes geothermal and hydropower as baseload power sources, though geothermal accounted for only 0.25 percent of Japan's electricity supply in 2012. Pumped hydropower is listed as a peak power source. The plan classifies solar power, a major target of the FIT, as an "emergency power source."²⁰⁶ Wind power, the other major FIT beneficiary, is referenced in the plan, but it is not assigned a specific role in Japan's energy mix.

In April 2015, METI's advisory committee proposed a 22 to 24 percent renewables target by 2030. This target is only two to four percent higher than the 20 percent codified in the 2010 Strategic Energy Plan appendix, prior to the Fukushima disaster. Hydro would account for about nine percent, also about two percent higher than the ratio before March 11. The solar target is seven percent, biomass around four percent, wind about 1.5 percent, and geothermal around one percent.

The government's relationships with the electric utilities and the public can help to explain these unexpected, inconsistent policy signals.

Conservation and Efficiency

Reminiscent of the post-oil crises, the Japanese government implemented several conservation and efficiency measures to lower electricity consumption after the Fukushima disaster.²⁰⁷ For two weeks immediately following the disaster, the Japanese government mandated a series of rolling blackouts in TEPCO's service area. The

²⁰⁶ Government of Japan, 2014, *Strategic Energy Plan*, 22.

²⁰⁷ For a detailed overview of all energy conservation measures implemented in 2011 and 2012, see Hidemasa Nishiyama, 2013.

government also implemented an energy saving campaign (*setsuden*) to avoid planned blackouts. Beginning in 2011, METI invoked article 27 of the Electricity Business Act, which enables the government to mandate reduced electricity use to avoid blackouts. The 2011 application of the article required users of over 500 kW to restrict their electricity use by 15 percent below 2010 levels in areas serviced by TEPCO and Tohoku Electric Power during the summer months.²⁰⁸ Smaller users in these and other service areas were asked to implement voluntary energy saving protocols. Government requests for conservation by all users in all service areas in subsequent winters and summers ranged from 1.5 to 7 percent below 2010 levels.²⁰⁹ In 2013, the Diet passed the Amended Energy Conservation Act.²¹⁰ The revised act includes expanded categories for building materials, implemented in December 2013, and measures to address peak electricity demand, implemented in April 2014.²¹¹

As a result of these policies, the electric utilities have secured reserve margins of over three percent in all service areas since 2011.

²⁰⁸ The nuclear reactor accident affected TEPCO's service area, and the Tohoku service area was the epicenter of the earthquake and tsunami.

²⁰⁹ Electricity Supply-Demand Review Committee, Energy and Environment Council, Ministry of Economy, Trade and Industry, Government of Japan, 2012.

²¹⁰ Several revisions of the original law passed in 1979, addressed in chapter 5, took place during the 1990s and early 2000s. These revisions focused on manufacturing and residential efficiency improvements that would contribute to meeting Kyoto Protocol goals.

²¹¹ Building efficiency improvement measures include expansions of the Top Runner program initiated in 1998 to spur competition and innovation in energy-efficient products. The government established standards based on the most efficient products. For an evaluation of the Top Runner program, see Osamu Kimura, 2010.

Policy Process and Structural Changes

The Japanese government undertook several policy process and structural changes after the Fukushima nuclear disaster. These include changes to policymaking, economic regulation, and safety regulation.

As mentioned in previous chapters, the electric utilities had been formal members of METI's various energy policy advisory committees prior to the Fukushima nuclear disaster. After March 11, 2011, the DPJ's reorganization of the committees resulted in ousting of the electric utilities as formal members of all committees. However, they continue to attend committee meetings as observers, and they are permitted to voice their opinions, though they have no veto power. The DPJ also altered policymaking processes to empower the public, including first-time application of deliberative polling to determine Japan's nuclear power ratio by 2030. Deliberative polling is a policymaking technique in which a random, representative sample is polled on an issue. The participants then engage in a two-day discussion of the issue with experts from all sides, supported by balanced briefing materials. After the session, the participants take the same poll. The Kan Administration used the deliberative polling results to determine that nuclear power should be reduced to zero by 2030.²¹² After assuming leadership, the LDP did not utilize these processes or the previous administration's results.

The Fukushima disaster also catalyzed changes in economic regulation, as government movement on electricity market liberalization resurfaced. In 2013, the Diet passed three measures proposed by the Abe Cabinet. Included in Prime Minister Abe's third arrow of Abenomics reforms, the three liberalization pillars include coordination

²¹² For more information, see Yasunori Sone, 2012a.

between the electric utilities' nine grids; small retail and household electricity market competition; and vertical unbundling, or separation of generation, transmission and distribution. Grid coordination measures involve establishment of an Organization for Cross-regional Coordination of Transmission Operators to coordinate supply-demand balance and order generators to reinforce interconnections in supply emergencies.²¹³ The government plans to implement the first measure in 2015, the second in 2016, and the third in 2020. While the first measure appears a sensible response to the grid isolation risks exposed by the Fukushima disaster, the others may at first glance seem an unlikely result of a nuclear accident.

Finally, the Fukushima disaster precipitated a safety regulation overhaul. The Japanese government created the NRA as a new, independent nuclear safety regulator. The NRA is not affiliated with METI. Housed instead within MOE, the NRA demonstrates independence through several design features. First, the NRA's office is located in a different part of Tokyo than all other government offices. Second, legislation stipulates that staff cannot return to their home agencies after serving in the NRA. In 2014, the NRA formally merged with JNES, which had provided ancillary support to NISA.

The NRA issued new nuclear reactor safety guidelines in June 2013. These standards address perceived vulnerabilities based on the Fukushima accident, including sea wall construction, filters for radiation removal, fire protection, secondary control rooms, and fault lines. The electric utilities must implement the new standards for

²¹³ Electricity Market Reform Office, Agency for Energy and Natural Resources, Ministry of Economy, Trade and Industry, Government of Japan, 2013.

existing reactors and new construction. The new guidelines also allow a one-time 20-year extension for plants that have or surpassed reached their 40-year lifetime. After issuing the new guidelines, the NRA began reviewing applications for nuclear reactor restarts.

The motivations behind these changes emerge from shifts and stasis in the government's relationships with the electric utilities and the public.

Role of Institutional Relationships

The 2011 Fukushima nuclear accident occurred in an environment created by the electric utilities' cooperation with policymakers and conflict with regulators. Interview and secondary data reveal that these institutional relationships both contributed to the disaster and were affected by it. The data also highlights ways in which these relationship changes have affected the shock's influence on energy policymaking. In addition to influencing the government-electric utility relationship, the accident also shattered the tenuous public trust that had recovered from the previous string of accidents and scandal. As after past shocks, how the government's relationships with the electric utilities and the public impact energy policymaking also depends on the relationships' institutional features, as well as these groups' risk perceptions and priorities.

According to the interviewees, some initial process changes show signs of weakening. The government continues to debate policy changes, and structural changes also remain in flux. Table 9 captures this ambiguous effect. As time passes, if policymakers' and politicians' relationships with the electric utilities and the public remain in conflict, policy change likely will accompany Japanese policymaking process

and structural change. If policymakers' and politicians' relationships with the electric utilities return to cooperation, transformative energy policy change is unlikely to emerge. A return of electric utility clout and/or loss of public clout can also lead to this result.

Table 9: Changes to Japanese Government's Relationships and Energy Policy, Process, and Structure after the Fukushima Accident

Indep. Variable	Relationships	Mediating Variables				Change in Dependent Variable	
		Change in Cooperation/Conflict		Change in Clout		Policy	Policy Process/Structure
Shock		Before Crises	After Crises	Before Crises	After Crises		
	Bureaucrats-Utilities	Some cooperation	No change	Bur. < Util.	Bur. > Util.	Yes: But questionable long-term impact	Yes: safety, regulator and market structure change, but questionable long-term impact
	Politicians-Utilities	Cooperation	Some conflict	Pol. < Util.	Pol. > Util.		
	Economic Regulators-Utilities	Conflict	No change	Reg. = Util.	Reg. > Util.		
	Safety Regulators-Utilities	Conflict	No change	Reg. = Util.	Reg. > Util.		
	Government-Public	Some cooperation	Some conflict	Gov. > Public	No change		

* The highlighted relationships' change or stasis most strongly influence whether changes to policy and/or the policy process and structure occur.

Fukushima, Institutions, and Risk Perceptions and Priorities: Impact on Relationships

In previous periods, shocks competed or combined with institutional features and risk perceptions to affect the government's relationships with the electric utilities and the public. Like the oil shocks, the Fukushima disaster has dramatically altered risk perceptions. However, neither the oil crises nor the 1990s and 2000s accidents and scandal significantly changed existing relationships or institutional features. In contrast to these previous shocks, the Fukushima disaster initially altered the nature of existing relationships and institutional arrangements.

Examination of the government's relationships with the electric utilities and the public after the Fukushima disaster reveals that these striking relationship changes have begun to reverse, and these relationships are slowly reverting to their previous state over time. This trend particularly applies to policymakers' relationships with the electric utilities and the public. Regulators' relationships with the electric utilities have changed in some ways after the disaster and remain the same in others. Table 9 reflects these trends.

Shock impact

The small body of existing literature on the Fukushima disaster's impact on relationships largely asserts that policymakers' relationships with the electric utilities have not changed. The electric utilities' ties to the LDP and METI remain strong, and the

utilities still wield considerable clout behind closed doors.²¹⁴ Few, if any, scholars posit that the Fukushima disaster collapsed cooperation and extinguished electric utility clout.

The interview data reveals a reality that falls in between, and one that is changing as time passes, a trend consistent with both the external shocks and institutionalist scholars' views. Many government and electric utility interviewees asserted that the Fukushima disaster forced change in the electric utilities' cooperative relationships with METI bureaucrats and politicians, along with a loss of electric utility clout. Other interviewees confided that they believe the relationship has not changed much since March 11. A third group suggested that the disaster initially injected conflict into the relationship, but as time has passed, and the LDP has resumed political leadership, cooperation is returning, along with a subtle increase in electric utility clout. Policy and process evidence substantiates this last view. In particular, interviewees identifying the return of cooperation cited its reflection in 2014-15 policies supporting a significant role for nuclear power, as well as METI's resumption of advisory council leadership.

A number of government and electric utility interviewees indicated a dramatic change in the policymaker-electric utility relationship. Comparing cooperation prior to the Fukushima disaster to the situation since March 11, they highlighted distancing of the two groups and loss of electric utility clout over policymakers and energy policy decisions. I7 asserted that there is "currently almost no relationship between the government and electric power companies." I7 offered institutional changes as examples, citing the utilities' inability to offer opinions to the NRA regarding reactor restarts. He

²¹⁴ For example, see Andrew DeWit, Tetsunari Iida, and Masaru Kaneko, 2012, or Jeff Kingston, 2012.

also emphasized the utilities' removal from METI's energy advisory committees, while noting that "under the LDP administration, electric power companies have the opportunity to say their opinions at the government committees." Another electric utility interviewee, I10, clarified that "we can consult with METI, but now they never say confidential information to us. Now we can talk with METI, but not so much as before Fukushima." 15 stated a similar view of distance between the electric utilities and policymakers, noting intensification of the conflict over responsibility for the nuclear fuel cycle.

Some interviewees who say the relationship has changed attribute it to public awareness and distrust of the close relationship revealed by the Fukushima accident. The bureaucracy and politicians are responding to public criticism of the electric utilities and their relationship with the government. G12 explained that

after the earthquake, I think things changed very drastically...every politician had to change their attitude toward electricity companies. So I think, still, many politicians and government, especially under the LDP, people want to keep the nuclear policy, while, as for the market reform, somehow they have to push market reform to show the people that they are doing something against the will of the electricity companies. So I think after the earthquake, of course the political strength, the political influence of the electricity companies very drastically dropped, and at the same time, the politicians' attitude toward the electricity companies changed.

Interviewees like G12 assert that the electric utilities have lost clout over policymakers because public clout has risen, forcing the government to demonstrate at least the appearance of a rift. Some government interviewees suggested that the public's loss of confidence in the electric utilities has forced the politicians to criticize them. This criticism has relatively strengthened policymakers' clout over the utilities. G18 described

this scenario specifically for TEPCO: “the electricity industry, TEPCO lost public confidence, and politicians have to criticize TEPCO. So the power balance for METI changed. Both lost to some extent confidence from the public, but the degree lost is more for TEPCO. The government has a better position compared to electric utilities.”

The Fukushima disaster weakened the electric utilities’ collective bargaining power with the government in several other ways. Some electric utility interviewees cited the loss of TEPCO’s leadership as the reason for the utilities’ diminished access to and leverage over METI. After 3/11, the government partially nationalized TEPCO, formerly Japan’s most influential electric utility. KEPCO’s ascension to the leadership role in FEPC compounded this problem, since KEPCO lacks TEPCO’s government connections and diplomacy skills, according to several interviewees. I1 summarized the problems facing the electric utilities: “the question is now raised if Kansai can be a leader of the ten utilities or not, where the interests, the stakes are so different from company to company...currently Kansai is the leader of the electricity industry, and historically, they do not have good access to METI. And historically they are not accustomed to being a leader. And also they are in a very unique position to have a priority on nuclear power.” I1 predicted that “if the utilities are not in agreement, they do not present some unified request.” These challenges may signal the end of the electric utilities’ unified front on nuclear power promotion and the future of Japanese energy policy, according to I1 and other electric utility interviewees. This downturn in electric utility clout, if long-term, could open the door for energy system change.

Several government and electric utility interviewees indicated little to no change

in the relationship between policymakers and the electric utilities after the Fukushima disaster. G4 said, “I’m still not sure the strong political influence of utilities, close relationship with the government and the politicians, will change fundamentally. It’s not clear to me.” G7 explained that while the relationship may seem to have changed on the surface, in reality, policy and regulatory discussions between the two groups have continued after the Fukushima disaster.

If a watcher like you really closely watches the relationship between the energy sector or utility sector and us, you can argue there is completely no change...What we do is not really different, just having a conversation with utility people here, how do you think about the regulation, how do you think about the promotion side? We keep on such kind of discussions...Of course, we listen to what they say. There is completely no change.

Another government interviewee, G16, offered the long-term, deep connections between these groups one reason behind this stasis. “I think in terms of the relationship between industry and METI, industry has a lot of roots, informal roots, to influence decision-making, even if they don't participate in the [advisory committees]. And they have very good access to politicians. And that is especially the case for LDP compared to DPJ.” While the electric utility interviewees did not explicitly say that the utilities currently have a close relationship with policymakers, their comments suggested the continuation of cooperation. For example, I10 stated that “METI is helpful, basically helpful...always we have good consultations with METI, especially in the nuclear field.”

Some interviewees say the relationship is changing, but true delinking cannot happen suddenly after decades of close cooperation, even after a shock like the Fukushima accident. Others say the relationship is slowly reverting back to electric

utility cooperation with and clout over government. While I7 did not say this explicitly, he predicted that the LDP might reinstate the electric utilities as committee members, at least in the committee discussing market liberalization, “because without any opinions from electric power companies, the conclusions might be very unrealistic.” G6 described the shift after the LDP returned to power in 2012 as follows: “At least after the earthquake, these almost two years, METI people had distance from the power companies. But I’m not sure if it’s a temporary situation. After changing the government, I’m afraid the relationship between METI and the power companies is getting back to what it was before the earthquake. I’m not sure, but it might happen.”

While the electric utilities’ clout over the central government has waned, influence at the local level continues. G16 described the utilities as “so much kind of penetrated in the local government, and they are kind of champions of especially the more regional areas.” The local governments in these remote areas tend to trust the electric utilities’ views on energy supply decisions, affecting energy system change.

As highlighted in previous chapters, even the electric utilities’ relationship with METI is not monolithic. Even before the Fukushima disaster, some offices within METI, including those focused on regulatory reform or renewables introduction, had contentious interactions with the electric utilities, while METI’s nuclear policy office maintained a strong relationship. Government and electric utility interviewees’ comments regarding the various METI offices suggest that the Fukushima disaster further diversified METI’s relationship with the electric utilities, as METI created new offices specifically to address the disaster and renewables promotion. The disaster also initially shifted clout from

utility supporters within METI to factions interested in diminishing electric utility clout in energy policymaking.

Institutional Influences

Table 10: Institutional Features' Impact on Policymaker-Utility Cooperation and Clout

Institutional Feature	Change	Cooperation Impact	Clout Impact
Government legitimization of utilities' nuclear power plans	Utilities want more; government does less	Less cooperation	Both weakened
Political donations	Less donations	Less cooperation	Utilities weakened
Advisory councils	Utilities officially removed	Less cooperation?	Utilities weakened?
Public input processes	More opportunities under DPJ; LDP removed them	Trust increase under DPJ, lowered under LDP	Public strengthened, then weakened
Nuclear safety regulatory structure	Moved out of METI	More cooperation	Both strengthened

Government and electric utility interviewees' comments suggest that the Fukushima disaster has altered some institutional features in ways that have compromised cooperation and clout in the electric utilities' relationship with energy policymakers (Table 10). However, some of these changes have begun to reverse, suggesting that shifts in cooperation and clout may do the same. Other institutional changes have fostered continued cooperation. Informal institutions include government legitimization of utilities' nuclear power plans and political donations. Formal institutions include advisory councils, processes for public input, and the nuclear safety regulatory structure.

As mentioned in the previous chapter, the electric utilities historically used the government to garner public trust in their nuclear power expansion activities. After the Fukushima disaster, said government and electric utility interviewees, they have sought even more government approval. G11 explained that the electric utilities “use the government to get the trust from the public. They are doing that, I think, more since the earthquake, since they lost public trust.” Since the government has felt public pressure to maintain distance from the utilities, few clear statements of government support for the utilities have emerged. This ambiguity has led to conflict and a struggle for clout between policymakers and the electric utilities.

The Fukushima disaster also has challenged the electric utilities’ ability to continue large political donations to both the LDP and the DPJ. With their nuclear reactors shut down, the electric utilities have no profits to allocate for this relationship-building. Electric utility and government interviewees said that without these donations, electric utility clout over these politicians has waned, as has cooperation. As electric utility industry interviewee I7 explained, “now, electric power companies have much financial difficulties, so for politicians, it’s not so interesting to have a very close relationship with the industry. And also in this sense, politicians and electric power companies don’t have such a close relationship currently and also perhaps in the future.” Thus, newly elected politicians, even in the LDP, have felt less obligated to pressure METI or otherwise support the electric utilities’ interest in continuing nuclear power and stopping market liberalization. Diet member Kono observed that “there are more LDP politicians who just don’t listen to power companies now. They have a more independent

view.” However, he said that these politicians represent a minority when compared to pro-utility politicians. He also predicted that the electric utilities would find ways to build relationships with these new politicians in order to gain support for nuclear power and stall market liberalization.

After the Fukushima accident, the DPJ government changed several policymaking institutions that aimed at shifting clout away from the electric utilities and severing cooperation with them to rebuild public trust in government policymaking. First, they cut METI out of the energy policymaking process, forming the Cabinet-level Energy and Environment Committee to handle decision-making on Japan’s energy mix. The Kan Administration also revamped the energy policy advisory committee, renamed the Fundamental Energy Issues Subcommittee, and ousted the electric utilities from it. I7 said that the electric utilities “had a big influence on the decision of the committee, now the public believes, so therefore the government [removed them].” The new committee also included anti-nuclear members. These changes caused both the electric utilities and their METI supporters to lose clout.²¹⁵

However, when the LDP’s Abe Administration assumed power in 2012, government and electric utility interviewees largely perceived a return to pre-Fukushima relationships between policymakers and the electric utilities, as well as a reversion to pre-

²¹⁵ As mentioned previously, the DPJ had distanced itself from the bureaucracy, and this move crippled the government’s ability to address the accident in a coordinated manner. Subsequent changes undertaken by the DPJ preserved this separation of politicians from bureaucrats, including formation of a committee that superseded METI’s authority. G4 explained that the DPJ “set up a so-called Energy and Environment Council above METI and MOE. So they wanted to take political leadership in making energy policy decisions. And they did not want to let METI or bureaucrats or Atomic Energy Commission bureaucrats make a decision. They wanted to make a decision by themselves.”

3/11 institutions. Prime Minister Abe appointed former METI nuclear renaissance architect Yanase, introduced in the previous chapter, as his administrative aide. METI assumed advisory committee leadership again, and the electric utilities were granted observer status at committee meetings. Most of the anti-nuclear members were ousted, including NGO leader Iida. Government and electric utility interviewees' views on the actual clout of the utilities in the advisory committees is mixed. Some say that the electric utilities still play an influential role in the committees, voicing their opinions freely. Others argue that the utilities have no veto power and are only able to express their opinions publicly in committee meetings, limiting their ability to voice their true opinions. The electric utilities and METI pro-utility supporters regained some clout.

While removal of the safety regulatory function from METI has negatively affected the utilities' clout over safety regulators, this change has enabled less conflict and greater cooperation between METI and the electric utilities. METI no longer has to balance nuclear promotion with regulatory responsibilities, so the agency is free to openly support nuclear power promotion. G12 captured this new freedom as follows:

As for nuclear, we can stand on the industry's side or nuclear promotion side more freely. You know, when we have the regulatory authority, we had to somehow...we had to contain ourselves, because we are regulators. But now that we are not regulators, we somehow freely can say things from the viewpoint of the energy policy.

This change contributes to preservation of the incumbent system, since it enables policymakers and electric utilities to continue to work together. At the same time, the NRA's move increased MOE's clout over the electric utilities, while deepening conflict. G2 asserted that "the responsibility for nuclear oversight was foisted on MOE, so there is

a lot of resentment and anti-nuclear sentiment.” In addition, the electric utilities turned to coal use to replace nuclear power, seeking MOE’s agreement to expedite environmental impact assessments for coal plants. This request added tension to the relationship, since it conflicts with MOE’s climate change mitigation mission.

All of these institutional changes have a mixed effect on policymaker-electric utility cooperation and clout, resulting in tension. Challenges to cooperation on previously mutual priorities add to this tension.

Risk perceptions and priorities

Table 11: Influence of Fukushima Disaster on Risks/Priorities and Cooperation

Risk or Priority	Fukushima Influence	Influence on Cooperation	Details
Energy security	Negative	Challenge	Fossil fuel conflict
Economic growth	Negative	Challenge	Renewables conflict
Environment	Negative	Challenge	Coal conflict
Safety	Negative	Challenge	Nuclear conflict

Existing literature widely covers the Japanese government’s focus on the 3Es as energy policy priorities that have guided development of Japan’s energy system.²¹⁶ The literature and interviewees generally agree that until the Fukushima disaster, policymakers and the electric utilities broadly framed energy system risk as energy security risk, and later added environmental risk. Policymakers and the electric utilities did not focus on safety risks.

²¹⁶ For example, see Valentine and Sovacool, 2011.

The Fukushima disaster forced addition of safety risk to the government's priority list, according to most government and electric utility interviewees, as well as scholarly analyses.²¹⁷ This prioritization of nuclear safety risks challenged continuation of policymakers' and electric utilities' shared energy policy priorities, because nuclear power had enabled their alignment (Table 11). In the absence of nuclear power, policymakers have been forced to seek alternative solutions to the 3Es. Each alternative has raised conflict between policymakers and the electric utilities. Fossil fuel imports worry policymakers due to geopolitical risks affecting energy security. The electric utilities oppose renewables for economic reasons. Policymakers prefer other options over coal for environmental reasons.

Of the 3E's, the electric utilities indicated that their priority has become economic survival, which requires continued operation of existing nuclear power plants. The emergence of safety risk has not eliminated METI's and the electric utilities' prioritization of nuclear power expansion, but public opposition continues to challenge open admission of this priority.

Economic Regulators and Electric Utilities

Shock Impact

Government and electric utility interviewees generally agreed that the Fukushima disaster empowered economic regulators and weakened the electric utilities' clout. While little literature analyzes this relationship in depth after 3/11, resurrection of

²¹⁷ For example, see Vlado Vivoda, 2012.

electricity market liberalization after the disaster is cited as evidence of relatively weakened utility influence.

Interviewees also suggested that this movement on regulatory reform after the disaster revived conflict between the two groups. However, some government interviewees indicated that this time, loss of clout has forced the electric utilities to seek compromise rather than elimination of liberalization. At the same time, the shock's revelation of the opaqueness of policymaking has driven METI's Office of Electricity and Gas Market Reform to share more information with the electric utilities than in the past. I19 noted that the officials in charge of market liberalization "tried to do everything openly. So when you visit the website of METI, all the information is listed. I'm very surprised."

Institutional Features

Outsiders have criticized the housing of METI's economic regulator inside ANRE, positing that an independent regulator is needed to ensure fair competition and grid access. While METI's market liberalization legislation includes creation of a regulator outside of ANRE by 2020, G16 noted, "I think in terms of economic regulation, there has not been great change. The regulator is inside METI and still doesn't have kind of independent support even now." This view suggests that the economic regulators may still not have enough clout to choose a market structure design opposed by the electric utilities.

Priorities and Risk Perceptions

Some government interviewees asserted that the electric utilities consider preservation of nuclear power their top priority, so they are willing to compromise on market liberalization. Meanwhile, METI's economic regulators consider full competition and unbundling higher priorities than before 3/11.

Prior to the Fukushima disaster, the electric utilities were able to frame risks and uncertainty of market liberalization as a threat to economic and energy security. After the Fukushima disaster, Japan is already in an unstable economic and energy security situation. The electric utilities claim that market liberalization will worsen these risks by discouraging investment in infrastructure and introducing electricity supply instability.

I21 predicted that

after the deregulation starts, there is no guarantee for the utilities to collect investment to their facilities, especially for the generation assets. So far, utilities can invest in nuclear and fossil power plants under regulation, because they can collect investments from the electricity fee from the customers, but after deregulation, they cannot. As a result, nobody will be able to invest in huge investment like nuclear or big fossil power plants. So that would cause a shortage of electric supply.

In contrast, METI's reformers have defined liberalization as a solution to these risks.

They assert that competition will promote economic gain through efficiency and lower electricity prices, as well as local employment. G10 explained that "pressure from [manufacturing] companies to reduce the cost of energy was one motivation to pursue deregulation." G10 also noted that renewables "are one big tool to promote [the local] economy" by providing new job opportunities. Existing analyses of electricity market liberalization are split on whether full deregulation and unbundling help or harm an

economy.²¹⁸

METI reformers also assert that liberalization will foster energy security by diversifying suppliers. Existing literature on this topic presents mixed views that suggest that reform and market design determine whether liberalization bolsters or compromises energy security.²¹⁹ Diet member Kono dismissed the electric utilities' portrayal of liberalization as a threat to energy security as "total nonsense."

The divergence between electric utilities' and economic regulators' opinions on the economic and energy security risks of market liberalization reflects conflict between the two groups.

Safety Regulators and Electric Utilities

Shock Impact and Institutional Features

The Fukushima disaster dramatically altered the dynamic between the electric utilities and nuclear safety regulators by granting the regulatory agency independence from METI. A number of scholarly works and the Diet Investigation Commission recommended this shift.²²⁰ Creation of the NRA as an independent regulatory body has freed the agency from policymakers' pressure to accommodate electric utility interests. G13 asserted that "when we had NISA, that belonged to METI, and METI is the policymaker. And so policymaker METI can control, to some extent, NISA's ideas. Used to control, used to be able to control. But now, they cannot do it." In addition, G9

²¹⁸ For a balanced view, see Michael Pollitt, 2012.

²¹⁹ For more background, see Edgard Gnansounou, 2010.

²²⁰ See, for example, Masahiko Aoki and Geoffrey Rothwell, 2013.

also described how the NRA has more clout over the electric utilities than NISA did, because the electric utilities are now required to respond to all of the NRA's requests for information in order to continue operations:

Before, if we have some doubt or questions we could not ask [the utilities] to stop, but now, the NRA can ask them to stop if they cannot answer every question. [The utilities] could ask us to show them all the data, the reason why you have some doubt. They could ask us to explain all your doubts. But now it changed, and we can ask them all the questions.

These changes have resolved the former clout battle in favor of the regulator. G9 explained that this new clout is coupled with continued conflict. Many of the NRA staff are former NISA officials who are happy to be free of utility and METI influence. "My feeling is that two-thirds or three-fourths of NRA officials hate utility people and they do not trust them at all. Before also." However, the LDP may alter the composition of the NRA, perhaps making it friendlier to the electric utilities. G17 said that ANRE officials told him that "some of the members of the current NRA are selected under the DPJ, so at that time they were free from public utility companies, but after four or five years from now, they will change under the LDP. At that time, the situation will be changed dramatically."

The no return rule for NRA staff aims to enhance the NRA's independence by breaking the personnel rotation tradition. However, it has a mixed effect on the NRA's ability to function as an effective, independent regulator. On one hand, G17 indicated that NRA staff do not fear retribution for their decisions, since they cannot return to METI. But the no return rule hinders staffing, because bureaucrats who want to return to their home agencies refuse to transfer to the NRA, shrinking the pool of knowledgeable

regulators. Compounding NRA's staffing problems, nuclear power opponents accuse potential NRA candidates with a background in nuclear power of ties to the "nuclear village," arguing that they will bias regulations in favor of the electric utilities. This staffing problem has contributed to continuation of some aspects of the previous tension between NISA and the utilities, indicated government and electric utility interviewees. The electric utilities have criticized the NRA's lack of nuclear reactor knowledge, a view also expressed by Diet member Kono. I20 asserted that "one big problem is that NRA commissioner and staff have little experience with [nuclear reactor] operation. It is a big problem." JNES merged with the NRA to address this problem by boosting the NRA's staffing and expertise. This change has reduced conflict between the NRA and the electric utilities, which trust JNES' knowledge. At the same time, skeptics argue that JNES has strong ties to the electric utilities. And yet, the utilities have continued to criticize the NRA, which weakens the regulator's credibility, say some government interviewees. "We established the NRA as an independent body, but still it seems to me that the utilities try to blame the NRA. I advised them not to do it," said G9.

Electric utility and government interviewees also accused the NRA of taking independence too far, resulting in isolation from the electric utilities and the rest of the government. As an example, I10 described the lack of discussion on inspection of the Rokkasho reprocessing plant: "we cannot contact with them. Also, they feel they cannot contact with us. Once they contact with us, they must make public what kind of discussion if more than five minutes. If they talk with utility people, they must make public the minutes on their website." To demonstrate transparency, all meetings between

NRA officials and anyone outside the NRA must be recorded and made publicly available if longer than five minutes. This measure has further widened the distance between the NRA and the electric utilities, as well as METI officials and politicians. It also has increased NRA clout. Interviewees say that none of these groups are able to pressure the NRA, for fear that the public will learn about it. G9 explained that “now the utilities are asking politicians, members of the LDP to give political pressure on the NRA. But once politicians make some action to the NRA, they make a record, so politicians cannot call NRA to ask for change.”

The NRA’s isolation, electric utility interviewees assert, could again lead to unrealistic regulations if the NRA is uninformed by any electric utility perspectives. I22 offered the example of a new regulation requiring all cables in the reactors to be fire resistant. “There is a lot of cable, long, long cables that extend more than five hundred, six hundred miles in total. And the new regulation requires that the cable should be non-flammable, fire-resistant. So the newer plants are using those non-flammable cables, but old plants don’t. And it’s almost impossible [to replace them], because those cables are going everywhere inside the plant.” The utilities are expected to provide data for the NRA to use in crafting regulations, but electric utility interviewees asserted that NRA staff did not communicate at all with utility engineers for the first year or so, after an NRA commissioner was publicly condemned for meeting with electric utility executives shortly after creation of the new agency.²²¹

²²¹ Even the dissertation author was unable to meet with anyone from the NRA after the media criticized the NRA for meeting with the utilities. The NRA official who had arranged a meeting before the scandal later sent a message stating that “due to some

Discussions between the NRA and the electric utilities on the regulations began after the NRA had formulated and released them. Now, the electric utilities can meet with the NRA, but only publicly. I10 explained the electric utilities' angst over this constraint: "So, we are in difficulty. So, we are very frustrated that this is our situation with the NRA." The transparency rule has made candid discussions difficult, since the electric utilities do not want to be publicly perceived as saying that they cannot comply with the regulations, or implying that their facilities are unsafe. A few electric utility interviewees supported the concept of more open interactions with regulators, but they emphasized that transparency should include regular exchanges to allow development of viable regulations.

The electric utilities' questioning of regulators' qualifications and the concern over potentially unrealistic guidelines echo a setting that contributed to the Fukushima disaster and other accidents and scandals in the past. The electric utilities did not respect the regulators, and they believed they could not comply with overly severe regulations, so they did not report non-compliance.

Some government and electric utility interviewees offered evidence that this isolation argument is aimed at enabling METI and the electric utilities to regain clout over the safety regulator. They say that METI has been trying to find a way to reassert influence on nuclear regulation. I1 said that the former NISA officials in the NRA "didn't want to listen to METI at all. So even METI officials do not have a meeting with METI officials. Because of that, METI didn't like NRA. So they wanted to establish a

recent changes in my workload, I find that I am unable to meet with you in the foreseeable future."

NISA-like organization within METI with the support from the utilities. So that is what I heard.” I1c confided that “They may say this is an agenda of energy policy, but the reality is that they just lost the power for regulating nuclear power.”

At the same time, the electric utilities face an internal challenge to rebuilding clout. The disaster and ensuing challenge to the return of nuclear power in Japan’s energy mix revealed a split in the utilities’ priorities that has divided and weakened their negotiating power with the NRA. KEPCO, as well as Kyushu and Shikoku, have more nuclear facilities than the other electric utilities. As the electric utility with the largest share of nuclear power, KEPCO has the largest stake in nuclear reactor restarts. The utilities don’t even agree on priorities within nuclear power. Since KEPCO’s reactors are all PWRs, the utility has promoted restarts of this reactor type over BWRs. I18 complained that “Kansai Electric would like to say our nuclear is always safe because we only have PWRs. Fukushima Daiichi is a BWR, and we don’t have any concern such as Fukushima. Any utilities who have a BWR complain about Kansai Electric’s stance.” This tactic has pitted KEPCO against TEPCO and the other three utilities on Japan’s eastern side, all of which have only BWRs. I19 explained that, as a result, “it’s very difficult to coordinate. Each company has to survive. So if we cooperate with each other, some company has to give up some request, but it’s very difficult.”

Overall, the conflict between the nuclear safety regulator and the electric utilities has continued from the previous era, but the increase in regulator clout has emerged in part as a remedy for public distrust in the government after the Fukushima disaster. The utilities’ efforts to discredit the NRA have deepened this distrust.

Risk Perceptions and Priorities

The NRA and the electric utilities disagree on several aspects of nuclear reactor safety risk. In November 2014, Japan Atomic Power Company (JAPC) criticized the NRA's determination that a fault line under Tsuruga units 1 and 2 remains active. JAPC is jointly owned by six of the electric utilities. The debate reveals conflict between the NRA and the electric utilities over seismic risk.

The electric utilities also think the stringency of NRA's new reactor design regulations is introducing economic risk. I22 raised the fire-resistant cable issue as an example. The electric utilities are negotiating for the ability to coat the existing cables with non-flammable paint, rather than replacing them. If the NRA does not approve this more cost-effective option, the electric utilities may opt to decommission these older plants.

The one area of cooperation between the NRA and the electric utilities is the joint prioritization of nuclear reactor restarts. While they hold opposite views, both groups are focused on the steps necessary to determine eligibility for the restarts. However, as mentioned previously, friction between the groups has contributed to public distrust, impairing the NRA's ability to build public confidence that will enable reactor restarts.

Government and Public

While conducting the research for this project, the dissertation author sat at her dining room table in Tokyo with the mother of one of her daughter's friends. The mother explained that she had taken her daughter to Fukuoka for two years after the Fukushima accident. When asked why, she responded, "Because of the radiation exposure. We were told that it would be safer to leave Tokyo." The author asked her who had given this

guidance. The government? “Of course not,” she scoffed. “The government would never tell us something like that.” Then who? She retorted, “I read it on the Internet.” This anecdote, which reflects the sentiments and actions of many Japanese citizens, reveals the ongoing lack of public trust in the government following the Fukushima nuclear disaster.

Shock Effect

All government and public representative interviewees agreed that the Fukushima disaster shattered public trust in the government’s ability to manage not only nuclear power, but the energy policymaking process and crafting of energy policies in the public’s best interest. Existing literature on public opinion after the Fukushima disaster supports this view and maintains that trust has not yet returned several years later.²²²

Poll data (Table 12) before and after the Fukushima disaster reflects two trends seen in previous eras after energy system shocks. First, the disaster did not have a discernible impact on the public support rate for the Kan government immediately after it occurred. Prime Minister Kan suffered from a low support rate at the time of the Fukushima disaster, and it actually rose slightly immediately after the accident, but support dropped over time until he left office in October 2012.²²³ A political party support poll conducted by Asahi Newspaper two months after the accident reveals more than polls on support rates for the political leadership. In May 2011, 19 percent of respondents supported the DPJ, 19 percent supported the LDP, and 55 percent of

²²² For example, see Daniel Aldrich, 2013a.

²²³ Public support for the Noda administration plummeted due to scandals unrelated to energy.

respondents supported no party.²²⁴ These results reveal a lack of trust in government overall. The results of the deliberative polling conducted in August 2012 revealed a similarly high level of public distrust in the government. The report on Japan's deliberative polling found that "participants came in with extremely low levels of trust for all the information sources available to them. On first contact only 6.4% trusted information from the government."²²⁵ The only group the public trusted less was the electric power industry. Increasing participants' knowledge did not improve trust in the government. The report concluded that "these levels of distrust are remarkable and speak to the traumatic nature of the disaster."²²⁶

When the LDP regained power in 2012, the public had high hopes for Abenomics. However, over time, public trust in the new government waned, and Abe's support rate declined. Some analyses indicate that the LDP's win in 2012 did not indicate a referendum for Abe's energy policies or a return of nuclear power.²²⁷ Concurrent poll data on support for nuclear reactor restarts corroborates this view. For example, a January 2014 poll by Fuji Television found that 52 percent of 1,000 respondents said they support the Abe cabinet, but 60 percent of them said they oppose restarting any of Japan's nuclear reactors.²²⁸

²²⁴ <http://mansfieldfdn.org/program/research-education-and-communication/asian-opinion-poll-database/asahi-shimbun-regular-public-opinion-poll-released-june-5-2011/>.

²²⁵ Yasunori Sone, 2012a, 4.

²²⁶ Yasunori Sone, 2012a, 5.

²²⁷ In fact, voter turnout was extremely low, and some interviewees suggested that the vote was more anti-DPJ than pro-LDP.

²²⁸ Iwata, Mari, 2014.

Table 12: Public Opinion of Japanese Leadership after the Fukushima Disaster

Month/Year	Cabinet	Support Rate (%)	Opposition Rate (%)
6/2010	Kan	60	20
1/2011	Kan	20	67
4/2011	Kan	21	60
10/2012	Noda	18	59
12/2012	Abe	59	24
2/2013	Abe	62	17
6/2014	Abe	43	33
1/2015	Abe	42	37

Source: *Asahi Shimbun* public opinion polls, 2010-2015.

Media and NGO interviewees asserted that public trust in the government has remained relatively low since the Fukushima disaster. M1 asserted, “After the Fukushima event, the impact was huge. They lost their credibility. I don't think they regained, no, still, I think their credibility is together with politicians and bureaucrats, very low.” M2 suggested that public trust might return slowly over time. “Of course, people less trust the bureaucrats after Fukushima than before, but you know, I would say again that Japanese people are very forgetful. So I don't know if distrust will continue for a long time or not.”

Interviewees also asserted that the Fukushima disaster encouraged the public to seek more clout in the policymaking process. P2 described this shift: “after Fukushima,

many people lost confidence in governmental power to create policies, and many people started to want their control back, so to speak. So we have something to say to the government, and the government should listen to us. That is a very big movement after Fukushima among people.” G7 suggested that this decline in public trust led to an increase in public clout. He indicated that before the Fukushima disaster, “the government had the guts to say no to the public, but I think that public trust in the Japanese government is kind of eroded, so the Japanese government is listening more to the public opinion.” The DPJ’s goal of rebuilding public trust led the government to respond to the public’s demand by creating opportunities for increased public involvement in energy policymaking.

Institutional Features

Changes in several institutional features have influenced cooperation and clout in the Japanese government's relationships after the Fukushima disaster (Table 13).

Table 13: Post 3/11 Institutional Features' Influence on Cooperation and Clout

Institutional Feature	Change	Cooperation Impact	Clout Impact
Paternalistic relationship	Public more independent	Public distrust	Public wins, then loses
Demonstrations	Huge participation	DPJ responded, LDP has not	None
Public input processes	More opportunities under DPJ; LDP removed them	Trust increase under DPJ, lowered under LDP	Public wins, then loses
NRA creation	New regulator	Trust building	None
Market liberalization	Competition	Trust building	None
Subsidies	Localities rejecting	Reveals public distrust	Public wins

The public's loss of trust in the government after the Fukushima accident is linked to the paternalistic relationship mentioned in previous chapters. The public perception that the government was both partly responsible for and unresponsive to the accident led to distrust in government policies and the policymaking process after the shock. P2 summarized the shift in the public's view of the roles of public and government in energy policymaking. "An increasing number of people are now believing that they have to voice their opinions, they have to think and make choices by themselves, while in the past, they just let the government decide. But now people believe that we have to get involved in the policymaking for energy, because energy is so important for our lives, as well."

As a result of this new distrust, the public sought greater clout in energy policymaking, as well as transparency of the energy policymaking process. Citizens utilized an informal institution to voice distrust in the government and its energy policies. Huge demonstrations of over 20,000 people took place outside of government buildings frequently in the year after the disaster, shrinking in volume and frequency since then. Interviewees say that these demonstrations have had little direct influence on post-Fukushima energy policies and policymaking processes,

P2 does not believe that the government generally shares this view. “But I would say from the government point of view, I don't think any change.” However, several government officials asserted that institutions will have to change permanently in order to regain public trust. G4 represents one such policy reformer. He contended, “My personal feeling is that the relationship should change given the Fukushima accident.” He clarified that “we need a change in the governance of the nuclear energy policymaking process. We should have more public participation. We should have more transparency. We need to do everything we can do to regain public trust. That’s what I personally believe we should do.” G4 could not predict whether such dramatic changes will take place, but he pointed to some signs.

I think Fukushima has changed universally the public perception of how government behaves on nuclear energy policy. That’s for sure. So the public will demand reform, definitely. And utilities have to be liberalized, and energy policymaking should be changed. And even the LDP is saying they will set up group to reexamine the role of the AEC. So some kind of reform will take place.

This said, the LDP government has reversed some of the DPJ's institutional changes, while the public continues to distrust the effectiveness or intent of others.

The DPJ initiated a series of formal institutional changes intended to rebuild public trust after the disaster and respond to public demand for a role in energy policymaking. One of these changes, deliberative polling, directly impacted public involvement in the policymaking process during the DPJ's leadership. For the first time, the DPJ employed deliberative polling to determine the future of nuclear power in Japan's energy mix. Almost 50 percent of polling participants voted to eliminate nuclear power by 2030. A much smaller percentage – 15 percent – of participants voted for a 15 percent nuclear share by 2030, and only 13 percent supported a 25 percent nuclear share.²²⁹ However, interviewees indicated that the DPJ did not know what to do with the deliberative polling results, so no formal policy path to achieve zero nuclear emerged. P2 expressed mixed feelings about the DPJ's efforts to empower the public through deliberative polling.

I think the DPJ was trying to listen to people's voices, but their mistake, to my understanding, is that they didn't have a goal or the process before going into that period. So they just go to the people, and listen to them, but actually, they didn't know what to do with so many opinions. Actually, they didn't know how to reflect these opinions in their policies. So actually, they just discarded those opinions. So in that sense, they also didn't change in that respect.

The DPJ may have intended to build public trust through empowerment, but their efforts did not result in increased public trust. When the LDP assumed power, they rejected deliberative polling as a DPJ tool.

²²⁹ Yasunori Sone, 2012b.

The second formal institutional change, revamping of the energy policy advisory committee, also empowered the public during the DPJ's leadership. Several anti-nuclear NGO leaders became members of the new Fundamental Energy and Environmental Issues Subcommittee. To build public trust in the committee's decisions, the DPJ ousted the electric utilities from formal membership in the committee. I7 explained that "the utilities had a big influence on the decision of the committee, now the public believes, so therefore the government [took them out]. The DPJ also made the committee meetings open to the public and available on the internet. The committee considered the same three nuclear options presented to deliberative polling participants, but no policy steps emerged beyond consideration of these three options before the DPJ lost power.

While the DPJ offered the public increased clout in energy policymaking through changes to formal institutions, the LDP has tried to rebuild trust in government policymaking without public input. Along with LDP replacement of the DPJ cabinet came a reduction in public input. Interviewees noted that LDP would not use the DPJ's deliberative polling results, nor would the Abe administration conduct a new polling exercise. While the Japanese government has made energy policies such as the Strategic Energy Plan available for public comment, the procedure for reviewing such comments appears designed for minimal impact. For example, METI held a public comment period for proposed reform that would protect electric utilities' transmission lines from renewables entrants. On the day of the public comment deadline, METI announced that the agency would begin work on the reform four days later, after a three-day holiday weekend. Diet member Kono criticized this timeline as disregard for any comments

received.²³⁰ This said, the government withdrew the original Strategic Energy Plan released in January 2014 after receiving 19,000 public comments reflecting opposition to the plan's inclusion of nuclear power as the key to electricity supply-demand stabilization. The plan released a few months later still contained the conflagratory language describing nuclear power as an "important baseload power source," but the revised version also included language on reducing nuclear power dependence. This contradictory language reflects the government's effort to concurrently rebuild public trust by acquiescing to public demand for a decline in nuclear power use, while also signaling to the utilities a plan to resume use of nuclear power. Taken together, these responses to public comment indicate a decline in public clout under the LDP, even as the government continues efforts to regain public trust.

The advisory committee represents a further signal that public clout has declined under the LDP. Most of the anti-nuclear NGO members were ousted after the LDP took over. M1 described this change: "The LDP wants to decide energy policy in a conventional way. They set up some committees, and some of the anti-nuke opinion leaders were rejected. The conventional decision making process will come back at the LDP meeting. That makes it much, much harder for the public to intervene, to say something about energy policies."

The LDP has continued to use the new nuclear safety regulator created under the DPJ as a way to rebuild public trust in government oversight of nuclear power. One of many interviewees to note this as NRA's mission, G13 confirmed that the new NRA's

²³⁰ Taro Kono, 9 January 2015.

“first priority they are trying to make is to rebuild the regulatory body’s trust.” The NRA’s activities have received a mixed public response, with public opposition to some reactor restart decisions and support for others. These will be discussed in more detail in the next section. Most government, NGO, media and academic interviewees suggested that regaining public trust in the nuclear safety regulator in particular will take more time, given the media’s coverage of the previous regulator’s role in the Fukushima accident.

One last trust-building exercise by the government is still in process. A number of government and electric utility interviewees cited restoration of public trust as one of the reasons for reintroduction of electricity market liberalization measures. I22 explained that

after the nuclear accident, almost all utilities are blamed for the lack of safety of nuclear. So utilities lost trust from the public. So public people think they want to choose utility companies. So METI also has to be sensitive to the public opinion, so METI thinks they have to change the structure of the utility companies, the electric utility industry structure, to get approval from the public.

The loss of public trust also has reduced the effectiveness of a previously used government institution. Since the Fukushima disaster, one town in Fukushima prefecture has shunned subsidies for nuclear plant construction. A few months after the Fukushima disaster, Minami-soma chose to end construction of Tohoku Electric Power Company’s Namie-Odaka plant, rejecting the subsidies that would come once the plant started operation. If more towns follow suit, the central government will cede clout to the local governments and the public, paving the way for energy system change.

Overall, institutional changes have aimed at building public trust in government policymaking, but public perceptions of the genuineness of these changes affect their

success. Public reactions to institutional changes also depend on alignment of public and governmental risk perceptions and priorities.

Risk Perceptions and Priorities

The Fukushima accident raised public awareness of nuclear safety risk. M2 faults the paternalistic relationship for the government's failure to effectively convey this risk to the public prior to the disaster. "I think...the lack of education about nuclear energy in Japan is the reason why people didn't pay attention to the risks before. So the traditional way of Japanese governing people is not to tell them or educate them or tell them the truth about complicated matters. In my opinion, many people in Japan don't know what nuclear power is." This sudden awareness of safety risk contributed to public distrust in government policymaking.

The Fukushima disaster also has highlighted a more fundamental issue associated with risk perceptions and the paternalistic relationship. As discussed in the previous chapter, government interviewees' comments indicate that the government has avoided conveying safety risks because the public expects zero risk.²³¹ Before the Fukushima accident, this zero risk tolerance also extended to energy security, embodied in intolerance for power outages, no matter how short. The communication of zero safety and energy security risk in order to meet public expectations resulted in public distrust when the Fukushima accident revealed the existence of both risks.

²³¹ This zero risk tolerance extends to all areas. Government interviewees noted the ban on imported beef due to public perceptions of risks associated with mad cow disease. See Jennifer Sklarew, 2008.

The risks revealed by the Fukushima accident have altered the public's energy priorities, but not necessarily those of the government. Since the disaster, say NGO and media interviewees, the public has prioritized safety risk over all three of the Es. The deliberative polling results reflect this shift. P3 explained that the polling results showed that "Among 3Es plus S, S is first. S can explain almost everything. Safety influenced almost every choice. But in the deliberative polling results, S is overwhelming."

Meanwhile, policymakers have continued to focus on energy and economic security, with a safety caveat. Some government officials frame energy risks as a trade-off between energy security risk and safety risk. Diet member Kono claims this is a false dichotomy aimed at convincing the public that nuclear power's energy security benefits outweigh the safety risks. The public believed this argument prior to the Fukushima disaster because they thought safety risks were minimal.

The Fukushima disaster reversed this prioritization, and the public has demanded that the nuclear reactors remain off despite any explanations of energy security risks associated with fossil fuel imports. Some government and NGO interviewees also indicated that the public no longer trusts the government's characterization of environmental risk. Many now believe that climate change is just an excuse for nuclear power promotion.

The public no longer trusts the government to convey risks. As evidenced by Minami-soma's rejection of nuclear plant construction, localities have prioritized perceptions of safety risk over the economic gains from subsidies. This decoupling of

public and government priorities has deepened public distrust in the government's energy policymaking ability.

Impact of relationships on energy system change

The Fukushima disaster and the relationship changes it caused have had a mixed effect on energy system transformation. Some policy changes have emerged, as well as policymaking process and structural changes. Some of these process and structural changes are impacting further policy changes. As time has passed, some static features of the relationships have enabled elements of the incumbent energy system to regain dominance.

Policymakers' relationships with the electric utilities and public were not in conflict before the Fukushima disaster. After the accident, each of the two relationships is in conflict, and METI also faces difficulties in balancing their contradictory demands. The electric utilities want METI to play a role in restoring public trust in the utilities and nuclear power. On the other hand, the public wants METI to keep its distance from the utilities. This public pressure on the government to maintain a more detached relationship with the utilities is coupled with public demand for a policy shift away from nuclear power. At the same time, the electric utilities are struggling to keep nuclear power and maintain strong ties to the government. I7 explained, "Japanese people don't have any good impression toward electric power companies currently. So the politicians don't want to have a close relationship with electric power companies." The electric utility industry executive said that at the same time, politicians want to support nuclear restarts for economic and energy security reasons. "So in this sense, politicians have a common

way of thinking with electric power companies.” The Fukushima this forced a rift, whether real or superficial, in the government-electric utility relationship, enabling change in the energy system. If the tension is not real, incumbent system could return. If it is real, lasting policy change may occur. The Fukushima disaster also has created friction among the electric utilities. Without TEPCO’s leadership, the companies are pursuing disparate strategies and priorities on reactor restarts. Thus, they no longer present a unified front seeking preservation of the incumbent system. This said, if policymakers’ relationships with the utilities remain stronger than public influence, nuclear power can retain a central role in the system.

Some government and NGO interviewees highlighted the role of the Fukushima disaster in raising public awareness of energy system choices. Some of these interviewees observed that this new awareness has encouraged the government to make changes to the energy system. G1 asserted, “Until the Fukushima crisis happened, Japanese public did not feel the need for any change, so the government could not make any change and did not think there needed to be any change. Crisis allowed people to realize that there could be a different way, allows new innovation.” Meanwhile, a loss of public trust in the government’s management of energy policy has led to public demand for a greater voice in energy policy decisions. While this demand resulted in more public input under the DPJ, the LDP has reclaimed clout in policymaking. Some interviewees predicted that this new public awareness will inevitably lead to energy system change under either party, while others expected prior relationships to return and preserve the incumbent system.

The disaster also has empowered energy system reformers who previously received little attention. Like the backlash that emerged from Exxon's failure to rapidly address and define the Exxon-Valdez oil spill, TEPCO's belated, disjointed efforts to explain the Fukushima Daiichi nuclear disaster have empowered policy entrepreneurs.²³² Diet member Kono, whose efforts to redirect Japan's energy system over the past few decades, has gained a stronger voice in the media, the Diet, and the public arena. After the accident, Kono spearheaded a committee to reform Japan's energy policy. He also played a role in drafting of the FIT. Kono's calls for a solution to the nuclear waste problem, the fuel cycle debate, and opportunities for public input in policies on electricity grid access have garnered attention. Whether he is able to utilize this attention to implement concrete policies for energy system and process change depends on whether policymakers prioritize their relationships with the electric utilities or rebuilding public trust. The evidence to date suggests that policymakers are attempting to achieve both goals while limiting real change, as well as opportunities for changemakers to play a role.

Electricity supply changes

Nuclear power

The 2011 Fukushima disaster should have derailed the Japanese government's plans to expand a nuclear-based energy system. And yet, the majority of interviewees predicted that the incumbent system will remain largely intact. Four years after the shock, the Japanese government continues to debate revisions to the policy targets set in 2010. The expected shift away from a nuclear-based energy system has not been codified in any

²³² For more on the impact of Exxon-Valdez, see Thomas Birkland, 1997.

policies produced since the disaster. The revised Strategic Energy Plan released in early 2014 included nuclear power as an “important baseload energy source.” The new supply targets for 2030, announced in April 2015, include a 20-22 percent nuclear power generation goal.²³³

The interplay between the government’s relationships with the electric utilities and the public can explain the overall ambiguity in Japan’s post-3/11 nuclear policy. As G16 observed,

I think that METI has been in a very fragile, uncertain position, pushed by one side and pushed another side. And it seems to have been just spending time to react to many pressures. But I think finally under DPJ the political pressure finally got METI to conclude the phasing out of nuclear power. But...because it is not a kind of wholehearted commitment of the bureaucracy...after LDP came back to power, the bureaucracy again pushed for another direction.

Most interviewees suggested that policymakers and the electric utilities generally agree that nuclear power should continue to play a major role in Japan’s energy system. This support comes from the highest level of government. Several interviewees noted that nuclear renaissance architect Yanase is serving as Prime Minister Abe’s administrative aide. However, the Fukushima disaster has created some institutional roadblocks.

First, some changes to policymakers’ relationships with the electric utilities have challenged nuclear power’s central role in Japan’s energy system. New LDP politicians are less likely to support nuclear power. G21 explained that “the new LDP Diet members did not depend on utility companies or utility unions or nuclear issues, so they didn’t get

²³³ While this target may seem unrealistic, J-Power’s construction of one new reactor, Ohma, has continued after the accident. Ohma’s planned 1383 MWe is half the output of decommissioned Fukushima Daiichi units 1-4. Chugoku Electric also plans to complete Shimane Unit 3, which is almost the same size as Ohma. The five units planned for retirement all are small – no greater than 530 MWe each.

votes or money from utilities for this election. So many new LDP members...don't want to be involved in nuclear issues, or they don't want to be seen by the public as nuclear promoters.”

This comment raises a second challenge to policymakers' promotion of nuclear power: public opposition. Even if policymakers support nuclear power's return, they fear a public backlash even as they are attempting to rebuild public trust in government-led policymaking. G12 intimated that

maybe METI's position is that we want to promote nuclear, but at the same time, we somehow have the face of the neutral people or face to the people which are opposing to nuclear. So from the viewpoint of the utilities, they have been complaining that METI is somehow not so aggressive. But from the viewpoint of the people who are opposing nuclear, still they see that METI is very close to the utilities.

Electric utility interviewees expressed frustration with the government's lack of publicly voiced support for nuclear power. I15 said that while the electric utilities understand the government's need to build public trust, Japan's nuclear program cannot proceed without some signs of government support.

The problem that mainly exists is that the government cannot clearly support these issues in public. Because of the politics. When they talk to industry, they say we support nuclear restarts, and in the future, they support new builds, and also fuel cycle. To the industry, but they cannot say that to the public, and they are saying that to the local government, sometimes, but it depends. They are comfortable to make a policy, but implementation of the policy should be done by the industry.

I15 noted that central government support and assurances of safety are necessary to convince local governments to accept restarts and new construction. Several government

interviewees suggested that policymakers are awaiting the return of public trust before openly pursuing a pro-nuclear policy.

Some government and electric utility interviewees say that the future of nuclear power depends on policymakers' relationships with the electric utilities, particularly regarding support for nuclear expansion and responsibility for the fuel cycle. Others assert that the relationship with safety regulators will determine the future of nuclear power, as regulations influence decommissioning and investment choices. Others say that the utilities' relationship with economic regulators will wield the strongest influence, as market liberalization impacts the utilities' ability to continue with nuclear power rather than cheaper options. The government's efforts to build public trust color all of these relationships.

Strategic Energy Plan Language

The conflict between policymakers' relationships with the electric utilities and the public also explains the contradictory policies regarding specific aspects of Japan's nuclear program. The most prominent of these is the 2014 Strategic Energy Plan's inconsistent language on nuclear power.

The plan's language reflects the government's attempt to balance the need to regain public trust with the need to continue cooperation with the electric utilities on nuclear power. The plan's stated aim of reducing nuclear dependency responds to the public demand for this movement away from nuclear power. It also reflects the reality of the electric utilities' decommissioning plans, based on some older reactors' inability to comply with NRA guidelines. The emphasis on nuclear power as an important baseload

fuel signals to the electric utilities that the government supports continued use of nuclear power. Several electric utility interviewees explained that their firms sought this signal as a guide for their future investment plans. The assertion that the government will reduce nuclear dependency “to the extent possible” allows both the government and the electric utilities the flexibility to determine what is possible.²³⁴

Policymakers’ concern regarding public opposition to nuclear power also explains the plan’s lack of an appendix containing specific electricity source targets. Recognizing that any mention of a nuclear target would draw public criticism, policymakers chose to avoid targets completely by eliminating the appendix, said government interviewees.

New Targets

The 20 to 22 percent nuclear target announced in April 2015 reflects electric utility influence. Energy industry interviewees confided that in the debate within the advisory committee responsible for the proposed targets, even anti-nuclear committee members suggested a target of 15 to 20 percent, while nuclear supporters proposed a 20-25 percent target.

Restarts and New Construction

Government interviewees perceived that the public will not accept any safety risk. As a result, government interviewees indicated that the government has felt obligated to convey zero risk, since the public would not have agreed to nuclear power expansion if associated with any risk. The Fukushima disaster shattered the zero risk myth, deepening

²³⁴ During the author’s time as a negotiator on Japanese electricity market liberalization, METI officials often inserted this term to allow for flexibility, or even future disregard for the terms of an agreement.

public distrust in the government. The NRA represents a vehicle to rebuild this trust. G16 explained that “the NRA is trying to...create trust. And if the public sees that it is doing its job well, then public acceptance of nuclear power will be increased. ”In creating the NRA as a tool to rebuild trust, the Japanese government may have set it up to fail. If the public believes the NRA can guarantee zero risk, trust will collapse when another accident occurs. Signs already indicate that the public fears the NRA’s inability to guarantee zero risk.

Fukui District Court has rejected the restarts of two of Kansai Electric Power Company’s units at the Takahama nuclear power plant approved by the NRA. The court’s criticism of the NRA standards as inadequate to guarantee safety reflects public distrust of the NRA’s regulations. The rejection of the restart approval also demonstrates growing public clout in energy policy decisions at the local level. Minami-soma’s refusal to continue with Tohoku Electric’s planned construction of the Namie-Odaka plant represents another example.

The electric utilities’ criticism of the NRA has further weakened the regulator’s credibility, making the public distrust the new regulations. This public belief that the regulations are inadequate has challenged reactor restarts. The Fukui district court’s rejection of the NRA’s approval for restarts reflects this problem. If the electric utilities undermine public confidence in the regulator, they challenge their own ability to continue nuclear power use.

The electric utilities’ criticism of the NRA stems in part from frustration over the agency’s isolation from utility input on regulations. This conflict and loss of electric

utility clout has shaped regulations that have led the utilities to plan decommissioning of older reactors that would be too costly to upgrade.

Electric utility interviewees indicated that the NRA regulations also may deter new plant construction. I11 noted that “of course, the utility company wants to continue construction, but the new rule is ‘always safe.’” As a result, said I12, “brand new projects will be difficult in Japan. I don't think new nuclear plant activity will start.”

The Fuel Cycle Debate

The government-electric utility conflict over fuel cycle responsibility sheds light on the puzzling discussion of reprocessing progress without reactor operations. I15 explained that if the reprocessing facility does not start operating soon, the nuclear plants will need to remain off, since the spent fuel sites are filling up. The Fukushima disaster also intensified the battle between the government and the electric utilities over responsibility for the nuclear fuel cycle. I15 asserted, “If METI pushes industry to start up Rokkasho too much, they fear industry may say then the government should take responsibility for the back end of fuel cycle.” At the same time, G6 confided that some electric utilities secretly continue to hope for the end of the fuel cycle. I15 did not dispute this claim, but offered a caveat. “Of course there will be some opponents, even in industry, but in general, we understand that we need the fuel cycle in any case.”

Oil

The increase in oil use as a replacement for nuclear power is temporary, based on the Strategic Energy Plan, which characterizes oil as a “peaking power source.” The three percent target announced in April 2015 reflects continuation of the pre-3/11

suppression of oil use. However, the assignment of oil as a “peaking power source” rather than “emergency power source” is notable. Since solar power’s target is higher, the electric utilities’ preference for oil over renewables seems a likely reason for this categorization.

Natural gas

The government’s continued emphasis on natural gas use is expected. The characterization of natural gas as an intermediate power source, rather than a baseload source, reflects the expectation, shared by the electric utilities, that nuclear power will reclaim a percentage of the electricity supply currently produced by natural gas after the Fukushima disaster. G7 highlighted this expectation: “Frankly speaking, from the energy policy side, ambiguity about nuclear energy is really a big problem. So right now natural gas is supporting our energy supply, but apparently, there is a big risk. You mentioned about supply risk. And also we have price risk.” This view reflects policymakers’ and electric utilities’ mutual focus on energy security and economic risk associated with longer-term natural gas use, and prioritization of these risks over safety.

Coal

The Fukushima accident promoted continued cooperation between METI and the electric utilities on coal use. It also forced MOE officials to reluctantly add provide institutional support.

The 2014 Strategic Energy Plan’s reference to reevaluation of coal as an “important baseload source” reflects the electric utilities’ interest in investing in cheap electricity sources, especially if and when market liberalization forces price competition.

G2 noted the manufacturing sector's influence on the government's and electric utilities' promotion of coal use. "METI is increasing coal power because industry wants that." MOE, which wrangled with the electric utilities over coal use prior to the Fukushima accident, has enabled coal plant construction after 3/11. I21 explained that "actually, before the Fukushima accident, utility companies were not allowed to build coal power plants, but after the Fukushima accident, I think the Environment Ministry has to approve for the utilities new coal power building." MOE also agreed to expedite environmental impact assessments for coal plants. I21 suggested that the electric utilities pushed for this change. "I think FEPC was giving some pressure to change the rule to the Environment Ministry."

MOE's cooperation with the electric utilities to promote coal use also strengthened due to a shift in public priorities after 3/11. Demotion of environmental goals in favor of economics and energy security led to public pressure to stabilize electricity rates. G7 said that "after March 11, there is a strong request from the public that we should stabilize the rates of the power sector as much as possible, we should avoid the rise of the rates as much as possible." G7 explained that "without nuclear power, coal-fired power plants are one strong option. But there is little future sense of building power plants because of the assessment process, so that's why they have a discussion." Underlying this shift is emerging public disbelief in the climate change priority, which many came to view as merely a rationale for nuclear power expansion after the Fukushima disaster, according to some NGO and media interviewees. This

diminishment of public interest in the climate change issue, coupled with energy security and safety risk concerns, has enabled public acceptance of a coal expansion policy.

Renewables

The 2014 Strategic Energy Plan highlights renewables as a promising option for future energy supply. And yet, the 22 to 24 percent renewables target announced in 2015 is only slightly higher than the 20 percent target included in the 2010 Strategic Energy Plan. The breakdown of renewable energy source targets and supply categories is equally puzzling. Hydropower, listed in the plan as a baseload energy source, will account for about nine percent of Japan's electricity supply by 2030, about two percent higher than the ratio before March 11. Geothermal, which the plan also considers a baseload power source, has a measly one percent target for 2030. Solar power, considered an emergency supply source, has a target of seven percent. Biomass and wind, with targets of around 4 percent and 1.5 percent respectively, are not even assigned a category in the Strategic Energy Plan.

The government-electric utility relationship can explain the trivial renewables growth and limited 2030 targets after the Fukushima disaster, as well as the contradictions between the Strategic Energy Plan language and the targets for each source.

The Fukushima disaster has not raised the electric utilities' interest in using renewables. When asked about the future of renewables, I6 rolled his eyes. "This... investment is a very, very small amount. Less than one percent. In Japan, about nine to ten percent is renewables. Of that, most is hydro, but some of the small hydro is one of

the investment areas, maybe.” I6 confided that the rest of the renewables investment is intended as a perfunctory nod to government efforts to demonstrate renewables progress to the public. “The other is only to show how we do our best to introduce renewable power. Like wind power and solar system.” I12 had a equally pessimistic view: “The DPJ insists renewable energy can assist the power source, but it’s a very long way. Maybe several hundred years.”

Government and electric utility interviewees presented divergent reasons for electric utility opposition to renewables. Electric utility engineers and pro-nuclear politicians and bureaucrats cited complicated technological issues that challenge grid and supply stability, including voltage and frequency fluctuation and rotor angle stability. Pro-renewables politicians and bureaucrats accused them of fabricating these problems to preserve market share and avoid having to purchase renewables that would jeopardize profits from low-cost operation of their existing power plants.

Regardless of the veracity of their arguments, the disaster has prevented the electric utilities from overtly saying that they do not support renewables growth, for fear of appearing to oppose national energy security and environmental goals. G21 explained, “It is very awkward or embarrassing for the utilities now. They can’t say we are opposed to introduction of renewable energy.” At the same time, G16 argued that without real cooperation from the electric utilities, renewables entry remains difficult.

...you need cooperation from industry to radically expand the role of renewables. And I think still, it is a very solid, determined position of Japanese utilities not to expand renewables. So there is every effort by them to deemphasize the importance or feasibility of renewable energy. And also they have many reasons to claim...it is the utilities network that can, that should manage the new world of renewable energy. So unless the

utilities industry is a kind of positive or more welcoming stance, in general, you cannot expect the new, really meaningful progress toward renewable energy.

This situation has empowered pro-renewables officials in METI to move forward with renewable energy promotion policies. At the same time, METI officials opposed to renewables expansion have undertaken policies to limit it. This dichotomy has resulted in conflicting policies that incentivize new entrants while limiting their access to the transmission grid. The Strategic Energy Plan emphasizes the energy security benefits and challenges, as well as the economic difficulties associated with renewables. Low targets for 2030 reflect low expectations for electric utility adoption of renewables and new entrants' grid access. An unreleased study commissioned by MOE found that a 30 percent share of renewables by 2030 is feasible, according to Diet member Kono. Kono says that the electric utilities have convinced METI to downplay this potential.²³⁵

These targets also present an inconsistent message in the context of Japan's FIT. Japanese government introduced the FIT in 2012, heralded by the media as an important step toward building a robust renewables market in Japan, as well as a policy tool to reduce nuclear dependence.²³⁶ Behind the scenes, say government interviewees, other motives were at play. Diet member Kono asserted that at first, "METI was trying to introduce not a comprehensive FIT. Their original plan was really weird, It was even counterproductive." This unhelpful design suggests electric utility cooperation with METI to limit its effect. Kono said that passage of the FIT was supported in part by

²³⁵ Mari Iwata, 2015, *The Wall Street Journal Japan*.

²³⁶ For example, see Nasser Ayoub and Naka Yuji, 2012.

renewables advocates, joined by politicians who simply wanted to oust Kan. “I think even within DPJ, they were going to vote against Prime Minister Kan, and there was a vote of no confidence in the parliament. Kan said he will step down if he could accomplish three things...one of them was the FIT.” Government interviewees suggested that Kan’s determination to introduce the FIT was based on his anger toward the electric utilities for the Fukushima disaster. Kono said that the DPJ’s FIT was based on METI’s incomplete plan, but “it came to the LDP, and those power industry friendly politicians were not able to sit in front. That was the atmosphere back then, so we actually rewrote the bill so that complete FIT would go through.” Because of the Fukushima disaster, politicians could not appear to be overtly representing the electric utilities’ interests. The high 42 yen per kWh tariff for solar “was a byproduct of political infighting.”

The FIT generated a huge influx of solar projects, and the electric utilities argued that the grid could not support them. Electric utility interviewees also asserted that passing through the high tariffs to consumers’ electric bills will cause another breach of public trust, since the government has not informed the public of these future increases. I21 said, “We can collect additional fee through electric bill, so actually, we don't have any impact from the FIT, but electric fee is going to get higher, so I think that’s a problem, and that isn’t fair for the customers as well.” The government responded to both claims with price reductions for solar and wind tariffs. They also approved a measure to limit renewables access to the grid, based on utility predictions of instability and oversupply.

But skeptical NGO leaders think METI's solar FIT reduction is based on grid calculations that include the return of most/all nuclear plants to operational status. Electric utility interviewees' comments on renewables corroborate this perception that policymakers' cooperation with the electric utilities is driving the direction of the FIT. METI's "calculations for the new rules are based on the premise that all of Japan's nuclear reactors, including those that are 40 years old, will be in operation. The result is nuclear power accounting for between 50 and 60 percent of the supply at Hokkaido Electric and Kyushu Electric during minimum load demand times, and the reduction of available renewable energy,"" the Japan Renewable Energy Foundation, said in a report released just after METI's announcement.²³⁷

These same skeptics say that restrictions on grid access also reflect electric utilities' cooperation with METI to keep new entrants out of the market. NGO leader Iida argued that the inability to guarantee grid access through an independent third party operator will cause the FIT to fail. Iida asserted that the planned market liberalization reforms do not include creation of a truly independent operator. Iida and M2 also posited that unbundling of generation from transmission can prevent the electric utilities from passing on high prices from the FIT to consumers. Asserting that "the utilities know this very well," M2 said that the government is acquiescing to the electric utilities' interests by implementing unbundling too late to stop electricity price hikes that can kill the FIT.

²³⁷ Eric Johnston, 2 January 2015, *The Japan Times*.

At the same time, the electric utilities' influence over local governments' decisions on renewables also has slowed entry. New renewables players are battling at the local level with the utilities over claims that introduction of renewables will destabilize the grid. Softbank megasolar is an example of heavy hitter who helped to resurrect the electricity market deregulation movement, only to be pushed back out of the market by the electric utilities' ability to persuade the local government that renewables instability could jeopardize energy security. It confided that Softbank abandoned their megasolar plans "because of opposition from Hokkaido Electric Power and Tohoku Electric Power Company."

The low renewables targets reflect electric utilities' cooperative relationships with policymakers, but local institutional support or opposition also affects individual renewable sources. The electric utilities have used their cooperation with policymakers, as well as returning clout, to suppress solar power development despite the initially huge FIT incentive. This movement illuminates both the Strategic Energy Plan's definition of solar power as an "emergency power source" and the 2030 target of seven percent.²³⁸

The sudden interest in biomass, evidenced in an increased FIT and a four percent target by 2030, reflects electric utility cooperation with METI, but it also reveals the influence of policymakers from the Ministry of Agriculture, Forestry and Fisheries

²³⁸ Little investment has followed the high wind power tariff due to high installation costs for small scale turbines. As a result, the electric utilities have not needed to defend against wind developers yet.

(MAFF) and the Ministry of Land, Infrastructure and Transport (MLIT). The wood and construction industries have pushed for biomass support, which also appeals to local governments and local voters, according to G2 and I6.

In contrast, geothermal growth suffers from opposition from MOE and local spa owners. While the FIT for small-scale geothermal has remained high – 40 yen per kWh – , government and electric utility interviewees predicted small, slow growth due to MOE concern regarding drilling in national parks and spa owners’ opposition to drilling near their facilities. J-Power’s Onoi declared that “frankly speaking, geothermal has almost nothing to contribute to energy security.” While METI and the electric utilities agree that geothermal could be a baseload energy source, political obstacles to siting have relegated geothermal to a one percent target by 2030.

Efficiency and conservation measures

After the oil crises, the public trusted the government’s decision to promote energy conservation for the good of the nation. In contrast, after the Fukushima disaster, consumers complied out of necessity, not cooperation with the government. Manufacturers complained about conservation measures, and consumers blamed the government and the electric utilities for the need to conserve.

Policymaking Process and Structural Changes

The government made several policymaking process and structural changes in response to the Fukushima disaster and its impact on relationships with the electric utilities and/or the public. Since these changes also had a secondary impact on relationships, they were discussed in the previous section on relationships. The role of

relationships in precipitating and shaping these process and structural changes are summarized briefly here.

Role of the Electric Utilities in Policymaking

As previously mentioned, the Japanese government removed the electric utilities from government advisory committees handling energy policy issues. This process change emerged from the government's aim of rebuilding public trust in the energy policymaking process. While some government interviewees suggested that the electric utilities still exert influence in policy formulation, this cloud is -- at least temporarily -- no longer formal or overt. G7 explained that

the policymaking process has changed...after the earthquake, those industry representatives were not included in the advisory council. So we, as an advisory council, called them observers so they had chances to make their comments, but finally, they don't have any power to veto the report of the advisory council. So I think that's a difference...especially after the earthquake, there is big criticism toward the power sector, the power companies, and that might be one reason to exclude them from the policy formulating process.

G4 also indicated that some energy advisory committees outside of METI might have allowed electric utility representatives. If so, this occurrence supports the idea that removal of the utilities from the committees represents a cosmetic alteration for public confidence-building.

Role of the Public in Policymaking

The Fukushima disaster spurred the DPJ to alter existing policymaking processes to include public input. Once again, this change reflects the government's aim of rebuilding public trust in the energy policymaking process. To build cooperation, the DPJ ceded clout. One government interviewee, G18, also suggested that the change reflected

the DPJ's platform of transparency. "Because while they were in opposition party they were promoters of disclosing the government policymaking process. Transparency is one of the key dogma while DPJ was the opposition party, so they have to make it realized while they were in power. Energy policymaking is one of them."

However, once the LDP returned to power, these processes reverted back to their pre-3/11 form. The LDP did not use the results of the deliberative polling conducted under the DPJ, nor did they seek public input on the energy mix. M1 observed that "the LDP wants to decide energy policy in a conventional way. They set up some committees and some of the anti-nuke opinion leaders were rejected. The conventional decision making process will come back at the LDP meetings. That makes it much, much harder for the public to intervene, to say something about energy policies." The LDP reasserted clout over the energy policymaking process. Many interviewees suggested that the LDP's focus on relationships with the electric utilities led this reversion to a system without public input.

Transparency

The 2014 Strategic Energy Plan revision includes a section on government communication regarding energy policy. The focus is on communication of accurate, timely information to the public. The plan also cites "two-way communication," with the goal of promoting "dialogue with all levels of the society in order to increase transparency over the energy policy planning process and obtain public trust in the policy." The inclusion of this section highlights the government's efforts to regain public trust after the Fukushima accident, as well as a possible rise in public clout in

polycymaking. If more concrete policies follow this reference, greater public influence on energy polycymaking may occur. If not, the statement itself may be an effort to increase public trust without implementation of actual public input. To date, evidence of the latter includes lack of consideration of public comments on energy-related policies such as the transmission grid access limitation ordinance mentioned earlier in this chapter.

Safety Regulator Change

The Fukushima disaster destroyed public trust in the existing regulator's ability to regulate the nuclear industry. To rebuild this trust, say government interviewees, the Japanese government created the NRA as an independent regulatory body affiliated with MOE, rather than METI. Policymakers' and electric utilities' mutual aim of continued nuclear power use also has driven this creation of the NRA as an independent safety agency. Both groups have recognized that the regulator needs to appear tough on the electric utilities in order for nuclear power use to continue. G16 stated that "it is my view that the Commission is trying to...create trust. And if the public sees the Commission is doing its job well, then public acceptance of nuclear power will be increased."

Separation of regulators from policymakers aims to eliminate the conflict of interest between nuclear policy and safety regulation. Government interviewees indicated that by doing so, the government aims to rebuild public confidence in regulators' clout over the electric utilities and the government's ability to manage nuclear power policy.

G4 asserted that the creation of the NRA will impact not only nuclear plant safety, "but also the business strategy of the utility companies." Whether creation of the NRA leads to reinforcement of the incumbent system or fosters a shift away from nuclear

power depends on three factors: 1) NRA's pace and rate of approvals for nuclear reactor restarts and continuation of plants under construction. 2) the electric utilities' ability and desire to make the needed changes in existing reactors and future reactor design, and 3) public trust in NRA decisions. Some local opposition to the NRA's decisions reflects a continued lack of trust.

Electricity Market Liberalization

Market liberalization under the Abe Cabinet surprised observers of Japanese energy policy, as well as several interviewees. They expected the LDP's cooperation with the electric utilities on nuclear power and preservation of electric utility profits to stymie regulatory reform, as it did before the Fukushima accident. In the early 2000s, the data falsification scandal and accidents shifted attention away from market liberalization, halting structural change. Conversely, the Fukushima disaster appears to have enabled resumption of market liberalization efforts, promoting change.

Diet member Kono, who supports deregulation and renewables introduction, expressed skeptical bewilderment at the LDP's change of heart. "I'm wondering what METI really is thinking. They are going to go all out on deregulation. So I'm wondering, 'what's the hitch?'" While one of the measures, establishment of an independent mechanism to monitor supply and demand balance, seems a logical response to the supply risks revealed by the accident, the shock alone does not explain the other two measures. The government's relationships with the electric utilities and the public can shed light on the motives behind full deregulation and unbundling, as well as the challenges of implementing them.

Relationships and Liberalization Motives

Government and electric utility interviewees' comments yielded six possible reasons for LDP and METI pursuit of market liberalization measures. All of them involve government efforts to rebuild public trust. Two of these motives actually benefit the electric utilities. First, some interviewees suggested that market liberalization is a trade-off for nuclear restarts. By appearing to diminish utility clout in policymaking, market liberalization paves the way for nuclear power's return by convincing the public that the government has clout over the electric utilities. G12 explained:

The LDP and METI and the utilities want to keep the nuclear policy, and ...I would say, nuclear policy doesn't have popularity among the people. And then, nuclear is more important for these three [groups] than keeping the current market structure. So in that sense, these three have some kind of implicit consensus that we should further proceed on deregulation. Otherwise, we cannot have the confidence, or we can't have trust from the people. And then, of course, with such regulatory reform efforts, maybe the LDP and METI or government can say we have ...a very confrontational stance...toward the utilities, and the utilities also can say...we are very strongly led by, or forced by deregulation. And so, with such a structure, now the three can proceed with nuclear policy.

However, since the NRA is an independent regulator, METI and the LDP supposedly cannot influence reactor restart approvals. The trade-off, then, is contingent on NRA approvals coupled with a return of public trust. Without linking it to nuclear promotion, electric utility interviewees also posited that policymakers' pursuit of market liberalization aims to build METI's clout over the electric utilities in order to gain public trust. As a second, related motive, G12 added that by introducing price competition, liberalization also helps to justify the electric utilities' request for government assistance with nuclear fuel cycle investment costs. Since taxpayers' money would fund the fuel

cycle if the government takes over, this shift requires public trust in the government's decision-making.

The other four motives build public trust by challenging the electric utilities. First, some electric utility interviewees went a step beyond enhancement of METI's clout, claiming that liberalization intends to punish the electric utilities for the Fukushima disaster and past scandals. They asserted that the government is responding to the public's desire to see the electric utilities suffer for creating the Fukushima disaster. I18 contended, "My personal opinion and my feeling is deregulation is some kind of punishment to our organization. We should be punished because utilities and electric industry had the Fukushima nuclear disaster to all the Japanese people, so the Japanese government should punish."

Some skeptics, like Diet member Kono and NGO leaders, think that the market liberalization plan aims only at the impression of punishment, while actually designed for minimal impact. NGO leader Iida asserted that

the original intention by the Cabinet is obviously kind of fake. The LDP pretends they are more revolutionary, or more progressive, looks like. But in reality, that is a very slow step of electricity market reform. And actually nothing to be promised...if the government or the LDP Abe administration seriously considers unbundling or electricity market reform, TEPCO must be the first. But they never discuss about that. So that is another evidence that this electricity market reform is something like just drawing big pictures on the wall, but nothing to do with reality.

The design of the unbundling scheme seems to support this impression. METI chose to implement legal unbundling, rather than operational unbundling. Legal unbundling separates generation from transmission and distribution, but the electric utilities control a

holding company that houses the separate firms handling these operations. This design results in little change in utility clout.

Second, some government interviewees suggested that unbundling is necessary to open grid access to new entrants in order to foster renewables increases. They believe that the FIT cannot effectively accomplish renewables growth without it. G10 asserted that “this deregulation debate is for expanding renewables. The most important thing is for the grid system to be much more independent from the utility companies. The grid is infrastructure, so everyone should use it.” G10 and others say that unbundling is needed to enable new entrants access to the transmission grid. “New entrants are suspicious, so they think the utilities will do unfair treatment to new entrants. For renewables, heightening openness of the grid is very important.” Electric utility interviewees argued that unbundling will limit interest in investing in expansion of transmission networks needed to add a large amount of renewables. I16 contended that “the government’s goal is to increase renewables to around 25 percent by 2030, they are saying. I think they will have to add a fair amount of electricity supply lines for the stability of transmission and distribution areas, but if we liberalize, I think investment in that will be extremely difficult.” METI’s choice of legal unbundling, rather than true separation of generation and transmission companies, reflects a compromise with the electric utilities that allows them to continue to exercise control over the grid.

Third, some electric utility interviewees think that the government aims to improve transmission efficiency through unbundling. I18 presented this argument as follows:

Just after the Fukushima accident, many public opinion groups or consumers' entities say utilities should change to be more and more efficient, and the Japanese government thinks, 'oh, unbundling is very good to change utilities' organization to be more efficient.'...the Japanese government can focus on the regulation of only wire business. And they can more strictly check the wire business efficiency.

I18 also suggested that the government believes market competition in generation will make it more efficient and reduce electricity prices.

Electricity price reductions and consumer choice are the last rationale for market liberalization, cited by several government interviewees. These arguments have particular salience after the Fukushima accident raised prices and highlighted the lack of choice. Several electric utility interviewees agreed that liberalization is METI's response to the public's demand to choose electricity providers after the Fukushima disaster. I21 expressed this view:

I think that after the nuclear accident, almost all utilities are blamed for the lack of safety of nuclear. So utilities lost trust from the public. So public people think they want to choose utility companies. So METI also has to be sensitive to the public opinion, so METI thinks they have to change the structure of the utility companies, the electric utility industry structure, to get approval from the public to get consensus of the public.

METI's efforts to rebuild public trust thus underlie the price reduction and consumer choice rationale for market liberalization, as well. All of these reasons for building public trust also represent ways to protect the nuclear power program, while appearing to challenge it. G12 and others suggested that the government will execute market liberalization in a way that does not harm nuclear power, a priority shared by policymakers and the electric utilities.

How Relationships Have Enabled or Hindered Liberalization

The Fukushima disaster injected conflict between the electric utilities and policymakers - at least publicly, enabling the return of the market liberalization movement. Some government and electric utility interviewees suggested that the Fukushima disaster's boosting of METI's pro-reformers' clout over the electric utilities also allowed resurrection of market liberalization. I1 said that "after 2011, METI has become strong again. The electric utility companies' power became relatively weakened. In reality, METI's power was relatively strengthened. In that power relationship, METI, who was considering market liberalization, took advantage of the Fukushima Daiichi accident." Some interviewees linked this increase in METI's pro-reformers' clout to the elimination of TEPCO's influence, though others said that TEPCO was less opposed to market liberalization than some of the other electric utilities.

G17 expressed interest in capitalizing on the disaster's constraint of electric utilities' and pro-utility politicians' clout: "after Fukushima, it seems to me that these kind of Congressperson and public utility company's power declined, so now, I am not sure, but I believe, and I want to realize the deregulation right now." The disaster strengthened reformers' clout, while leaving cooperation between the electric utilities and their LDP supporters untouched. G16 observed, "So even at this time, when METI tried to propose legislation for further liberalization, the LDP's energy group tried to moderate or weaken the substance. Finally, it was passed. LDP finally endorsed the Cabinet proposal for new legislation." This balance of cooperation and clout thus enabled passage of liberalization measures, but LDP influence weakened these measures' potential impact on energy system change. Several interviewees offered the example of

delayed, legal unbundling, rather than rapid, operational unbundling.

Summary: Policy, Process and Lock-In Linkages

The interview data reveals that the expected severing of policymakers' relationships with the electric utilities is more nuanced. The government has made efforts to rebuild public trust, while relying on time to heal distrust as the memory of the accident fades. Reflective of Birkland's discussion of advocacy coalitions in energy policy change after shocks, empowerment of anti-nuclear and pro-renewables factions within the government and the public has catalyzed transformation. However, the shock does not appear to have challenged pre-existing relationships between the government and the electric utilities strongly enough to result in derailment of the incumbent energy system.

The Fukushima disaster and institutional relationships have had a mixed effect on the traits that foster energy system lock-in: infrastructure, interrelatedness and complexity, institutional support, momentum and risk and uncertainty.

Infrastructure

A number of infrastructure challenges inhibit energy system change, even after the Fukushima disaster. On one hand, clean-up efforts have highlighted the difficulties associated with nuclear reactor decommissioning and spent fuel disposal. Policymakers, the electric utilities and local government officials have voiced concern regarding recouping of investments already made in nuclear plants and fuel cycle facilities. The electric utilities say they will optimize the lifetimes of newer plants if the NRA approves resumption of their operations.

On the other hand, policymakers and the electric utilities also warn against the high costs of transmission line expansion to accommodate a major shift to renewable energy. Policymaker-electric utility cooperation on cost recovery of existing infrastructure and hesitance to invest in new infrastructure hinders energy system change. Further, cooperation with policymakers has enabled the electric utilities to continue control of existing shared infrastructure. Even if legal unbundling of generation and transmission takes place, new entrants will have difficulty accessing the grid.

Interrelatedness

Even within the energy system, interrelatedness of subsystems renders change difficult after the Fukushima disaster. G18 observed, “Even if today, we commit to stop any nuclear power plant activities right now, we have to still cope with the waste from nuclear power plants. Period. And we have to dispose of those by using recycling of nuclear power fuel at Rokkasho plant in Aomori prefecture. But stop nuclear activity means that simultaneously we stop nuclear fuel recycling program.” Local officials in Aomori prefecture are opposed to cancellation of the nuclear fuel cycle, for fear that the prefecture will be stuck with the spent fuel that Rokkasho would have reprocessed.

The Fukushima disaster also demonstrated the interrelatedness of Japan’s energy system with many other sectors. In particular, say government and electric utility interviewees, the manufacturing sector has lobbied heavily to restart the nuclear reactors to lower electricity prices and end conservation measures.

Institutional support

A return to the incumbent nuclear-based system is hampered by the government's inability to actively promote nuclear power until public trust returns. In the meantime, based on policymaker-electric utility cooperation, several institutional changes enable this return of both trust and a nuclear –based system. If the creation of the NRA builds public trust, reactors approved for restart will reinsert nuclear power in Japan's energy mix. The electric utilities' cooperation with policymakers and economic regulators has postponed unbundling of generation and transmission, leaving the electric utilities in charge of the grid. New entrants face grid access difficulties even after legal unbundling is implemented. Policymakers' reduction of the FIT also protects the incumbent system.

Momentum

Japan's nuclear-based energy system is literally stalled. However, the momentum built through the system's interrelated elements and stakeholders' vested interests is pressuring the return of nuclear power. If public distrust continues to combine with clout at the local level, system change may result. However, if policymaker-electric utility cooperation again becomes the dominant force in the direction of Japan's energy system, little change may occur, if the financial risks of returning to the incumbent system do not change the electric utilities' interest in preserving it.

Risk and Uncertainty

The Fukushima disaster has altered all groups' risk perceptions regarding a nuclear-based energy system. New considerations of safety risk have joined the traditional 3 Es concerns, altering all groups' views of resilience in Japan's energy system.

Institutional changes resulting from the disaster have injected further uncertainty that affects the electric utilities' investment decisions. If this trend continues, Japan's energy system may change slowly over time. The electric utilities' new risk focus is financial uncertainty in a liberalized market with stricter nuclear safety standards. As a result, the utilities are negotiating even harder than before 3/11 for government support for the nuclear fuel cycle to offset the losses predicted from market competition.

Institutional Relationships and Shock to the System Combined: Shaken but Not Stirred?

At the very least, the Fukushima nuclear disaster shocked Japan's energy and energy policymaking systems temporarily. Ultimately, recovery of pre-3/11 institutional relationships will determine whether the disaster forces significant, lasting change in Japan's energy system and policymaking process.

CHAPTER EIGHT: CONCLUSIONS AND FUTURE RESEARCH

A Holistic Approach to Creation and Destruction of Energy System Lock-in

This study's findings contribute to the existing scholarship on drivers that create path dependence in large technological systems. The study also integrates two previously distinct factors that perpetuate or break this technological and policy lock-in: external shocks and institutional relationships. The findings emerge from analysis of government documents and public opinion polls, as well as data from 80 interviews of relevant government officials, electric utility executives, NGO leaders and media representatives examining public opinion, and academics. This data yielded observations about the cooperation, conflict and clout in the government's relationships with the electric utilities and the public. These observations support the study's hypotheses on how shocks and relationships have combined to influence Japanese energy policymaking:

These hypotheses emphasize the role of institutional relationships in formation of system lock-in, building on existing literature that depicts institutional support as a key factor. The study adds to this existing body of work by revealing the ways in which these institutional relationships influence the other factors driving lock-in: infrastructure, system interrelatedness and complexity, system momentum, and risk and uncertainty.

The analysis of Japan's energy policymaking trajectory from the oil crises through the Fukushima disaster reflects these features of energy systems that make them

prone to such lock-in. Japan's movement toward a system based on nuclear power demonstrates reliance on infrastructure, system interrelatedness and complexity, institutional support for expansion of nuclear power, and momentum of a nuclear-based system. Japanese policies over the past four decades also reflect downplaying of nuclear energy uncertainty and risk, coupled with attention to uncertainty and risks associated with switching from nuclear power to alternative sources such as renewables. Japan's energy and energy policymaking systems also reflect the concept of combined technological and institutional lock-in described by several scholars.

The study also contributes to the broader public policy literature on breaking policy lock-in by merging two disparate existing theories on how path dependence derails. Exogenous shocks and institutional change each can disturb systems that exhibit lock-in. This study hypothesizes that institutional relationships can positively or negatively influence the transformative capability of external shocks. Analyzing this effect creates a more holistic explanation of disruptions in technological systems that exhibit lock-in. Japan's policymaking responses to shocks and institutional changes reveal how such shocks can alter institutional relationships, as well as how these relationships can inhibit the ability of shocks to alter energy policy path dependence.

The study's findings create a historical narrative of Japan's energy policymaking from the time of the oil crises through the Fukushima disaster. This narrative reflects the correlation between external shocks and institutional relationships, and their combined influence on energy policymaking.

Summary of Findings: Exiting and Reentering Lock-In

The Oil Crises

The study's findings indicate that the oil crises broke Japan's oil-based energy system lock-in by threatening several of the traits that supported this lock-in. In particular, the shocks highlighted the dangers of interrelatedness, as well as the risk and uncertainty associated with a system based on imported fuel sources. The oil crises also challenged institutional support and stalled momentum. Japanese policymakers' clout over and cooperative relationships with the electric utilities and the public supported the crises' pressure for a transition away from an oil-based energy system.

These same relationships enabled a policy shift toward nuclear power without any policy process change. They also contributed to difficulties in responding to future shocks to Japan's energy system, especially as the electric utilities gained clout in energy policymaking while battling safety regulators. The electric utilities' clout increased in tandem with a deepening of the utilities' interest in perpetuating and expanding nuclear power use to recoup start-up costs and achieve economies of scale. This institutional shift contributed to Japan's movement from oil-based energy system lock-in to diversification, then toward nuclear-based system lock-in.

The 1990s and 2000s Accidents and Scandal

During the 1990s and early 2000s, nuclear accidents and safety violation scandals did not catalyze changes in Japan's energy system. They also did not yield significant changes to Japan's energy policymaking process or energy industry structure. Instead, the policies fostered preservation of a nuclear-based energy system and energy policy

lock-in. Japan's energy system reflected signs of nuclear power path dependence: infrastructure development, expanding institutional support, increased momentum, and mitigation of uncertainty and risk.

The government's relationships with the electric utilities and the public contributed to this trend. Interviewees revealed that while the electric utilities increased clout over and sustained cooperation with policymakers, their tensions and the battle for clout with safety regulators worsened. Lack of risk communication perpetuated public acceptance of a nuclear-based energy system. While public trust in the government declined after each shock, it returned shortly, as reflected in interviewees' recollections and public opinion polls. This opaqueness set the stage for a future catastrophe to enable destruction of public trust in the government and incite a call for energy system and policymaking process change.

The Fukushima Disaster

Even a huge shock such as the Fukushima disaster does not appear to have challenged pre-existing relationships between the government and the electric utilities strongly enough to break energy system lock-in. The disaster has endangered the traits that foster energy system lock-in: infrastructure, interrelatedness and complexity, institutional support, momentum and risk and uncertainty. However, interviewees indicated the gradual return of the government's preexisting cooperative relationships with the electric utilities, which has supported preservation of the incumbent nuclear-based system. While public trust has not returned, interviewees' comments and recent

policy changes suggest that the Abe administration continues to make efforts to bolster public confidence, while promoting the return of nuclear power.

Policymakers' cooperation with the electric utilities has protected existing nuclear facilities and hindered creation of infrastructure needed for an energy system shift. The Fukushima disaster exposed the interrelatedness within Japan's energy system, as well as links with many other sectors. As the theory on combined technological and institutional lock-in suggests, these complex structural linkages are coupled with government connections with the electric utilities, as well as the manufacturing sector and others interested in returning to the status quo. At the same time, public distrust has hindered the government's ability to provide overt institutional support for nuclear power since the disaster. However, policymaker-electric utility cooperation has fostered institutional changes in safety regulation and market structure aimed at rebuilding public trust with minimal change to the existing nuclear power program. The Fukushima disaster halted momentum of Japan's nuclear-based energy system. And yet, prior momentum built through the system's interrelated elements and stakeholders' vested interests is pressuring the return of nuclear power. While safety risk has moved to the forefront of policy discussions and public attention, institutional changes resulting from the disaster have injected financial uncertainty that affects the electric utilities' investment decisions. If this trend continues, Japan's energy system may shift gradually away from nuclear power.

The Fukushima nuclear disaster shocked Japan's energy and energy policymaking systems, at least in the short term. Ultimately, recovery of pre-3/11 institutional

relationships will determine whether the disaster forces significant, lasting change in Japan's energy system and policymaking process.

A Model for Relationships' and Shocks' Influence on Energy Systems

Japan's experience offers five broad conclusions that can serve as a model for understanding how institutional relationships affect the influence of external shocks on national energy policymaking.

First, both cooperation and conflict in institutional relationships can perpetuate or challenge an existing energy system. Cooperation between electric utilities and policymakers can support positive change in an energy system, as it did in Japan after the oil crises. Such cooperation also can perpetuate lock-in of energy systems and policies that stifle innovation and resilience, as reflected in Japan's energy policies during the 1990s and 2000s. Cooperation between electric utilities and regulators can create effective, realistic regulations that build safety and resilience in an energy system. It also can result in "regulatory capture" that can threaten an energy system by failing to build resilience.

Second, conflict between policymakers and electric utilities can create distance between the two groups that allows policymakers to choose policies based on priorities other than electric utility interests (e.g., consumer choice, lower electricity prices, and environmental concerns). As reflected in Japan during the period of scandal and accidents in the 1990s and 2000s, conflict also can stymie change if the electric utilities have clout, since the utilities must implement the government's policy shifts.

Third, conflict between safety regulators and electric utilities can create a healthy dialogue on realistic regulations and strict oversight that builds resilience in an energy system. However, if conflict leads the electric utilities to violate or disrespect regulations, and/or if it leads the regulators to develop unrealistic regulations, a dysfunctional regulatory system will result, jeopardizing the energy system. Japan's nuclear reactor regulatory problems, publicly revealed during the 2002 scandal, demonstrate this effect.

Fourth, cooperation between the government and the public can perpetuate a locked-in system, or it can break such lock-in. Japan's 1990s-2000s energy system stasis reflects continued lock-in, while the dramatic energy system shift after the oil crises embodies breakage of lock-in. By contrast, public lack of trust in the government can encourage policymakers to make changes in an energy system that exhibits lock-in, but it also can hinder such change if it sends an unclear mandate to policymakers or results in a lack of support for changemakers. Japan's situation immediately following the Fukushima disaster demonstrates this complex effect.

Fifth, formal institutionalization of electric utilities' clout in energy policymaking can contribute to a government's inability to change energy policy when new shocks to the energy system occur. The electric utilities' formal role in Japan's energy policymaking process contributed to the government's preservation of existing policies during the 1990s and 2000s accidents and scandal. Removal of this formal role after the Fukushima disaster has enabled change, though the significance and permanence of these changes remain in question.

Japan's experience also demonstrates that the government's relationships with the electric utilities and public influence not only whether change takes place after a shock, but also the pace of change, as well as whether change takes place within the existing system or causes a transformation away from it. If the changes take place within the system, they can preserve lock-in.

Japan's energy system trajectory also offers some specific insights on the influence of public trust in the government and public trust in an energy technology. This dissertation's findings suggest that if public trust in the government is coupled with distrust in technology, trust in the government trumps technological distrust and enables a shift away from the existing system if the government chooses transformation. This scenario occurred after the oil crises. Public trust in the government and distrust of the energy technology also can permit continuation of the existing energy system if the government prefers the incumbent system. This scenario occurred after the 1990s and 2000s shocks. During this period, the public gradually lost some trust in both nuclear technology and the government's ability to manage it. As a result, when the Fukushima disaster occurred, the public already had begun to distrust the existing energy system. The Fukushima disaster completely depleted public trust in both nuclear technology and the government's ability to regulate it. This double distrust catalyzed public calls for a new system and a new policymaking process, suggesting that the loss of public trust in both the government and the technology opens the possibility for energy system change. This lack of public trust also can hinder government efforts to change the energy system, since the public doesn't trust the government to make good decisions.

Limitations and Future Research: Relationships and Case Comparisons

The focus on the government's relationships with electric utilities and the public offers valuable insights due to the importance of these relationships in shaping policymaking responses to shocks. The study's interview data supports the assumption that the government's relationships with the electric utilities and the public wield the greatest influence on energy policy and policymaking process changes after shocks. This said, these relationships are part of a broader network of energy policy stakeholder groups. Examination of several other sets of relationships in this network would offer an even more holistic view. These include intragovernmental relationships, the government's relationships with the manufacturing sector, and the role of the media as an interlocutor between the government and the public. This study's interview data suggests that changes in these relationships will support the findings on the influence of relationships and shocks on energy system change.

This study's findings also suggest that the transformational power of the relationship between the local government and the public merits further exploration. Interview data indicates that this relationship has the potential to counter the influence of other relationships and deepen the influence of external shocks on energy policy change.

Intragovernmental Relationships

The interview data for this dissertation confirms repeatedly that intragovernmental relationships are intertwined with government relationships with the public and the energy sector. Government interviewees emphasized the role of relationships between METI's energy-related offices, between METI and MOE, and

between the central government and local governments in energy policymaking. The NRA's relationships with METI and MOE also would offer useful insights. In particular, interviewees highlighted tensions between these groups that grew as their missions blurred or conflicted due to shocks and institutional changes. While this study touches briefly on these relationships, the findings warrant a more detailed analysis.

Manufacturing Sector Relationships with the Government and the Electric Utilities

The interview data also confirms that the government's relationship with the manufacturing sector wields considerable influence on Japan's energy policymaking. As mentioned in chapter three, existing studies suggest that the manufacturing sector typically competes or coordinates with, but does not trump, the electric utilities for influence over energy policymaking. However, as large electricity users, these companies have relationships with the government and the electricity utilities that influence energy policies through pressure on the government to lower electricity prices. They also can operate as electricity producers if they have access to the grid, a role some companies are beginning to explore. Relationships with the electric utilities and the government affect this potential. Examination of these effects on energy policymaking after a shock will provide a more nuanced analysis of the ways in which institutional relationships affect shocks' ability to alter energy systems.

Media's Relationships with the Electric Utilities and the Public

The media's relationships with the energy sector and the public represent a third area of future research emerging from the interview data. Existing studies indicate that government-media relations do not directly alter energy policymaking. However,

interviewees' comments indicated that the media plays a crucial role in shaping the public's attitude toward the government, government policies, and the electric utilities. As a result, the media also influences the government's relationships with the electric utilities. The interview data suggests that the media's influence on public opinion wields particular importance after shocks occur, reflecting a need to incorporate this relationship into the analysis.

Local Government's Relationships with the Public

Existing research on local government relationships with local communities reflects movement away from Japan's nuclear-based energy system.²³⁹ Further study is needed on this relationship's potential for breaking national energy system lock-in one community at a time. This study's interview data suggests that if local governments and local communities conflict with the central government while cooperating with each other after a shock, this effect could lead to energy system change at the local level. Evidence from this study suggests that such local change could occur despite stasis at the central government level.

Case Comparisons

Japan's case offers some compelling insights on the influence of relationships and shocks on resilience and innovation. However, application of these lessons to other nations or localities depends on the similarities and differences between relationships in Japan and these other cases. Comparisons with other nations that feature similar institutional relationships would enable confirmation and expansion of the insights

²³⁹ E.g., see Aldrich 2013a, Andrew DeWit 2014, and Samuels 2013.

developed here.

Existing literature indicates that the United States and France seem to have similar relationships with the electric utilities.²⁴⁰ While the formal and informal roles of the electric utilities in these nations' policymaking structures may differ, the literature's depiction of the influence on policymaking resembles Japan's situation. Case studies of the United States and France thus would provide evidence to supplement the findings from Japan's case. These additional studies will contribute to further development of a model for understanding how shocks and institutional relationships influence energy policymaking. Germany's trajectory also offers an interesting comparison, as institutional relationships have fostered energy system transformation, while exploiting external shocks to promote this shift.²⁴¹ Examination of the influence of relationships and shocks on these three nations' energy policymaking trajectories will contribute to more generalizable lessons for resilience and innovation in energy systems.

Japan's Energy Future: Path Dependence or Independence?

This study's findings suggest that Japanese policymakers' relationships with the electric utilities eventually will return to cooperation after shocks, regardless of the size. The utilities also will regain some clout in policymaking, while continuing their battle with safety and economic regulators. Policymakers also will continue efforts to regain public trust until they succeed. The findings also suggest that these trends will contribute to the return of the incumbent energy system, while perpetuating regulatory tension that could contribute to future shocks and challenge responses to them.

²⁴⁰ E.g., see Hirsh and Sovacool 2006 and Haugland, et al. 1998.

²⁴¹ E.g., Stefes and Laird 2010 and Jordan-Korte 2011.

One trend could jeopardize this scenario. To date, local public opposition has slowed nuclear reactor restarts and resumption of new reactor construction. If this trend of conflict and increased public clout at the local level becomes more widespread, it may limit the return of nuclear power, despite policymaker-utility cooperation and clout over the public at the central level. As previously mentioned, if local community cooperation with local government officials combines with conflict with the central government, these institutional relationships have the potential to break Japan's nuclear-based energy system lock-in from the bottom up, one community at a time.

The study's findings also suggest the continued rise of coal and constrained renewables growth, supported by the return of the government's cooperative relationship with the electric utilities and clout over the public. Once again, local efforts could alter this scenario if the public coordinates with electricity providers to develop distributed generation focused on renewables.

In addition to these local efforts that could disrupt a return to a nuclear-based system, this study also unearths some broader proposals on building energy system resilience without lock-in. Interviewees' comments revealed that resilience transcends the ability of an energy system to withstand shocks. Japan's narrative indicates that true energy system resilience involves the flexibility and ability of institutions to adapt to a shock in ways that are the least disruptive to the energy system's goals, while averting new lock-in. Creation of this kind of resilience requires adjustment of some of the features that create lock-in, including system interrelatedness, institutional support, and risk and uncertainty.

Interrelatedness

The study highlights the interconnectedness within Japan's energy system, as well as its connections with other systems. The study's findings reveal that connections between Japan's nuclear power program and the nuclear fuel cycle have caused additional challenges after the Fukushima disaster. The shutdown of the nuclear reactors has created a dilemma regarding reprocessing. Reprocessing addresses Japan's spent nuclear fuel problem, but without operating reactors, new fuel will accumulate without a plan for its use.

Japan's experiences also demonstrate the interconnectedness of the energy system with other systems. After both the oil crises and the Fukushima disaster, energy system failures led to increased electricity prices. Both the price increases and conservation measures led the manufacturing industry to raise product prices for consumers.

While no good solutions to these problems have emerged, they do provide a lesson: crafting an energy system requires a comprehensive look at the chosen energy sources and linkages between them and other parts of the energy system, as well as other sectors and systems. This evaluation can contribute to policies that can help to build system resilience by addressing the ripples shocks can cause in these interconnected systems. In addition, local efforts to develop distributed generation may enable unique solutions to these problems, linking the local economy to successful energy system innovation.

Institutional support

In addition to the lessons on institutional relationships, Japan's energy system narrative offers insights on regulatory and transparency features that can foster flexible institutional support.

Regulatory Realism...without Capture

Government documents and much of the literature analyzing the Fukushima disaster attributed problems to regulatory capture and cooperation between safety regulators and the electric utilities. Interviewees' comments divulged a completely different, but equally problematic relationship. The scandal and accidents that occurred because of the conflict and battle for clout between Japan's electric utilities and safety regulators revealed that such conflict can cause as much damage as capture.

Several institutional design features can facilitate an environment of cooperation without regulatory capture. Government and electric utility interviewees broadly agreed that a regulator independent from the government's policymaking functions can regulate more effectively. At the same time, communication between regulators and the electric utilities remains necessary for creation of a realistic regulatory framework that enables compliance. Conversely, poor communication between the regulators and the regulated can lead to ineffective regulations that contribute to shocks. Many interviewees highlighted transparency as the key to solving this problem while building public trust.

Transparency

All three groups' interviewees highlighted the need for more transparent energy policies. However, the Fukushima disaster revealed that the government and the public define transparency differently. While the government has focused on increasing the

transparency of information conveyed about energy policies, the public seeks transparency of the process and considerations behind the policies. This disconnect has yielded government explanations of energy policies -- the results of an opaque policymaking process -- in order to regain public trust. These efforts have not engendered this trust, since the public is seeking greater openness in the process and explanation of the priorities that shape the policies. Implementing such transparency might enable the government to regain clout over policymaking by building trust in the government's decisions, as well as understanding of the need for policymakers' and regulators' cooperation with the electric utilities to ensure realistic policies and regulations.

Risk and Uncertainty

Japan's story of safety risk communication failure and its negative effect on public trust demonstrates the need for governments and electric utilities to share and convey realistic risk expectations and trade-offs with each other and the public. A lack of transparency regarding energy technology risks -- including safety, but also energy security, environmental and economic risks -- leads to public distrust when these risks reveal themselves through shocks.

By demonstrating the ways in which shocks can create rifts between groups' risk perceptions and priorities, Japan's narrative can help to explain current and future energy policy conflict and inform domestic and international energy cooperation. From the oil crises until the Fukushima disaster, the Japanese government, the electric utilities and the public cooperated on nuclear power expansion as a solution to energy security, economic

and environmental risks and priorities. The Fukushima disaster moved safety risk to the forefront for the public, while the electric utilities continued to prioritize economics. The government has continued to prioritize energy security, with economics a close second, and safety a necessary caveat. This discrepancy between their priorities has contributed to conflict between these groups.

Japan's weakened climate change goal after the Fukushima disaster, which has caused pushback from the United States, demonstrates a similar effect on a larger scale. When shocks influence alignment of national priorities and risk perceptions, they can create similar conflict between countries' governments.

Japan's situation also indicates the importance of financial risk in preserving incumbent systems and preventing system transformation. Electric utility interviewees indicated that their firms prefer to maintain the incumbent system as long as it compensates them for their financial investments. Risk and uncertainty associated with a shift away from the incumbent system thus can limit innovation.

Innovating Out of Energy System Lock-In?

Innovation at the local level has the potential to break Japan's energy system lock-in. The oil crises offer a precedent for sparking innovation within and outside of Japan's incumbent energy system. This innovation emerged in response to government incentives such as the TopRunner program. The interview data suggests that after the Fukushima disaster, three drivers have led to innovation: the belief that renewables innovation will create jobs, efforts to gain local control over energy supply, and the promise of financial gain due to public demand. Examples of the third incentive include

the electric utilities' innovations on efficient heat pumps, which interviewees indicated they developed in response to consumers' interest in more efficient products that would lower their electricity bills.

This energy innovation is occurring with some central government support. MOE is making efforts to create an environment conducive to such innovation. METI is encouraging the electric utilities to position themselves as innovators, rather than incumbents threatened by innovation. The public has indicated a willingness to pay for this innovation through higher electricity prices, because they believe renewables will make the energy system more resilient. This evidence suggests that cooperative relationships between policymakers, regulators, electric utilities and the public can enable innovation to arise from external shocks if these groups' priorities and risk perceptions align to promote energy system change. If their priorities and risk perceptions are aligned to preserve the status quo, little innovation will result.

The public's distrust of Japan's energy policy process after the Fukushima disaster has generated calls from NGOs, and even some government officials, for energy policymaking process reform. Suggestions include more opportunities for public involvement, some devolvement of policymaking to local governments interested in distributed generation, and introduction of more transparency measures in the policymaking process. Deliberative polling offers one example of such innovation. This potential for policy process innovation after a shock offers an opportunity to build cooperation across groups while redistributing clout, along with some responsibility for energy policy results. These types of changes can build resilience in a nation's

policymaking process as well as in the energy system itself.

If local cooperation on energy system change and innovation continue, gradual breakdown of Japan's energy system lock-in appears possible. Signs of central government support for this innovation bolster this potential. At the same time, the central government's relationships with the electric utilities and the public indicate preservation of nuclear-based energy system lock-in, supported by coal and natural gas.

The central government continues to control policy incentives and regulations. The electric utilities control transmission lines, while wielding power as incumbent electricity suppliers as well as energy resource purchasers. As such, the resilience of new, locally-driven energy systems likely will depend on cooperation between local government-public partnerships, the central government, and the electric utilities.

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Her 20 years of energy policy experience have led Jennifer F. Sklarew to a career of teaching and research on U.S.-Japan energy policymaking. She has designed and taught a course on energy policy in George Mason's Environmental Science and Policy program. Dr. Sklarew previously served as an international trade specialist in the U.S. Department of Commerce's Office of Japan, where she led her office's work on Japanese electricity and gas deregulation, as well as the Asia-Pacific Partnership on Clean Development and Climate. As a 2003-2005 Mike Mansfield Fellow, she spent a year working in Japan's Ministry of Economy, Trade and Industry, Ministry of Foreign Affairs, Cabinet Office, and a Diet member's office. Prior to entering the government, Dr. Sklarew worked as a Washington, DC-based energy policy consultant to Japanese utility companies and as rapporteur for the Council on Foreign Relations' Energy Security Group. She began her policy career as a policy analyst for the Japan Nuclear Cycle Development Institute.

Dr. Sklarew has published and presented widely on energy policy issues throughout her career. A member of the Council on Foreign Relations, she received her MA in Japan studies and international economics from Johns Hopkins' School of Advanced International Studies (SAIS) and her BA in English with a minor in Asian Studies from the University of Pennsylvania.