



## Crumbling Dream: Japan's Nuclear Quest, 1954-2011

Steven Tolliday

On the eve of the earthquake and tsunami of March 11, 2011, Japan was producing nearly 30 percent of its electricity from fifty-four nuclear reactors and planning to double this share by building a further fourteen new reactors in the next twenty years. One year later, not a single Japanese reactor was still in commercial operation, and at least twelve of them will never reopen. The nuclear dream had crumbled. This article considers why the Japanese nuclear power industry was so cherished and so vulnerable. Why did Japan place its bets so heavily on a nuclear future and then not watch over them better than it did? This is a massive topic, but the article begins to sketch out some key factors, considering in turn the role of business-government relations; corporate structures and governance; and the problems of Japanese energy security in a changing international political and economic order.

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Japan is famous for its engineering and scientific skills. Its orderliness and social solidarity are admired worldwide. Yet its nuclear history is full of monopolies and lavish subsidies, of cosy business-government relationships behind closed doors, and of plans and targets that fall somewhere between “bold and ambitious” and borderline fantasy. The conduct of the industry has been marked by error and malpractice, data falsification, the concealment of incidents, and the denigration of risk. And on March 11, 2011, it came close to catastrophe. The prime minister, Naoto Kan, subsequently acknowledged that his government had even considered evacuating Tokyo as it contemplated a realistic possibility of a release of nuclear radiation ten times worse than Chernobyl. Disaster was averted only through life-risking efforts by fewer than seventy workers inside the plant, while police and Self Defense Forces desperately towed emergency generators along narrow roads to the reactor, and fire-fighters and

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helicopters hurled whatever water they could lay their hands on onto the plant to prevent an imminent nuclear meltdown.<sup>1</sup>

All this happened not in a decaying authoritarian state policed by unaccountable apparatchiks or in the midst of civil war, but in a well-ordered modern state. If such a disaster can happen in Japan, we may have more to fear from the operation of civilian nuclear power in less well-ordered states such as Iran and North Korea than from their projects to build nuclear bombs.

The Japanese people came to believe a “safety myth” that led them to cram fifty-four nuclear reactors into one of the world’s most earthquake-prone zones. Seismologists have long warned of the dangers, and documents recently released through Wikileaks show that in 2008 the International Atomic Energy Agency issued warnings of “serious problems” at Japanese reactors in the event of a major earthquake.<sup>2</sup>

The March 2011 tsunami reached a peak of 38 meters and caused 20,000 deaths. The undersea quake was 150km off Japan’s northeast coast, registered 9.0 on the Richter scale, and lasted 6 minutes. It was the most powerful quake ever recorded in Japan and the fourth most powerful in the world since records began in 1900. (Note that the Richter scale is logarithmic, so that 9 is 500 times stronger than 7 - Kobe was 6.8). 80,000 residents have been evacuated on a long-term basis from a 20km perimeter around the Fukushima reactors. The overall cost of the disaster is put at \$300 billion (compared to \$125 billion for Hurricane Katrina).<sup>3</sup>

Japan is home to 20 percent of all significant world earthquakes and is famous for the stringency of its building regulations. Tohoku, where Fukushima is situated, is one of the most tsunami-prone regions of the world. Comparable tsunamis of around 38m were recorded in 1896 and 1932 in this region, both killing thousands. The 1896 tsunami wiped out many of the settlements destroyed again in 2011. The underlying cause is the massive Pacific plate sliding under the eastern edge of the Eurasian plate; the possibility of further similar shocks remains high.<sup>4</sup>

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<sup>1</sup> “Naoto Kan: ‘Japan Was Invaded by an Invisible Enemy,’” Interview, 28 Nov. 2011, published in translation by PBS, 28 Feb. 2012; URL: <http://pbs.org/wgbh/pages/frontline>. For the most recent full-length overview of the events, see Susan Carpenter, *Japan's Nuclear Crisis: The Routes to Responsibility* (New York, 2012), which appeared too late for me to take into account for this article.

<sup>2</sup> As reported in the *Daily Telegraph*, 15 March 2011; David Edwards, “IAEA Warned Japan That Quakes Could Be Too Much for Nuclear Facilities, Leaked Cable Reveals”; URL: <http://www.rawstory.com/rs/2011/03/16>.

<sup>3</sup> For a succinct summary of the basic facts of the earthquake/tsunami, see Jeff Kingston, “Introduction,” in *Natural Disaster and Nuclear Crisis in Japan: Response and Recovery after Japan's 3/11*, ed. Jeff Kingston (New York, 2012); see also, *The Economist*, “Special Report: Nuclear Energy,” 10 March 2012.

<sup>4</sup> Vaclav Smil, “Japan’s Crisis: Context and Outlook,” *The American* (16 April 2011); URL: <http://www.american.com/archive/2011/april>.

Yet no Japanese reactor has been designed to withstand a Level 9 earthquake. The plants at Hamaoka and Kashiwazaki-Kariwa are both on even more dangerous fault lines than Fukushima and are much closer to Tokyo. Kashiwazaki was designed to resist a 6.5 earthquake, and Hamaoka was designed to resist an 8, but the Fukushima quake was a 9. A similar incident in these more southerly plants would probably have forced the evacuation of Tokyo. And this is not idle speculation. In July 2007 Kashiwazaki was hit by a 6.8 magnitude quake that resulted in a catastrophic breakdown and (though there was no escape of radiation) resulted in a three-year closure of the plant for repair.<sup>5</sup>

Why did the Japanese nuclear power industry come to operate on such a perilous basis? Why did Japan go against the tide and continue nuclear expansion when the United States and Europe were pulling back from the perceived risks? Why did Japan place its bets so heavily on a nuclear future? The causes are of course complex: a mixture of national strategic needs, ill-suited governance systems, external economic and strategic pressures, and dysfunctional political and bureaucratic systems. Like the economic ideologies that drove the “bubble economy” or the myths of “encirclement” that drove Japanese imperialism, Fukushima was the product of a system and an underlying mentality that have been tested (almost) to destruction.

This essay begins to sketch out some of these factors by considering in turn the role of business-government relations, corporate structures and governance, and the problems of Japanese energy security in a changing international political and economic order.

### **Business and Government: Japan's “Nuclear Quest”**

As we shall see in more detail later, Japan lacks natural energy resources and is the largest importer of energy in the world. For sixty years it has been almost a doctrine of national policy that nuclear power is the route by which Japan can achieve energy security. Japan has been the international standard bearer for nuclear power in the late twentieth and the twenty-first century. No other country (not even France) has had such ambitious plans to expand its nuclear capacity in this period. Domestically there have been no major political battles and little contention or bitterness over the policy. As Michael Donnelly has put it: the “nuclear quest” appears “as a kind of national exercise in applied engineering.”<sup>6</sup>

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<sup>5</sup> Citizens' Nuclear Information Center, “Open Letter Concerning IAEA's Kashiwazaki-Kariwa Nuclear Power Plant Earthquake Damage Investigation,” 7 Sept. 2007; URL: <http://cnic.jp/english/topics/safety/earthquake/kkiaea20sep07.html>; Fukushima Daiichi Investigation Committee on the Accident at the Tokyo Electric Power Station, *Interim Report 26*, Dec. 2011; URL: <http://icanps.go.jp/eng/interim-report.html>.

<sup>6</sup> Michael W. Donnelly, “Japan's Nuclear Energy Quest,” in *Japan's Foreign Policy after the Cold War: Coping with Change*, ed. Gerald L. Curtis (New York, 1993), 179-80.

Nuclear power is often presented as a case of long-term strategic planning and development by MITI (Ministry of International Trade and Industry): MITI as a strong and prescient “pilot.” In some interpretations, MITI, in alliance with the Electric Power Companies (EPCs) and corporate and media elites, has pursued nuclear power at all costs. Some commentators have likened it to the way the military establishment drove Japan's imperial ambitions along the road toward disaster in the 1930s, ignoring or crushing all opposition. State-centered policy networks have faced little overt political opposition in the Diet, and the courts have been reluctant to rule against them. There have been disagreements over tactics and emphasis but all behind closed doors. The key issues are not aims but how to get there.<sup>7</sup>

It is certainly true that policy and institutions for nuclear power have been insulated from everyday politics. They are framed within a highly legalistic framework that embodies large scope for bureaucratic discretion in policymaking and implementation. Everything from R&D to safety to commercial applications is regulated through specific legal frameworks and institutional structures based on the Atomic Energy Basic Law and its revisions, with powers allocated to various government agencies that have codified, formal, and legal powers to regulate safety, licensing, liability, compensation, and so forth. The key advisory bodies report directly to the prime minister (not the Diet), and the key personnel in the agencies are directly appointed by the prime minister, who is obliged by law simply to “fully respect” the recommendations of the bodies he appoints.<sup>8</sup> The government institutions (most notably MITI and the Science and Technology Agency [STA]) form the hub of a public/private “policy community” (often referred to as the “nuclear village”). There has been consensus on aims since the 1950s, and tight-knit personal contacts are reinforced by *amakudari*, revolving doors between government and business, and shared interests and ideas.<sup>9</sup>

Until the 1980s this was a highly insulated community. But since then it has gradually become more permeable to the outside world, particularly because the issue of reactor siting has created a need to relate to local communities. Japanese laws on property rights have made the government wary of using compulsory purchase or coercion; government has

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<sup>7</sup> Gavan McCormack, “Hubris Punished: Japan as Nuclear State,” *Asia-Pacific Journal* 9 (3 April 2011).

<sup>8</sup> Donnelly, “Japan's Nuclear Energy Quest,” 186-87.

<sup>9</sup> Linda Cohen, Matthew McCubbin, and Francis M. Rosenbluth, “The Politics of Nuclear Power in Japan and the United States,” in *Structure and Policy in Japan and the United States*, ed. Peter Cowhey and Matthew McCubbins (Cambridge, England, 1995), 177-202; Peter Dauvergne, “Nuclear Power Development in Japan: ‘Outside Forces’ and the Politics of Reciprocal Consent,” *Asian Survey* 33 (June 1993): 576-78; S. Hayden Lesbirel, “Implementing Nuclear Energy Policy in Japan: Top-Down and Bottom-Up Perspectives,” *Energy Policy* 18 (April 1990): 267-82.

preferred to engage in bargaining with localities while ensuring that local struggles do not coalesce behind national programs.<sup>10</sup>

However, others have seen this in a very different way. Tessa Morris-Suzuki has argued that the situation is one of “a labyrinthine confusion of coexisting, overlapping and sometimes conflicting policies implemented by a host of different ministries and agencies, many of whom seem bent on competition rather than co-operation.” The fabled coherent strategic planning was more sound and fury than reality. As Morris-Suzuki puts it: “It is not that there was no plan, but rather that there were any number of plans, most of them endowed with grandiose titles [basic strategy, long-term vision, fundamental outline, etc.] which belied their fairly speculative contents.” The plans did not chart an immutable course. Rather they disseminated information, stirred debate, exerted pressure from the top, or simply strengthened a case for an enlarged budget.<sup>11</sup> They were consistently over-optimistic about the future of nuclear power (often wildly so). Often grand plans blazed for a few moments and then were quietly dropped. MITI's 1986 White Paper outlined a vision for 120 nuclear reactors by 2030 that soon dropped out of sight. The 1975 Ten-Year forecast of nuclear generation for 1985 turned out to be treble the actual outcome.<sup>12</sup>

In a similar vein, Richard Samuels portrays MITI as internally divided and possessed of only weak sanctions over private industry in this sector. His picture is one of continual conflict, negotiation, and bargaining between state and industry over jurisdiction and control. For him, industry has usually had the upper hand over pricing, technology, and production while MITI has lavishly supported it with subsidies, guarantees, and favors. Samuels goes so far as to say: “Nowhere have MITI ambitions been more thoroughly frustrated than in nuclear power.”<sup>13</sup> Samuels' discussion is subtle and complex, but it is marred by an overly black and white notion of “power.” He argues that MITI had extensive formal powers and jurisdiction but was unable to achieve the “unchallenged leadership” of the nuclear industry that its leaders sought. But comparing MITI's actual power to a yardstick of “unchallenged power” is unhelpful. The reality was one of changing contexts and strategies and shifting coalitions around various issues where the dividing lines as often ran through both government agencies and their business allies as between them.

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<sup>10</sup> Daniel P. Aldrich, *Site Fights: Divisive Facilities and Civil Society in Japan and the West* (Ithaca, N.Y., 2008); S. Hayden Lesbirel, *NIMBY Politics in Japan: Energy Siting and the Management of Environmental Conflict* (Ithaca, N.Y., 1998).

<sup>11</sup> Tessa Morris-Suzuki, *The Technological Transformation of Japan* (New York, 1994), 177.

<sup>12</sup> Dauvergne, “Nuclear Power Development in Japan,” 581.

<sup>13</sup> Richard J. Samuels, *The Business of the Japanese State* (Ithaca, N.Y., 1987), 234.

MITI's elegant and coherent long-term plans were often nodded through by the EPCs at the top table, but then did not materialize so neatly in operational choices in practice. Many bureaucrats experienced bruised egos and frustration as a result. The bureaucracy itself was also internally divided with very different cultures and scientific time horizons at the STA and MITI.<sup>14</sup>

The EPCs were philosophically and actively supportive of an ambitious nuclear power program, but they did not want to have to finance its development. On the other hand, they did not want to stand aside and let the new high-tech projects become owned and managed by government. They generally preferred to focus on medium-term commercial solutions and low-risk options (for example, Light Water Reactors [LWR] rather than Fast Breeder Reactors [FBR]) rather than long-term strategic development.<sup>15</sup> Along the way, they often tried to play off the STA against MITI to their own advantage, and there is a complex story to be told of how both EPCs and MITI/STA maneuvered for position in the political sphere where the Liberal Democratic Party (LDP) and its factions were critical allies.

In the 1950s and 1960s, MITI drove catch-up industrialization in steel and heavy industry and promoted a rapid transition from coal to oil in industry. It also pushed ahead a giant leap forward in Japan's entry into the computer industry.<sup>16</sup> But this sort of initiative could not be replicated in nuclear power. The big computer projects were generic technology projects to develop the architecture of systems that would then act as platforms for rival commercial firms to develop their own projects. But the nuclear project aimed at a single technological product that would be shared across the private sector but not create technological competition between firms.

What MITI could do effectively was to pragmatically develop domestic nuclear power by assisting the import of proven foreign nuclear know-how (Light Water Reactors—LWRs) as the quickest route to commercial operations, utilizing favored access to technology under the umbrella of the U.S. alliance and close U.S.-Japanese inter-corporate alliances for technology transfer (for example, TEPCO and GE or Kansai Electric Power

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<sup>14</sup> Daniel Kaufmann, "Preventing Nuclear Meltdown: Assessing Regulatory Failure in Japan and the United States," Brookings Institution, 1 April 2011; URL: [http://www.brookings.edu/opinions/2011/0401\\_nuclear\\_meltdown\\_kaufmann.aspx](http://www.brookings.edu/opinions/2011/0401_nuclear_meltdown_kaufmann.aspx) 1.

<sup>15</sup> Samuels, *Business of the Japanese State*, 247-52; Takeo Kikkawa, "The Role of Matsunaga Yasuzaemon in the Development of Japan's Electric Power Industry," *Social Science Japan Journal* 9 (Oct. 2006): 215-16.

<sup>16</sup> Marie Anghodoguy, *Computers Inc.: Japan's Challenge to IBM* (Cambridge Mass., 1989).

and Westinghouse).<sup>17</sup> However, this aroused fears that Japan would be left behind in “technologies of the future” (such as jets, space, or nuclear) and remain perpetually dependent on U.S. technology. One result was a demand in certain quarters for more emphasis on indigenous development of basic research capacity. In terms of nuclear policy, this was the starting point for long-term plans to achieve “energy security” and an “autonomous” nuclear fuel cycle that could free Japan from the restrictions of dependence on imported energy through hugely ambitious projects for Fast Breeder Reactors. In everyday terms, these are “reactors that create their own fuel,” a sort of holy grail in the nuclear industry—a hugely complex technical project that was adopted as the centerpiece of Basic Energy Plans in the 1960s, and that has remained an alluring and perhaps crazy dream for the Japanese nuclear industry ever since.

### **The Dream of the Fast Breeder Reactor**

The Fast Breeder Reactor embodies “a dream of eternal, almost limitless energy that has inspired the imagination of generations of Japanese bureaucrats and politicians” and eaten up vast sums of money.<sup>18</sup> The key feature of the FBR is that it would not require large quantities of “new” imported uranium and plutonium to run. Instead FBRs can use reprocessed spent fuel from other reactors in the form of MOX (mixed uranium oxide) produced by utilizing separated waste plutonium oxide and uranium oxide from LWRs as the key ingredient in the new reactor fuel.<sup>19</sup> In 1956 the Japan Atomic Energy Commission (JAEC) announced long-range plans to create breeder reactors to “close the nuclear fuel cycle” and ultimately lay the basis for full national energy independence. The project was a major factor in the creation of the Science and Technology Agency as an autonomous entity within MITI in 1957 with oversight of nuclear power projects and a commitment to research and development of new technologies. The STA went on to sponsor the various public corporations (notably PNC—Power Reactor and Nuclear Fuel Development Corporation), which oversaw the development of the FBR

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<sup>17</sup> Samuels, *Business of the Japanese State*, 237-39; Morris Low, Shigeru Nakayama, and Hitoshi Yoshioka, *Science, Technology and Society* (New York, 1999), 78; Shigeru Nakayama, *Science, Technology and Society in Postwar Japan* (London, 1991), 150-51.

<sup>18</sup> McCormack, “Hubris Punished,” 1.

<sup>19</sup> Susan E. Pickett, “Japan’s Nuclear Energy Policy: From Firm Commitment to Difficult Dilemma Addressing Growing Stocks of Plutonium, Program Delays, Domestic Opposition and International Pressure,” *Energy Policy* 30 (Dec. 2002): 1339.

from the first Joyo prototype in 1965 to the opening of the commercial Monju reactor in 1995.<sup>20</sup>

In the 1960s and 1970s MITI's White Papers placed the FBR at the heart of Japan's strategy for self-sufficiency, and until the early 1970s all Western European and North American governments with nuclear power programs had fast breeder reactors as significant elements. By the late 1970s nearly all of them had cancelled or suspended their FBRs, and by the early 1990s all European breeder projects had been terminated. While the rest of the world decided FBR technology was too difficult and expensive and set it aside, Japan clung to the dream.<sup>21</sup> As Susan Pickett puts it, since the 1980s Japan has been "locked into a technology path that has less than favourable economics and a shrinking number of proponents."<sup>22</sup> Japan was the "last man standing" in global FBRs when it opened its Monju FBR in 1995.

Monju was probably the most expensive industrial facility ever built in Japan when it opened. Ironically, within a few months, Monju was closed down because of a dangerous sodium leak in its cooling system. Although no radiation escaped, the image of the plant was severely damaged, and this was exacerbated some years later when it was revealed that management had tried to cover up the seriousness of the leak by doctoring internal videos of the accident. Seventeen years later, the Monju reactor has still not reopened.<sup>23</sup>

Although the private EPCs built and managed Monju and its experimental predecessors and the big supplier groups like Mitsubishi Heavy Industries, Toshiba, and Hitachi designed and constructed the plant, the project was almost risk-free for the private sector. The EPCs paid for only 15 percent of the costs of Monju (even excluding huge government "compensation" payments made to the local host community to persuade them to accept the reactor). MITI funded almost the entire operation, and management and research staff rotated through the EPCs from STA and MITI. The EPCs were happy to keep a foot in the door, but they never accepted MITI's arguments that national imperatives of energy security should trump costs in relation to technology choice. They never

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<sup>20</sup> Pickett, "Japan's Nuclear Energy Policy," 1338-44; Hitoshi Yoshioka, "The Rise and Fall of Fast-Breeder Development in Japan," *Science Studies* 9, no. 2 (1996): 14-26.

<sup>21</sup> Dauvergne, "Nuclear Power Development in Japan," 585; Low, Nakayama, and Yoshioka, *Science, Technology and Society*, 78-79.

<sup>22</sup> Pickett, "Japan's Nuclear Energy Policy," 1338.

<sup>23</sup> CNIC, "Restarting Monju: Like Playing Russian Roulette," 6 March 2012; URL: <http://cnic.jp/english/newsletter/nit134/nit134articles/monju.html>. Also see the startling evidence of the doctored videos released by Wikileaks in January 2008; URL: [http://wikileaks.org/wiki/Monju\\_nuclear\\_accident\\_video\\_1](http://wikileaks.org/wiki/Monju_nuclear_accident_video_1).

really believed in the commercial future of FBRs and always demanded massive guarantees and subsidies for their wary participation.<sup>24</sup>

Not only was FBR technology over-expensive and technically dubious, but it also locked the Japanese industry into a further parallel mammoth project. The Monju project was often referred to as “a mansion without a toilet,” because Japan lacked the essential capacity to reprocess its own waste to feed the FBR.<sup>25</sup> A full FBR program required the simultaneous development of FBRs and reprocessing. FBRs without national reprocessing capacity still depended on foreign fuel supplies. On the other hand, if Japan had reprocessing and not enough FBRs, it would just be stockpiling dangerous radioactive materials. But the FBR program ran far ahead of reprocessor development, and in the meantime Japan continued to depend on long distance transportation of waste to La Hague in France and Sellafield in the United Kingdom, running into storms of international controversy over the dangers of international terrorism (reprocessed uranium is a primary component of nuclear weapons) and radioactive waste safety.<sup>26</sup>

The massive reprocessing plant under development at Rokkasho was supposed to resolve this issue, and in the 1990s MITI carried out one of its longest, most lavish, and most strenuous “public acceptance campaigns” to ensure that it went ahead. But by the time Rokkasho opened, Monju was already closed. Rokkasho started up in 2006 but was still in a start-up phase (and had not handled FBR reprocessing) when the Fukushima disaster occurred. By then the initial planned cost of ¥690 billion had trebled to ¥2,140 billion.<sup>27</sup> On the eve of Fukushima, estimates were that Rokkasho would eventually cost ¥19 trillion to complete (making it perhaps the world's most expensive civil facility).<sup>28</sup> Rokkasho faced a large accumulated backlog of waste to reprocess but without an FBR no obvious outlets for the reprocessed waste itself.

Nevertheless, even in the twenty-first century government strategies continued to promise a future based around FBR and reprocessing. The New National Energy Strategy (NNES) of 2006 renewed the commitment to the elusive and expensive FBR. The Monju plant had by then been mothballed for more than ten years and had cost \$7 billion to date without ever producing any commercial energy—one of the great white elephants of history. Even so, on the eve of Fukushima, the NNES and the METI White Paper of 2010 both called for a new FBR to be built to supplement or replace Monju by 2025.<sup>29</sup>

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<sup>24</sup> Samuels, *Business of the Japanese State*, 237-43, 247-51.

<sup>25</sup> Donnelly, “Japan's Nuclear Energy Quest,” 194.

<sup>26</sup> Dauvergne, “Nuclear Power Development in Japan,” 585.

<sup>27</sup> Pickett, “Japan's Nuclear Energy Policy,” 1342-44.

<sup>28</sup> McCormack, “Hubris Punished,” 4.

<sup>29</sup> Peter C. Evans, “Japan,” *The Brookings Foreign Policy Studies: Energy Security Series* (Washington, D.C., 2006), 16-18; John S. Duffield and Brian

### The Electric Power Companies (EPCs)

The key non-government actor in the nuclear power industry has been the Japanese electric power companies, a massive industrial oligopoly with immense political clout that has always remained somewhat obscure and impenetrable. The Japanese electric power industry has historically been private except for wartime (something quite unusual in comparative terms), and since 1951 the industry has been controlled by nine regional utility companies (ten after 1994). Each has a regional monopoly, and they are among the largest electric utilities in the world. They have concentrated exclusively on the domestic market and have never pursued direct foreign investment. They are linked to close networks of suppliers drawn primarily from big keiretsu companies, with long-term contracts based on “reliability” and little history of competitive bidding. For example, TEPCO buys nearly all its big plant from Toshiba and Hitachi; Kansai purchases from Mitsubishi.<sup>30</sup>

From 1951 to 1973 the EPCs operated fairly independently as the industry transformed itself from a coal to an oil base. The EPCs often clashed with MITI in their commercially driven haste to abandon coal for oil.<sup>31</sup> But the oil shocks pushed the EPCs closer to MITI. MITI helped them to operate a sort of “convoy” system, co-ordinating price movements across the industry and playing the role of central dominant actor in the process of reactor site selection and instigation. In return, MITI expected the EPCs to play a central role in regional economic development, and EPC chairmen were invariably chairmen of the relevant regional economic association (except for Tokyo).<sup>32</sup> According to Takeo Kikkawa, until the 1990s, “the nine power firms degraded themselves to spiritless government agency-like entities.”<sup>33</sup> Inter-company competition more or less disappeared and international price competitiveness declined sharply, as MITI routinely allowed the companies to straightforwardly pass on rising

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Woodall, “Japan’s New Basic Energy Plan,” *Energy Policy* 39 (April 2011): 3741-48; Lawrence M. Lidsky and Marvin M. Miller, “Nuclear Power and Energy Security: A Revised Strategy for Japan,” *Science and Global Security* 10, no. 2 (2002): 127-50.

<sup>30</sup> Richard Suttmaier, “The Japanese Nuclear Power Option: Technological Promise and Social Limitations,” in *The Politics of Japan’s Energy Strategy*, ed. Ronald A. Morse (Berkeley, Calif., 1981), 106-33; Low, Nakayama and Yoshioka, *Science, Technology and Society*, 76-77.

<sup>31</sup> Kikkawa, “Matsunaga Yasuzaemon,” 215-16.

<sup>32</sup> Richard J. Samuels, “Consuming for Production: National Security, the Domestic Economy, and Nuclear Fuel Procurement in Japan,” *International Organization* 43 (Autumn 1989): 633.

<sup>33</sup> Kikkawa, “Matsunaga Yasuzaemon,” 216; Takeo Kikkawa, “Liberalization and Japan’s Energy Industry,” unpub. paper, Institution of Social Sciences, University of Tokyo, 2009.

oil costs to consumers, notably to residential consumers who paid three or four times more per kilowatt than U.S. consumers in 1990s.<sup>34</sup>

The EPCs were often seen at this time as quasi-government agencies. But it is hard to say who really ruled. MITI did not direct the companies and, according to Samuels, the companies were often more the “principal architects” of MITI’s plans than the “victims” of them.<sup>35</sup> The companies were happy to go along with ambitious promotion of nuclear power—as long as MITI paid the bills and gave them favorable tax treatment on their nuclear accounts. But where there were disagreements on the relative roles of coal, oil, and nuclear or over electricity rates, these matters were generally resolved congenially (and usually in favor of EPCs) behind closed doors. The EPCs co-ordinated with each other to set rates, and MITI generally approved their proposals. As Samuels describes it, the EPCs have “separated state aid from state control” to a significant degree.<sup>36</sup> The state has socialized risks while allowing the companies to operate with commercial freedom. Although the internal history is obscure, it appears that the EPCs “captured” many of the institutions that were supposed to oversee or regulate their domestic electric power operations (notably the STA and JAEC). At the same time, in the era of transfer of American nuclear technology, the EPCs and their big keiretsu contracting partners in the electrical machinery industry dominated the public corporation PNC (Power Reactor and Nuclear Fuel Corporation), the vehicle through which the companies co-ordinated their import of commercialized U.S. reactor technologies from 1967. These networks gave the electrical machinery companies huge strength in developing close technical and commercial alliances with partner U.S. firms. Mitsubishi resumed a close relationship with Westinghouse; Hitachi and Mitsui/Toshiba partnered with GE; and Sumitomo linked up with United Nuclear.<sup>37</sup>

From the mid-1990s, the relationship became somewhat more complex. In an era of cheap oil, economic stagnation, and external pressures to free up Japanese domestic markets, government emphasis shifted to the liberalization of domestic energy markets to drive down prices and the pursuit of the reduction of greenhouse gases mandated by the Kyoto Protocols. This liberalization began to create more space between the EPCs and METI. Revisions of the Electric Power Law of 1965 between 1995 and 1999 permitted new entrants, weakened central control of pricing, and allowed more competition on the retail side (also allowing the electric power firms themselves to engage in other businesses).<sup>38</sup>

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<sup>34</sup> Samuels, “Consuming for Production,” 625-28.

<sup>35</sup> *Ibid.*, 636.

<sup>36</sup> Samuels, *Business of the Japanese State*, 234.

<sup>37</sup> Suttmaier, “Japanese Nuclear Power Option,” 109-10.

<sup>38</sup> Paul J. Scalise, “The Politics of Restructuring: Agendas and Uncertainty in Japan’s Electricity Regulation” (D. Phil. Thesis, University of Oxford, 2009), 1-26, 48-65; Kikkawa, “Liberalization and Japan’s Energy Industry,” 12-13.

At the same time, however, in terms of nuclear power, the EPCs worked more closely than ever with METI (Ministry of Economy, Trade, and Industry) to push nuclear power forward and silence popular opposition. Work by Hayden Lesbirel, Daniel Aldrich, and Martin Dusinger has documented in detail how METI spent huge and growing amounts on “public acceptance” campaigns for new reactor sites after the Three Mile Island (1979) and Chernobyl (1986) disasters increased public resistance to reactor locations.<sup>39</sup> Early patronizing attitudes and high-handedness were quickly seen to be counterproductive, and MITI developed a much more subtle and co-ordinated strategy of inducements, including “economic development assistance” to communities that agreed to host new plants (sums continually ratcheted up as communities learned to drive canny bargains). Accidents and public resistance did not make MITI/METI rethink its nuclear expansion targets; rather, they simply pressed ahead with aggressive expansion targets using the carrots of massive infrastructural projects and immensely sophisticated pro-nuclear public relations.<sup>40</sup> METI avoided confronting public opinion across Japan as a whole and instead concentrated on locating reactors in regions where resistance was least likely and could be most easily bought off (for example, in regions where reactors could be presented as “depopulation countermeasures.”<sup>41</sup> It avoided compulsory purchase or direct central control as far as possible. Instead it placed resources at the disposal of the electric power companies and left them to handle local negotiations backed up by its central guidance and support. The “assistance” was funded partly from central government funds but also from a levy on the EPCs. The EPCs accepted this because they were then permitted to recoup this cost from their energy pricing—a further factor in persistent high consumer electric power prices. Despite differences among EPCs, MITI, and their supporters in the LDP on other matters, they collaborated harmoniously in the face of outside challenges.<sup>42</sup>

But this notorious ‘nuclear village’ of METI, EPCs, LDP and media was profoundly unprepared for the government reaction against the companies after Fukushima. The Tokyo Electric Power Company (TEPCO) in particular was accustomed to being treated as a darling of government, bankers, and media. The bankers loved TEPCO stock because it had remained some of the most rock steady through stagnation. TEPCO was a darling of the media because METI had so carefully helped it nurture its

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<sup>39</sup> Lesbirel, *NIMBY Politics in Japan*; Aldrich, *Site Fights*; Martin Dusinger and Daniel P. Aldrich, “Hakoto Comes Home: Civil Society and Nuclear Power in Japan,” *Journal of Asian Studies* 70 (Aug. 2011): 683-704.

<sup>40</sup> Dusinger and Aldrich, “Hakoto Comes Home,” 692-93; Dauvergne, “Nuclear Power Development,” 581.

<sup>41</sup> Aldrich, *Site Fights*, 128-35, 150.

<sup>42</sup> Aldrich, *Site Fights*, 132-34, 138, 145, 150; Dauvergne, “Nuclear Power Development,” 582, 589; Donnelly, “Japan’s Nuclear Quest,” 187-88.

media reputation as part of the massive promotional campaigns for site selection.<sup>43</sup> So when the “blame game” for Fukushima began, it became a vicious and high-stakes public battle as an unprepared TEPCO fought for its life. METI and TEPCO quickly declared that all reactors not directly affected by the quake and tsunami were safe and could continue in operation. But, responding to public shock, the Naoto Kan government insisted that all reactors be closed for stress tests that might take six months to a year. The LDP and EPCs engaged in bitter factional parliamentary struggles in the months following the disaster; they even attempted to block a bill on feed-in tariffs that threatened to advantage other renewable energy sources over nuclear power, even though those campaigns bogged down parliamentary work and delayed emergency relief and reconstruction legislation. Whereas the recovery act for Kobe in 1995 took 30 days, the 2011 act took 102 days.<sup>44</sup>

Within weeks of the Fukushima disaster, public trust and credibility in the nuclear program fell to all-time lows and fundamental weaknesses of regulation and governance began to be exposed. The full details of the past practices of laxity, malpractice, concealment, and belittling of risk are now beginning to emerge as investigation of the catastrophe and its background continues, but certain features are already clear. The “nuclear village” has a long history of purveying a “safety myth” of nuclear power. Safety breaches have been covered up and regulators have looked the other way. The Nuclear and Industrial Safety Agency (NISA) had been passive in response to deception and cover-ups by TEPCO and EPC executives for more than a decade.<sup>45</sup> In 2002, five top TEPCO executives resigned over a string of safety cover-ups, including the falsification of containment vessel tests. Later in the same year, four EPCs admitted concealing evidence of cracked containment structures from NISA. In 2003 local governments concerned by lack of information forced TEPCO to close all its reactors for safety check-ups, and in March 2007 the Japanese press revealed a major hidden history of near nuclear accidents, as a result of which seven EPCs admitted falsifying past safety records. Yet no sustained effort was made by regulators to seek out and punish private sector deceptions.<sup>46</sup>

Even during the Fukushima disaster the habits of covering up continued. The government issued speedy but baseless assurances about radiation risks. Ministries did not share their best information on the state

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<sup>43</sup> Roger W. Gale, “Tokyo Electric Power Co.: Its Role in Shaping Japan’s Coal and LNG Policy,” in Morse, ed., *The Politics of Japan’s Energy Strategy*, 85-105; Aldrich, *Site Fights*, 129-30.

<sup>44</sup> Jeff Kingston, “Ousting Kan Naoto: The Politics of Nuclear Crisis and Renewable Energy in Japan,” *Asia-Pacific Journal* 9, issue 39, no. 5 (26 Sept. 2011).

<sup>45</sup> Kaufman, “Preventing Nuclear Meltdown,” 1-4.

<sup>46</sup> Peter Aldhous and Zena Iovino, “Japan’s Record of Nuclear Cover-Ups and Accidents,” 23 March 2011; URL: <http://www.newscientist.com/article/dn20263>.

of affairs at the reactors with the prime minister or the cabinet.<sup>47</sup> For two months after the accident, TEPCO tried to play down the severity of the accident, denying that meltdown had occurred in three reactors. It also tried to insist that all the damage had been done by the tsunami and none by the earthquake (which was not true). In June 2011 the International Atomic Energy Authority (IAEA) strongly criticized TEPCO for its lack of transparency.<sup>48</sup>

The weaknesses of TEPCO's safety planning and emergency preparations were brutally revealed. The following incident was widely reported by press sources and subsequently broadly confirmed by testimony of the prime minister, Naoto Kan. On March 15, four days after the tsunami, a build-up of hydrogen made it necessary to vent the reactors to prevent explosions—even though this would release radiation into the atmosphere. The government of Kan Naoto ordered TEPCO to carry this out. But for 24 hours the company did not obey. On March 16, when TEPCO decided it had to vent, the system did not function because of power failures. They needed to vent manually. But no one had ever rehearsed this procedure and the details were contained only in a printed manual locked in the radiation-contaminated control room. They had to send someone in to get it. Even with the book, they could not successfully vent, and over the next three days, three huge hydrogen explosions ruptured the plant. TEPCO then lied to the press, saying that the government had refused to give them permission to vent.<sup>49</sup>

It will be some time before the evidence about corporate preparations, procedures, and practices is fully examined. At the moment all that can be said for sure is that there are many highly troubling reports about the failings of corporate governance and safety during twenty years of nuclear operations before Fukushima.<sup>50</sup> But even the most cursory examination can identify some key areas of concern.

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<sup>47</sup> For a searing indictment of TEPCO's misinformation and concealment during the key days of the crisis, see Naoto Kan's personal account: Naoto Kan, "Japan Was Invaded by an Invisible Enemy."

<sup>48</sup> Jake Adelstein and David McNeill, "Meltdown: What Really Happened at Fukushima?" *Atlantic Wire*, 2 July 2011; URL: <http://www.theatlanticwire.com/global/2011/07>; David McNeill and Jake Adelstein, "TEPCO's Darkest Secret," *Asia-Pacific Journal* 9, Issue 32, no. 2 (8 Aug. 2011).

<sup>49</sup> This is a summary of the story as given by Kingston, "Ousting Naoto Kan," 5; see also Naoto Kan, "Japan Was Invaded by an Invisible Enemy."

<sup>50</sup> Some of the most useful include: IAEA, *IAEA International Fact Finding Expert Mission of the Nuclear Accident Following the Great East Japan Earthquake and Tsunami. Preliminary Summary*, 1 June 2011; URL: <http://www.iaea.org/newscenter/focus/fukushima/missionsummary010611.pdf>; Aldhous and Iovino, "Japan's Record of Nuclear Cover-Ups and Accidents"; Sarah Buckley, "Japan's Shaky Nuclear Record"; URL: <http://www.news.bbc.co.uk/1/hi/world/asia-pacific/3548192.stm>; Rhead Enion, "Japan's Nuclear Reactors: Risk Assessment and Accident Theory," 14 March 2011; URL: <http://>

*Regulatory design:* NISA had plenty of money and power, but it failed to establish adequate risk assessment modelling and practice or to act on warnings about reactor design; it set design standards below those required in the United States (where few reactors face comparable earthquake risks). In particular, it based its risk assessment model on historical records of disasters rather than on possible future developments (despite IAEA criticisms), and it left the implementation, monitoring, and emergency response planning to the EPCs themselves. The Fukushima incident revealed that TEPCO's disaster plans were totally inadequate (for example, only fifty protective suits in the plant, absence of fire hoses).<sup>51</sup>

*Regulatory enforcement:* NISA was lax and passive in following up on breaches of safety. In 2007 a 6.8 magnitude earthquake at a TEPCO plant resulted in leakage of radioactive water and showed that existing plant designs were inadequate for shocks of that size, but no comprehensive review of reactors was undertaken. Likewise, the inspection regime for pipe work (one of the most vulnerable points in a nuclear plant) remained fragile. Similar problems caused dangerous leaks at plants in 1996 and 1999 (killing two workers at Tokaimura) before a major leak of superheated steam killed five workers at Kansai Electric in 2004. An investigation at Kansai revealed that the pipes there had not been inspected for five years.<sup>52</sup>

*Regulatory "capture":* NISA was at serious fault in its oversight of TEPCO, and it had failed to get a grip on past deceptions and evasions by EPCs.<sup>53</sup> One of the reasons for this was that NISA was not an independent regulator but an agency of METI, the ministry responsible for the growth and development of the industry and which actively campaigned for nuclear power. METI acted as a caretaker for industry interests and regarded nuclear expansion as a central part of government economic strategy. It lacked the necessary distance and independence properly to police safety in the industry. Only after Fukushima did discussion of splitting NISA from METI begin.<sup>54</sup>

## **Energy Security**

What accounts for the intense commitment of Japanese policymakers to nuclear expansion and a business-government establishment that lavished expenditure on the industry while ignoring or underestimating risks that could be fatal to the success of its own project? The threat posed by

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<http://legalplanet.wordpress.com/2011/03/14/japans-nuclear-reactors-risk-assessment-accident-theory/>; and reports in *Nuke Info*, the bulletin of the Citizens' Nuclear Information Center (Tokyo); URL: <http://cnic.jp.english>.

<sup>51</sup> Kaufman, "Preventing Nuclear Meltdown," 1-2.

<sup>52</sup> Ibid., 2-3.

<sup>53</sup> Dauvergne, "Nuclear Power Development in Japan," 582-83.

<sup>54</sup> Kaufmann, "Preventing Nuclear Meltdown," 3.

accidents was obvious to all. For example, in their 1999 book, Morris Low, Shigeru Nakayama, and Hitoshi Yoshioka state: “A major accident at a Japanese reactor would see the end of Japan’s nuclear power program.”<sup>55</sup> Yet a state of affairs developed in which the imperatives of nuclear expansion produced corner cutting and risk taking that eventually imperiled the whole “nuclear quest.” What was the context that fostered the sort of institutional behavior that we have been examining?

The short story is that Japan has faced extremely difficult traps and dilemmas in its national energy policy, and few of the solutions pursued in the last forty years have helped. The same problems keep returning in even more difficult forms. Nuclear power was seen as the one possible trump card to break the policy deadlock. Other nations looked at the nuclear option and stepped back to proceed with caution, but Japan plowed ahead, hoping to overcome high risks, high costs, and vulnerable technologies—only to hit the buffers (possibly decisively) with the disaster at Fukushima.

Historically Japan has been almost entirely dependent on imported fossil fuels (except for a brief era of plentiful cheap hydropower during early industrialization). Japan produces only 6 percent of its own energy needs compared to Germany’s 39 percent, France’s 50 percent, the United States’ 72 percent, and the United Kingdom’s 106 percent.<sup>56</sup> It imports nearly all its oil, gas, coal, and uranium. In the 1960s Japan dramatically shifted its energy base from coal to cheap oil—nearly all drawn from the Middle East (see Table 1).

Table 1: Japan’s Electricity Generation by Fuel Source, 1960-2004 (%)

	1960	1965	1973	1979	1990	2004	2030 Plan
Renewables	52	42	17	16	12	11	29
Oil	19	31	73	53	29	10	1
Coal	29	26	5	4	10	25	10
LNG	-	-	2	14	22	26	10
Nuclear	-	-	3	14	27	29	50

Renewables includes hydroelectric, solar, etc.; LNG = Liquid Natural Gas.

Note that oil was 41% of all energy used in Japan in 2004, but it was mainly concentrated in fuel for transportation. Nuclear was 11%, LNG 10%, and coal 23% of all energy consumed in 2004.

Source: Adapted and updated from Christoffels, *Getting to Grips*, 17. The 2030 Plan figures are from METI, *Revision and Update of the 2003 Basic Energy Plan* (METI, 2010).

<sup>55</sup> Low, Nakayama and Yoshioka, *Science, Technology and Society*, 81.

<sup>56</sup> Jans-Hein Christoffels, *Getting to Grips Again with Dependency: Japan’s Energy Strategy* (Netherlands Institute of International Relations, Clingendael, 2007), 3.

Japan's alarming dependence on Middle East oil made the Oil Shocks of the 1970s traumatic. As we have seen, the roots of the "nuclear quest" lay in a search for a source of energy that would free the country from external dependency. Alongside the core nuclear policy, the so-called energy autonomists who dominated policymaking in MITI in the 1970s and 1980s also sought ways to diversify Japan's sources of energy supply (the *dasseki* policy) and to spread risks.<sup>57</sup>

The most successful diversification came from the aggressive development of Liquefied Natural Gas (LNG) imports. METI provided lavish subsidies to keep imported LNG prices low and to incentivize EPCs to use it. As a result, LNG went from 2 percent of electric power generation in 1973 to a remarkable 22 percent in 2004. The Japanese oil companies did not like this, because they saw gas as a way for new entrants to penetrate Japanese energy markets. But by the 2000s, LNG was losing its attraction, as issues of supply security began to emerge that largely replicated those in oil. By 2004 75 percent of LNG came from Indonesia, Malaysia, Australia, and Borneo, and the growing East Asian economies were consuming more and more of their own LNG (notably in Indonesia). As a result Japan had to shift to importing more LNG from the Middle East and Russia. The main saving grace for energy security in the 1970s was the fast growth of LNG exports from Australia. Nevertheless, in the Plans of the 2000s the share of LNG in electric power production was forecast to fall sharply.<sup>58</sup>

The second prominent "energy security" strategy was to try to secure and stabilize oil supplies by investment and participation in resource development (commonly referred to as "autonomous development" or "equity oil"). METI formed the Japan National Oil Corporation (JNOC) as an umbrella for such operations, with the broader aim of procuring 30 percent of imported oil from sources "tied" to Japan and in the process developing a genuine major Japanese oil corporation that could compete with Western firms.<sup>59</sup> In the event, these ventures never generated more than 15 percent of imports and fell back below 10 percent in the 2000s. There were some positive ventures in Saudi Arabia and Iran in the 1990s, but in the 2000s the Japanese participants were pushed out through political hostility and Chinese rivalry. China also beat out Japanese attempts at such ventures in Kazakhstan and Uzbekistan in the 2000s and trumped Japanese companies in dealing with the Russian government to secure Siberian supplies and shape new pipeline schemes.

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<sup>57</sup> Evans, "Japan," 7-9.

<sup>58</sup> Christoffels, *Getting to Grips*, 5-8; Akira Miyamoto, "Natural Gas in Japan," in *Natural Gas in Asia: The Challenges of Growth in China, India, Japan and Korea*, ed. Ian Wybrew-Bond and Jonathan Stern (Oxford, England, 2002), 107-14; Ronald A. Morse, "Japan's Energy Policies and Options," in Morse, ed., *The Politics of Japan's Energy Strategy*; Evans, "Japan," 11.

<sup>59</sup> Christoffels, *Getting to Grips*, 10.

One reason for this failure that merits further investigation is that MITI/METI was never able to get private Japanese oil interests to co-operate or merge. Domestically they were unable to get upstream/downstream integration within Japanese oil companies.<sup>60</sup> Overseas they were unable to get the companies to co-operate along national lines. For example, in Iran and Libya there were fiascos when the governments wanted to deal with a “single Japanese entity,” but METI could not get the Japanese companies to co-operate in effective consortia.<sup>61</sup> Underlying these failures was also a lack of real will. Low oil prices made direct foreign investment in oil unattractive in the 1990s, and many projects financed by JNOC incurred heavy losses. In the “liberalization” era, these JNOC-supported ventures were attacked by politicians and business as “white elephants,” and JNOC was pilloried as a “retirement home” for retired METI officials. In 2001 the government of Junichiro Koizumi announced the closure of JNOC.<sup>62</sup>

But the core of “economic security” remained nuclear power. Difficulties in finding new reactor locations, recurring safety problems and accidents, and the intractable problems of Monju and the FBR strategy in the 1990s slowed the pace of nuclear expansion, and between 1995 and 2006 economic liberalization weakened METI's hand in driving nuclear power forward. METI had sharper disagreements with the EPCs over costs and strategy than ever before. The EPCs refused to share more of the risks in new nuclear projects and preferred to turn to higher levels of imported coal, which was much more commercially attractive.<sup>63</sup> But coal was anathema to METI because it had committed itself to radical emissions reductions under the Kyoto Protocol. Moreover, until the mid-1990s the EPCs had thrived and rapidly expanded LNG imports on the basis of generous subsidies. Now METI wanted to cut LNG consumer prices to increase the residential use of gas, and the EPCs feared that this could allow new companies into the market and undermine their dominance. “Liberalization” was hampering METI's ability to direct energy strategy and steer its allies in the strategic development of nuclear power.<sup>64</sup>

For a while in the 1990s cheap world oil led to a loss of a sense of urgency about energy security and a drift back to more oil dependency. Energy autonomists were marginalized, and plentiful cheap oil made “global energy markets” the official wisdom while strategic projects (like LNG and “equity oil”) were allowed to dwindle.<sup>65</sup> Government and business argued that stable supplies and the “best mix” of fuels would

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<sup>60</sup> Kikkawa, “Liberalization and Japan's Energy Industry,” 10-12.

<sup>61</sup> Christoffels, *Getting to Grips*, 11.

<sup>62</sup> *Ibid.*, 17-18.

<sup>63</sup> *Ibid.*, 16.

<sup>64</sup> Kikkawa, “Liberalization and Japan's Energy Industry,” 13.

<sup>65</sup> Christoffels, *Getting to Grips*, 14.

come from responding to market conditions. At the same time, a recognition that Japanese industry and consumers were paying some of the world's highest energy prices prodded METI toward deregulation and market liberalization; it embraced the thrust for "freer global markets" more fully than some of its traditional allies like the electric power companies.

But in the 2000s the pendulum swung back again with "the end of cheap oil." The price of oil had fallen as low as \$15 per barrel in the mid-1990s, and to \$10 in 1999, but it then rose to \$30 per barrel after 9/11 in 2001, and then climbed to \$78 in 2006 and to over \$100 in 2011.<sup>66</sup> Government and academics saw a "paradigm shift" in international energy markets and urged that energy supply had now to be treated as a strategic concern, not just as a commodity. "Energy autonomists" saw Japan as weak and dependent in a hostile world. They stressed the role of geopolitical tensions and risks and the need for long-term strategic investments that might not come through market forces. The implication was that energy autonomy should supersede economic efficiency as a policy imperative.

Between 2006 and 2011 this thinking underlay a revision of METI energy policy and a revival of older themes of energy security. Rising and unstable oil prices and fears about security of supply stimulated talk of a "nuclear renaissance." Targets for the future share of nuclear power in electricity generation were ramped up to 40 percent by 2025 in the NNES of 2006, and to 50 percent in the White Paper of 2010 and the new Basic Energy Plan of 2011. This would involve building nine new nuclear reactors by 2020 and fourteen by 2030, the most precise targets for new reactor construction ever set in METI planning documents (see Table 1). But, though precise, the new strategic vision lacked teeth, and few commentators thought these plans realistic, while many thought they were just pipe dreams. Siting delays made construction of new reactors on this scale extremely improbable in the opinion of expert commentators (well before Fukushima), and the Plan directly contradicted the conclusion of the Japan Atomic Energy Commission White Paper of 2009 that large-scale building of new reactors was highly improbable.<sup>67</sup>

On the eve of Fukushima, Japan's energy security problems were clear, but the proposed solutions seemed to rely on a large degree of wishful thinking. Japan's energy situation continued to be characterized by what Jan-Hein Christoffels has described as "the 3 dependencies": oil

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<sup>66</sup> International Energy Agency (IEA), *Energy Policies of IEA Countries*. Annual Reviews (OECD, Paris, 2001-2008).

<sup>67</sup> Duffield and Woodall, "Japan's New Basic Energy Plan," 3741-49; Evans, "Japan," 5, 15-23; Christoffels, *Getting to Grips*, 18; Japan Atomic Energy Commission (JAEC), *White Paper on Nuclear Energy* (Tokyo, 2009); Paul J. Scalise, "Hard Choices: Japan's Post-Fukushima Energy Policy in the 21st Century," in Kingston, ed., *Natural Disaster and Nuclear Crisis in Japan*, 141-42.

dependency, import dependency, and Middle East dependency, and all three seemed to be getting worse.<sup>68</sup>

Japan had made a certain degree of progress over forty years in reducing its absolute oil dependency. It had become a highly fuel-efficient nation (requiring only half the amount of primary energy per unit of GDP as the United States). And it had achieved a remarkable reduction in the role of oil in electric power generation (from 73 percent in 1973 to 10 percent in 2010) (see Table 1). But Japan still depended on oil for over half its overall energy needs, compared to about one-third in the United States and Western Europe, because of its high levels of consumption in transport and residential uses.<sup>69</sup> The low-hanging fruit of energy economy had already been harvested, and speedy reductions in oil use were unlikely. Japan had become a world leader in (heavily subsidized) solar power technologies, and it produced over 50 percent of global photovoltaic cells in 2005—but this and other innovations in renewable energy remained a very small element in the national fuel mix.<sup>70</sup>

Meanwhile import dependency and Middle Eastern dependency were being aggravated by changes in global economics and politics. Oil was subject to growing geopolitical risks, Japan was locked into some of the most volatile of these, and it increasingly lacked political and economic levers to control or influence oil markets.

Soaring demand from China, India, Indonesia, and other growing East Asian markets was crowding Japan out. China had consumed half as much oil as Japan in 1990, but it overtook Japanese levels in 2003 and was forecast to use twice as much by 2020.<sup>71</sup> Similar trends marked LNG markets, where Japan had been the world's dominant consumer in the 1980s but was now one among many. Japanese buying power was weakening, and Japan was becoming a smaller energy player in a more crowded field of Asian competitors. In addition, China was especially aggressive in its “going out” policy, investing in oil development by trading large investments for exclusive rights across Africa, Central America, and Kazakhstan—often investing lavishly in countries shunned by the West (and therefore off bounds to Japan).<sup>72</sup> China directly outbid Japan by “befriending” Japan's traditional suppliers in Saudi Arabia and Oman, and China competes head to head with Japan for supplies from Saudi Arabia and Iran (and, unlike China, Japan cannot offer arms or political support to those regimes).<sup>73</sup> China is doing on a big scale what Japan had for two

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<sup>68</sup> Christoffels, *Getting to Grips*, 4, 19.

<sup>69</sup> IEA, *Energy Policies of IEA Countries (2005-2009)*; Christoffels, *Getting to Grips*, 3.

<sup>70</sup> Evans, “Japan,” 12, 23.

<sup>71</sup> *Ibid.*, 1-5.

<sup>72</sup> Christoffels, *Getting to Grips*, 20; Evans, “Japan,” 15.

<sup>73</sup> Kazuhiko Togo, *Japan's Foreign Policy, 1945-2003: The Quest for a Proactive Policy* (Leiden, 2005).

decades tried to do on a modest scale, trading economic aid and foreign investment for secured rights and a role in development.<sup>74</sup> Against this background, METI set ambitious targets for a revival of the old “autonomous development” strategy, but JNOC has now been disbanded, and there are no institutions or new financial resources available. The ambitious targets for “equity oil” in the plans cannot be taken seriously.<sup>75</sup>

Moreover, Japan's vulnerability in world oil trade is aggravated by its continued dependence on Middle East oil despite thirty years of policies to reduce it. In the late 1970s about 80 percent of Japanese oil came from the Middle East. This was reduced to 68 percent by 1987, but it had climbed back to 90 percent by 2007 under the regime of buying at best prices on open markets. By then, 66 percent of Japanese oil came from just three countries: United Arab Emirates (UAE): 25 percent; Saudi Arabia: 26 percent; and Iran: 15 percent. A further 22 percent came from four other Middle Eastern states (Qatar: 9 percent; Kuwait: 9 percent; Iraq: 2 percent; and Oman: 2 percent).<sup>76</sup> And, as if to highlight this extreme vulnerability to energy disruption, a staggering 90 percent of Japan's oil passes through the Straits of Hormuz, which Iran has threatened to close on several occasions.

In this situation, Japan critically lacks the foreign policy clout of other nations like the United States, Europe, or China. In particular, it is dominated by the U.S. alliance in foreign policy and therefore has to support Israel in the Middle East and, unlike China, cannot exploit opportunities for resource diplomacy in the region (a situation reflected in a long history of bitter fights between MITI and the Ministry of Foreign Affairs).<sup>77</sup> There is no way for Japan to develop a “special relationship” with Iran or Saudi Arabia along Chinese lines. Since 9/11 Japan has been forced to pull back on direct foreign investment in Iran, and China has filled the gap. Likewise, Japan had to pull back on Siberian pipeline development because of tensions with Russia, while China has rushed to fill the vacuum.

Japan is uncertain about how to deal with volatility of suppliers and aggressive competing consumers. Most of the policy options have already been tried and already failed. The one get-out-of-jail card that Japanese policymakers have always hoped they could use under these constraints was the rapid development of nuclear power. In the early 2000s it became an almost desperate hope, with official plans and forecasts seeming to depart ever more from reality as Fast-Breeder and re-processing dreams crumbled, private sector allies pulled away from sharing the costs of

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<sup>74</sup> Christoffels, *Getting to Grips*, 22-23.

<sup>75</sup> Ibid., 44-48 and 50-51.

<sup>76</sup> METI, “Energy in Japan” (Annual Statistics); URL: <http://www.enecho.meti.go.jp/topics/energy-in-Japan/energy>.

<sup>77</sup> Martha Caldwell, “The Dilemmas of Japan's Oil Dependency,” in Morse, ed., *The Politics of Japan's Energy Strategy*, 65-84.

development, and the featherbedding of the nuclear industry fostered lax practice and ill-thought-out structures. The various government agencies incentivized, or even bribed, the industry rather than disciplining it. They ignored or belittled risks rather than going slower. They justified policies on the basis of national imperatives rather than economic and technological good sense. The result was a winding road to near-disaster. The nuclear strategy hangs in ruins after Fukushima. Before 2011 Japan got 30 percent of its electricity from nuclear power and planned to double it by building fourteen new reactors in the next twenty years. By April 2012, not one of Japan's fifty-four nuclear reactors was in commercial operation and at least twelve of them will never reopen. Nuclear power was the great hope of the future: now it could conceivably vanish altogether.