

# Lessons From Fukushima: An Assessment of the Investigations of the Nuclear Disaster 福島の教訓—4つの原発災害調査報告の評価

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## Abstract

Following the Fukushima nuclear disaster of 2011, the Japanese Cabinet, the Japanese Diet, a private-sector group as well as the operator of the Fukushima Daiichi nuclear facility, TEPCO, each set up an investigation commission to examine the causes of the accident, scrutinize the crisis response and make recommendations for future policies. This article provides some background on the four commissions and then examines and assesses the contents of the reports. Four key conclusions emerge from the analysis. Firstly, the establishment of the commissions was accompanied by immense mistrust, as each of the initiators suspected bias in the other inquiries. Secondly, the comparison demonstrates that while biases can be detected to some extent, the four reports overall agree in their identification of fundamental issues and crucial problems. Thirdly, the article maintains that the four reports used in combination convey a more complete picture than any single one of them. A comparison of the reports highlights diverging

interpretations and differing degrees of criticism, while exposing open questions and unresolved issues. Finally, the article argues that the four investigation reports can serve as important reference points, enabling critical assessments of reforms currently undertaken in Japan's nuclear power administration and crisis management system.

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Despite the severe consequences from the Fukushima nuclear disaster, Japan's current government appears determined to return to the pre-disaster policy of promoting nuclear power as a key source of energy, promising improvements in safety standards.<sup>2</sup> The governing Liberal Democratic Party (LDP) will likely take controversial decisions on reactor restarts following the July 2013 Upper House election. Given this outlook, it seems crucial for Japan and others to reflect on and incorporate the lessons that can be drawn from the Fukushima disaster, so as to prevent or better contain possible future crises.



Explosion at Fukushima Daiichi Nuclear Power Plant March 2011

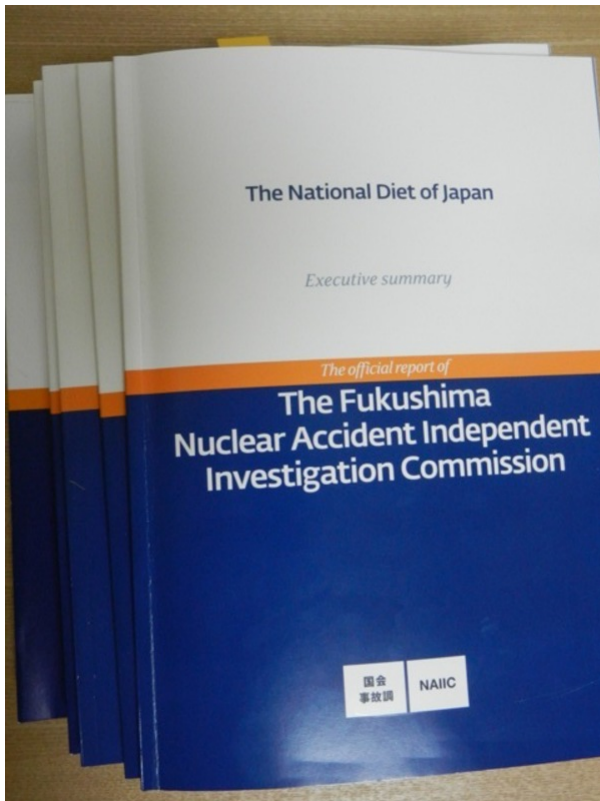
Four major investigations were launched in Japan to examine the Fukushima disaster, its causes, and make recommendations for future policies. Each investigation commission was initiated by different actors and entities: one by the Cabinet led by Prime Minister Kan Naoto of the Democratic Party of Japan (DPJ), one by the Japanese Diet, one by a private group of prominent citizens under the leadership of Funabashi Yōichi, former editor of the Asahi newspaper, and finally one by the operator of the Fukushima power plant, Tokyo Electric Power Company (TEPCO). The reports issued by the four investigations are designed to serve as important reference points for Japan's ongoing reform efforts in its nuclear energy sector. This article seeks to elucidate and compare the main findings, arguments and recommendations of the reports. Thus far, a comprehensive comparison is lacking.<sup>3</sup>

The article introduces each of the four investigations, explaining why and how they were initiated and what methodology the

commissions used. It then clarifies each report's major findings on three aspects: (1) the causes of the Fukushima disaster and the question of responsibility, (2) the evaluation of the crisis response by TEPCO, the Cabinet and regulatory agencies, and (3) the recommendations for future policies.<sup>4</sup> Finally, the article briefly evaluates current reform efforts in Japan's nuclear energy sector in light of the investigation results.

The analysis offers the following four key research findings: Firstly, the establishment of four different investigation commissions on the Fukushima accident was accompanied by enormous mistrust, as each of the four initiators was doubtful about the other inquiries, anticipating their results to be biased. This sense of suspicion also affected the selection criteria for commission members and methodologies used in the investigation. Secondly, the article demonstrates that while some of the reports are one-sided in particular depictions, they generally identify the same fundamental problems (though TEPCO's report is an exception on some points). For the most part, the commissions agree about the lack of risk preparedness prior to the accident, the absence of a culture of safety, weaknesses in regulatory oversight, and crisis management problems. Thirdly, the article contends that a comparative analysis of the four reports is nevertheless valuable, because each of the reports emphasizes different issues and provides distinct explanations and viewpoints. A

comparison thus allows for a more comprehensive understanding of the complex disaster, while also exposing unresolved issues and open questions. Fourthly, the article shows that reforms are currently underway in Japan's nuclear power administration and crisis management system, apparently in line with key recommendations made by the four investigations. Nevertheless, it remains doubtful whether a fundamental change of mindset that puts public rather than utility interests first has occurred among those responsible for ensuring nuclear safety.



Report by the Diet-initiated Investigation Commission

### Background to the Four Investigation Initiatives

#### *Cabinet-initiated investigation*

The first investigation was initiated by Cabinet decision on May 24, 2011, at a time of mounting public criticism about Prime Minister Kan's crisis management. The aim was to make "policy proposals on measures to prevent further spread of the damage caused by the accident and a recurrence of similar accidents in the future, by conducting a multifaceted investigation in an open and neutral manner that is accountable to the Japanese public to determine the causes of the accident [...]." <sup>5</sup> The Cabinet decided that the Prime Minister would appoint the committee members, selecting "persons with academic or other various backgrounds." <sup>6</sup>

Although it is unclear who initially suggested the investigation, Prime Minister Kan was one of the driving proponents. His support was shaped by his experience as Minister of Health and Welfare in 1996. <sup>7</sup> At that time, Kan initiated an inquiry into his ministry's legal responsibility for a scandal involving blood products contaminated with the human immunodeficiency virus (HIV). The investigation found that bureaucratic practices were considerably responsible for the incident's occurrence. Following the Fukushima accident, Kan sought a similar inquiry. <sup>8</sup> As chairperson, Kan appointed Hatamura Yōtarō, a professor emeritus of Tokyo University with expertise on accidents and mechanisms of failure. In total, the commission consisted of 12 members, including academics, lawyers and politicians.

While promising his administration's full cooperation with the investigation, Prime Minister Kan asked the committee to act independently from the government. Seeking to bolster the commission's credibility, Kan outlined three principles as the basis of the inquiry: independence from the existing nuclear energy administration, openness in disclosing findings domestically and abroad, and comprehensiveness in covering both technical and administrative questions related to the accident.<sup>9</sup>



Prime Minister Kan Naoto Testifies to Diet Commission

The Cabinet-initiated commission published an interim report of about 450 pages in December 2011 and a final report of almost 400 pages in July 2012.<sup>10</sup> (See table 1 summarizing the timing of the four commissions' establishment and publication of reports.) Overall, almost 800 interviews were conducted, including with citizens and mayors of the affected communities around Fukushima.<sup>11</sup> The committee had no particular legal power to enforce cooperation, but the initial Cabinet decision called upon all actors

to "provide at-most [sic] cooperation" and not to refuse requests "without any proper reason."<sup>12</sup> Given criticism about hearings not being open to the public, Chairman Hatamura responded, "I want to do it as openly as possible, but [that goal] clashes with the aim of exposing [new insights] through our investigation and inspection. It can only be done in this manner [i.e. in confidentiality]."<sup>13</sup>

#### *Diet-initiated investigation*

Opposition parties questioned the legitimacy and independence of the DPJ administration's accident inquiry. As early as May 23, 2011, a day before the Cabinet's official decision, Your Party member Kakizawa Mito proposed the establishment of an independent investigation commission by the Diet.<sup>14</sup> Other Diet members similarly demanded a separate inquiry. Kusakawa Shōzō of the New Kōmei Party saw a need for a commission whose independence and investigative powers were ensured under law, because "people related to the government will be object to investigation, too."<sup>15</sup> LDP member Nakasone Hirofumi concurred, arguing: "It is important to investigate properly such an accident with a huge international impact in order to regain international trust, and, above all, [...] to eliminate citizen's unease about the nuclear accident."<sup>16</sup> The LDP was particularly vocal in criticizing the Cabinet's initiative, fearing the DPJ would primarily use the investigation to put blame on previous LDP governments, which

had promoted the construction of all of Japan's nuclear reactors and shaped Japan's system of nuclear power administration.<sup>17</sup>



Hatamura Yōtarō Presents his Findings in Press Conference July 2012

Initially, members of the governing DPJ reacted cautiously to the Diet discussions about a separate commission.<sup>18</sup> However, they dropped their opposition when the LDP, New Kōmei Party and Sunrise Party of Japan joined forces, submitting a bill in August 2011 for the establishment of a separate commission by the Diet.<sup>19</sup> The bill was passed into law on October 30, 2011, thereby creating for the first time in the 66 years of Japan's post-war government an investigation set up by the Diet and composed solely of third party experts.<sup>20</sup>

The committee consisted of ten experts, including diplomats, scientists, lawyers and journalists, who were selected by a panel of 30 Upper and Lower House Diet members.<sup>21</sup> Kurokawa Kiyoshi, a Professor emeritus of Tokyo University with a specialization in internal medicine, was named

chairman of the investigation. The committee was mandated to explore the causes of the accident, to assess the emergency response and to recommend measures to prevent nuclear accidents.<sup>22</sup> It was endowed with the authority to request the legislative branch to use its investigative powers to obtain any necessary documents or evidence required.



Kurokawa Kiyoshi Chaired Diet Inquiry

Overall, the team conducted interviews and hearings with almost 1,200 people, including witnesses who held key positions at the time of the accident within the government, at TEPCO or at nuclear regulatory agencies. The commission also conducted a survey of more than 10,000

residents of the affected areas and workers at the plant.<sup>23</sup> Initially, the LDP-led opposition and the DPJ disagreed on whether to make hearings open to the public. In the end, they agreed to state in vague terms that hearings should be ‘basically open’ (*kōkai ga kiho*) leaving the commission with significant leeway on how to proceed.<sup>24</sup> While most hearings were open to the public, exceptions were made for some key witnesses. The Diet’s investigation committee published its final report of about 640 pages in July 2012. In its report, the team distinguished its work from that of the Cabinet-initiated inquiry, stating: “Without the investigation by this Commission, operating independently from the government, many of the facts revealing the collusion between the regulators and other players might never have been revealed.”<sup>25</sup>

**Table 1: Timeline of Commission Formation and Report Publication**

	Cabinet Commission	Diet Commission	Private Commission	TEPCO Commission
<b>formation</b>	June 2011	December 2011	September 2011	June 2011
<b>interim report</b>	December 2011	no interim version	no interim version	December 2011
<b>final report</b>	July 2012	July 2012	February 2012	June 2012

*Private-sector investigation*

A third investigation was initiated by Funabashi Yōichi, former editor-in-chief of the newspaper

Asahi Shimbun. Together with a group of progressive-minded Japanese, he launched a non-profit private think tank, the ‘Rebuild Japan Initiative Foundation’ in March 2011.<sup>26</sup> The aim was to shape public debates about Japan’s nuclear disaster as well as other crises facing the country, including mounting government debt and ongoing economic stagnation. Observing widespread public distrust towards the government after the March 11 earthquake, Funabashi decided to launch an in-depth investigation into the accident under the roof of the newly established think tank.<sup>27</sup> In an interview in February 2012, he explained the need for this investigation, stating:

“The Japanese government faced with a similar situation in the past has never accurately passed on information to the public or conducted investigations. The Diet has also done nothing. That was repeated a number of times in the past, but I felt that could absolutely not be allowed to happen this time.”<sup>28</sup>

In order to ensure independence of the investigation, the Rebuild Japan Initiative Foundation decided not to accept charitable donations from parties directly related to the Fukushima accident.<sup>29</sup> Furthermore, it decided against a partnership with a university in conducting the investigation. Funabashi later explained such a partnership would have been difficult because “starting with TEPCO, the power industry and the Federation of Electric

Power Companies of Japan have considerable influence by distributing subsidies” to such institutions, jeopardizing their objectivity.<sup>30</sup>

At the outset of the investigation in the summer of 2011, Funabashi and his colleagues selected seven commission members representing the fields of corporate strategy, economics and innovative technology and including a former prosecutor-general, researchers and professors, and a former chairman of the board of governors at the International Atomic Energy Agency.<sup>31</sup> Initially, Kurokawa Kiyoshi led the commission, but resigned after being offered to chair the Diet-initiated investigation. Kurokawa’s place was filled by team member Kitazawa Kōichi, a former president of the Japan Science and Technology Agency, an independent administrative agency promoting science and technology policies. According to Kitazawa, the goal of the commission was to “determine the truth behind the accident by clarifying the various problems that arose [...]”, to “identify and reveal the systematic problems behind these issues,” and to discern “clear lessons.”<sup>32</sup> Fellow member Yamaji Kenji furthermore noted that the investigation’s focus was on the accident response by the government and TEPCO in order to clarify responsibilities, because “there is a concern that [these aspects] may not be fully examined by the governmental investigation.”<sup>33</sup>



Funabashi Yōichi on right at Foreign Correspondent’s Club Japan with Kitazawa Kōichi

The commission’s report of about 400 pages was released in February 2012. Unlike the other reports, which were translated into English, this report is currently only available in Japanese.<sup>34</sup> In total, the investigation team interviewed more than 300 politicians, bureaucrats and workers involved in the Fukushima disaster.<sup>35</sup> Top executives of TEPCO were uncooperative, however, refusing to be interviewed or to release documents. Thus, to determine technical developments during the accident, the commission relied to “a considerable extent” on the findings presented in the interim report of the Cabinet-initiated inquiry.<sup>36</sup>

#### *TEPCO investigation*

A fourth investigation into the Fukushima accident was launched by the nuclear plant operator TEPCO in June 2011. The company’s executive vice president Yamazaki Masao explained that the inquiry had been set up in recognition of TEPCO’s “social responsibility to

conduct strict and thorough investigations and verifications of the accident, identify the causes of the accident and reflect the lessons learned in its business operations, in order to prevent the recurrence of similar accidents.”<sup>37</sup> Although not officially acknowledged, the plant operator was likely also motivated by the fear that other investigation committees would primarily blame TEPCO for the accident.

TEPCO’s report, which “focused on the events, causes and their preventive measures, especially from the point of facility design,” was compiled by an in-house investigation commission consisting of eight company employees and led by Yamazaki.<sup>38</sup> The team conducted on-site investigations at the power plant, examined company documents and recordings, and interviewed about 600 employees. To verify the results of the in-house investigation, TEPCO appointed a third party committee of seven experts specialized in the fields of nuclear energy, politics, law, safety, tsunamis and consumer science. Yagawa Genki, a Tokyo University professor emeritus of engineering, was named chairman of the committee. According to Leslie Corrice, a US expert on nuclear technology, the third party panel consisted of “unabashed advocates of nuclear energy.”<sup>39</sup>

Chairman Yagawa himself made little effort to counter public criticism of his verification efforts. To the contrary, he admitted his team had played

a limited role, stating “we were just hired by TEPCO and – comparable to a private tutor – had no authority.”<sup>40</sup> Given time constraints as well as a lack of authority vis-à-vis TEPCO, Yagawa conceded that “one cannot say that we [the verification committee] fulfilled our task sufficiently.”<sup>41</sup> He furthermore explained that he had not attended any of the hundreds of hearings conducted by the in-house commission. Neither had he seen the TEPCO teleconference recording, in which the withdrawal of plant workers was discussed with Prime Minister Kan, a matter of great controversy in subsequent crisis management evaluations.<sup>42</sup> In his defense, Yagawa argued that having spoken to TEPCO representatives, he had realized “that they are not the kind of people who lie. You can trust them to a certain extent.”<sup>43</sup> In his role as chairman of the verification panel, he mainly advised the in-house commission to tone down their criticism of Prime Minister Kan in their report and to avoid directly contesting the government’s investigation report. TEPCO issued its interim report of about 140 pages in December 2011 and its final report of about 350 pages in June 2012.

As will be briefly discussed in the outlook at the end of this paper, TEPCO’s report was publicly criticized for eschewing company responsibility for the disaster. The public outcry prompted TEPCO in late 2012 and early 2013 to repudiate many of the views on accountability presented in the original report and acknowledge findings



about its negligence and failures in the other three reports.

### Cause of Accident

The four investigation reports address the cause of the Fukushima nuclear accident in two respects: Firstly, they discuss the immediate cause of the accident, evaluating whether the earthquake or the resulting tsunami damaged vital equipment at the nuclear plant. This technical question fundamentally affects future reactor risk evaluations and safety standards. Secondly, the reports assess why safety measures and nuclear accident preparations were insufficient, pinpointing responsible actors. Findings in this regard will have a bearing on administrative policies in the nuclear energy sector. A comparison of the four reports on these points follows.

#### *Immediate Cause*

The **Cabinet-initiated commission** examined the immediate cause of the accident in detail in its interim report. It finds that vital equipment needed for the cooling and safe shutdown of the reactors was most likely damaged by the tsunami, and “not [...] by seismic motions from the earthquake.”<sup>44</sup> The report notes that the emergency diesel generators needed for cooling operations started up in all six reactor units “as they should” following the loss of external power after the earthquake.<sup>45</sup> The generators only stopped working after the arrival of the tsunami

“due to damage caused by floodwater.”<sup>46</sup> Nevertheless, the report qualifies its findings saying that radiation dose levels precluded the commission from on-site inspection of technical equipment, calling for further investigation into this issue.<sup>47</sup>

The **Diet-initiated commission**, by contrast, maintains the earthquake – in addition to the tsunami – may have critically damaged essential systems at the Fukushima nuclear power plant. In particular, the commission’s report asserts that “the possibility of damage caused by the earthquake at [reactor] unit 1 cannot be cleared away.”<sup>48</sup> The commission strongly criticizes TEPCO for being quick in citing the tsunami as the cause of the accident and denying significant earthquake damage. It states: “The commission believes that this is an attempt to avoid responsibility by putting all the blame on the unexpected (the tsunami), as they [TEPCO] wrote in their midterm report, and not on the more foreseeable earthquake.”<sup>49</sup> In this context, it is noteworthy that the report by the Diet commission is the only one that briefly examines the condition of two other nuclear plants along the Tōhoku coast, Onagawa and Tokai Daini, which were affected by earthquake and tsunami on March 11. The commission concludes it was “lucky coincidence” no major accidents occurred at these plants amid a lack of proper tsunami preparation.<sup>50</sup>

According to the **private sector commission** :

“The direct cause of this accident is the inadequate preparation against tsunamis and the failure of many devices due to the loss of power.”<sup>51</sup> While the report thus regards the tsunami as the plausible cause of this severe accident, it notes – similar to the report by the Cabinet-initiated commission – that on-site investigations were not possible. While not entirely excluding the possibility of earthquake damage, the commission regards this as “unlikely.”<sup>52</sup> Nevertheless, it favors further motion strain analysis.

Finally, **TEPCO's commission** is confident that the accident can be attributed solely to the tsunami. Its report states, “the major equipment that has important functions from the perspective of safety is considered to have maintained its safety functions throughout and immediately following the earthquake.”<sup>53</sup> It thus blames the tsunami with its massive scale for knocking out vital cooling systems at the plant.

**To sum up**, the commissions initiated by the Cabinet, private sector and TEPCO all maintain the available evidence does not point to the earthquake having caused critical damage at the nuclear power plant. Only the Diet’s commission contests this conclusion, citing possible damage incurred from the earthquake especially at reactor block 1. All four reports state that more thorough on-site investigations are necessary in the future to ascertain the damage to key

equipment.

#### *Lack of accident preparation*

The **Cabinet-initiated commission** finds a tremendous lack of preparation for the possibility of a severe accident involving the loss of all power on the part of the operator as well as the government. The report suggests, “TEPCO bears critical responsibilities [sic] to society as a nuclear operator primarily responsible for nuclear power plant safety.”<sup>54</sup> TEPCO’s failure is reflected in the insufficient capability in organizational crisis management and a lack of education and training for employees regarding nuclear crises.<sup>55</sup> The commission also raises criticism against the Nuclear and Industrial Safety Agency (NISA), the main government institution overseeing nuclear safety, finding the agency’s “emergency preparedness against tsunamis or severe accidents was insufficient.”<sup>56</sup>

While TEPCO is squarely admonished for its failures, the report is more ambiguous in evaluating the failures of the regulatory agencies and government as a whole. It maintains that the government’s emergency preparation “was reasonable to a certain extent when the logical framework of government administration is taken into account,” though acknowledging the accident should be used to draw lessons.<sup>57</sup> When administrative failures are named, questions of cause and responsibility are often left unaddressed or ambiguous. For example, the

report observes that NISA was convinced that an accident involving damage to a reactor containment vessel “would not occur in Japan,” but it fails to explain this misconception.<sup>58</sup> Concerning the Nuclear Safety Commission (NSC), another regulatory agency, the report merely notes that NSC “might have failed [sic] short of forming an organization that was sufficiently capable of handling” the revision of seismic safety standards.<sup>59</sup> A few text passages suggest the commission primarily believes that the regulatory agencies lacked organizational capabilities in terms of size, technical knowledge, and authority vis-à-vis operators.<sup>60</sup>

The commission’s report notes that prior to the accident a “myth of safety” existed “among nuclear operators including TEPCO as well as the government,” according to which “severe accidents could never occur in nuclear power plants in Japan.”<sup>61</sup> However, it fails to explain the emergence of this myth or to discuss the cozy ties between government agencies and utilities. The failure to address these issues is remarkable, especially given the LDP’s fear prior to the commission’s establishment that the DPJ government might seek to blame past administrations for their single-minded promotion of nuclear energy at the expense of safety monitoring. While the report does not discuss collusive ties in the nuclear energy sector, its recommendations reflect an awareness of this aspect. Hence, the report argues that a new

regulatory organization requires independence and autonomy, and should be separated from the promotion of nuclear power policies.<sup>62</sup>

According to the **Diet-initiated commission**, the Fukushima accident was a “man-made disaster” rather than a “natural disaster,” caused by the failure to properly consider safety risks.<sup>63</sup> The report clearly names the main actors responsible, stating “TEPCO as the nuclear operator, the NSC and the NISA as the regulatory authorities, and the [Ministry of Economy, Trade and Industry (METI)], as the government body promoting nuclear power, all failed to correctly prepare and implement the most basic safety requirements [...]”<sup>64</sup> The lack of accident preparation is explained by the “collusion between the government, the regulators and TEPCO, and the lack of governance by said parties.”<sup>65</sup> The report thus mainly criticizes the cozy ties between regulators and utilities, calling them “totally inappropriate.”<sup>66</sup>

Collusive relations were encouraged by the fact that both regulators and operators prioritized the interests of their organizations over the public’s safety.<sup>67</sup> Utilities and the government were committed to the promotion of nuclear energy, fearing that the implementation of nuclear disaster prevention measures might raise apprehension among citizens.<sup>68</sup> They sought to avoid lawsuits and measures that might lower utilization rates of existing reactors. Together, they thus conducted “collusive reviews” and

“looked for points of compromise in the regulations in order to maintain the appearance as regulation,” while ensuring that existing reactors could keep running.<sup>69</sup> In this process, Japanese regulatory agencies became introverted, failing to revise guidelines according to new international standards.<sup>70</sup> While the commission’s report does not employ the term ‘safety myth’, it observes that regulators “committed themselves to the idea that nuclear power plants were safe.”<sup>71</sup>

The consequence of these collusive relations, according to the report, was “a reversing of the relationship between the regulated and regulators.”<sup>72</sup> The commission describes the weak position of the authorities in bold terms, maintaining regulators were “prisoners” of the electric power companies, deferring to utilities’ wishes.<sup>73</sup> This condition is viewed as a typical example of “regulatory capture,” in which the oversight of an industry by regulatory agencies effectively ceases.<sup>74</sup> The commission criticizes utilities and their lobbying association, the Federation of Electric Power Companies, for their single-minded pursuit of industry interests.<sup>75</sup> Lobbying efforts were made with the goal to “avoid, neutralize or defer views criticizing the safety of existing reactors or the legitimacy of past regulations.”<sup>76</sup>

The **private-sector commission** concurs with the Diet-initiated investigation in calling the disaster “man-made” and assigning primary responsibility to TEPCO and the regulatory

agencies NISA and NSC for neglecting preparations for severe accidents involving the complete loss of power.<sup>77</sup> In particular, the commission strongly contests TEPCO’s claim that the scale of the tsunami was beyond what could be anticipated. It reveals that in 2006, the utility’s department for nuclear power engineering and quality assurance presented a simulation of a tsunami greater than previously assumed, but high-level company officials rejected it as “academic” and thus without implications for safety measures.<sup>78</sup>

The characteristic of the report is its historical perspective. It finds the insufficient preparation for disasters was born out of Japan’s determined promotion of nuclear power as the “dream energy” since the 1950s, a policy the report traces in detail.<sup>79</sup> For decades, the government emphasized safety and technical advancement, while not specifying risks.<sup>80</sup> The report stresses the “safety myth” as a keyword in this context, as nuclear accidents came to be seen as “inconceivable.”<sup>81</sup> Accidents at nuclear power plants abroad, like Chernobyl and the US Three Mile accident, were portrayed as irrelevant, given the superior technology of Japan. Domestic accidents, like the 1999 Tokaimura nuclear accident, were dismissed as problems concerning only the operator of the plant in question.<sup>82</sup> Like the Diet-initiated commission, the private sector report maintains that accident preparations such as evacuation drills were avoided for fear of

“creating apprehension among citizens about nuclear power generation.”<sup>83</sup> Such public safety concerns could have made it difficult to find local communities willing to host reactors.<sup>84</sup> Proponents of the safety myth, according to the investigation commission, comprise the “nuclear village,” and consist of “politicians, bureaucrats (METI and MEXT, the Ministry of Education, Culture, Sports, Science and Technology), the industrial sector including utility companies, and nuclear engineers.”<sup>85</sup>

The investigation report identifies two particular issues that contributed to lax regulatory oversight. First, it points out the huge gap between utility companies and regulatory agencies in terms of financial assets and technological know-how. The resources of governmental agencies are dwarfed by those available to the large energy companies in Japan.<sup>86</sup> The bureaucracy moreover tends to encourage staff to be generalists rather than specialists, and thus the accumulation of technical knowledge is difficult.<sup>87</sup> Secondly, the commission criticizes that administrative responsibility for nuclear safety was unclear in Japan. Two ministries, METI and MEXT are tasked with the promotion of nuclear power, and they also both influence safety regulations. Moreover, since the administrative reforms in 2001, two agencies, NISA and NSC, have been in charge as regulators ensuring nuclear safety, but without clearly defined roles. As a result, “the

division of labor was not clear, and the responsibility for reviews or approaches [to issues and problems] became ambiguous.”<sup>88</sup> Regulatory governance for nuclear safety has thus been in a “state of unaccountability.”<sup>89</sup>

**TEPCO’s investigation** report acknowledges “inadequate preparedness for tsunamis” at the Fukushima plant, but maintains that that the company cannot be blamed, because the scale of the March 11 tsunami “could not be anticipated.”<sup>90</sup> The report defends the company, contending that the utility proactively sought to incorporate new findings from risk analyses by making improvements in its facility design prior to the accident.<sup>91</sup> A corporate peer review about safety culture conducted in 2010 concluded that TEPCO had “sufficiently” addressed issues that had been pointed out in a review two years earlier.<sup>92</sup> The report maintains TEPCO’s safety measures taken prior to the accident had all passed inspections by the central government. The commission thus puts some blame on the regulatory agencies, maintaining for example that NISA failed to notify the utility about a new safety guideline for severe accidents issued by the US Nuclear Regulatory Commission following the September 9, 2001 terrorist attacks. According to the report, if TEPCO had been informed about the new guidelines, “this may have contributed to preventing the accident’s development (*jiko no shinten o bōs*)”<sup>93</sup>

From a **comparative perspective**, all four reports

concur that there were insufficient preparations for an accident like the one evolving on March 11, 2011. While TEPCO claims the scale of the tsunami was unforeseeable, the other three reports all contest this view, maintaining the accident was preventable. The commissions by the Cabinet, Diet and private sector all assign fault to the plant operator TEPCO and the regulatory agencies for failing to make preparations for severe accidents. The reasons for these failures are investigated most thoroughly by the latter two commissions, while the Cabinet-initiated report leaves some questions unanswered, such as how the ‘safety myth’ emerged in Japan. When explaining failures, the reports by the Diet and private sector address similar issues, although with varying emphasis. The Diet-initiated report focuses more on the collusive ties between actors in the ‘nuclear village’ and stresses that utilities and regulators pursued primarily organizational self-interests rather than public safety. The private-sector report, on the other hand, considers in greater detail the historical evolution of Japan’s nuclear policy and the emergence of the safety myth. Furthermore, the report calls attention to structural problems, such as the severely limited resources of regulators compared to utility companies.

### Evaluation of the Crisis Response

All four investigation reports attribute significant space to the accident response, differing however

in the extent to which they focus on particular institutional actors, i.e. TEPCO, the main regulatory and bureaucratic entities and the Kantei, the Prime Minister’s official residence where the Cabinet meets and where the government’s Crisis Management Center is located in the basement level. The following sections first examine and compare how the four reports assess involved actors’ and institutions’ crisis responses. The analysis then points to similarities and differences in evaluating key crisis management events. Findings on these aspects may influence reform efforts of Japan’s (nuclear) crisis management system.

#### *Actors and Institutions*

The **Cabinet-initiated investigation** focuses on the performance of TEPCO and the Kantei, but is more critical towards the former. It concentrates on TEPCO’s response measures implemented at the accident site, while also highlighting failures in the utility’s communication strategy. The commission’s interim report recounts the initial frustration of central government personnel “because information from TEPCO was not being provided promptly.”<sup>94</sup> The establishment of the Government-TEPCO Integrated Headquarters at the company’s head office on March 15 is thus regarded as “a practical way to resolve the initial confusion.”<sup>95</sup> While the report acknowledges that, “the information collection by the government [subsequently] showed great improvement,”<sup>96</sup> it warns against using the “Fukushima incident

[...] as a universal precedent.”<sup>97</sup> Instead of relying on such kinds of ad-hoc arrangements, an emergency response system should be set up that “enables government people access to the necessary information while staying at the government facilities [...] without moving to the nuclear operator head office.”<sup>98</sup>

The Cabinet-initiated investigation comes to a mixed evaluation of the Kantei’s crisis management approach. In line with the other investigation reports, it describes the establishment of the Kantei’s Crisis Management Center (CMC) in order to cope with the nuclear emergency. The commission criticizes Prime Minister Kan, who – having found the center too noisy – decided to convene with a group of advisors for deliberations away from the CMC.<sup>99</sup> As a result, “[...]decisions were made in places separated from the [CMC] which [...] resulted in a lack and bias in information.”<sup>100</sup> Nevertheless, the report acknowledges that it was understandable for the Prime Minister’s to play a role at “the forefront of the accident.”<sup>101</sup> It attributes Kan’s initiative to the failure of the nuclear plant’s Off-site Center, envisioned as a local coordination and information gathering center during emergencies, but not operational for a lack of radiation air filters and a loss of electricity. It furthermore points to “inadequacies in the information consolidation scheme in the Prime Minister’s Office, and in the advisory function of NSC.”<sup>102</sup> Likewise, the Kantei’s direct

interference in the on-site accident response – e.g. giving orders to the plant manager – receives mixed scores in the report. On the one hand, “the[Kantei’s]advice had little influence on the decisions regarding specific measures taken at the accident site,” as measures similar to the advice given had already been or were about to be implemented.<sup>103</sup> Thus, the commission reasons that “[it] should be considered inappropriate for the government and the Prime Minister’s Office to spearhead the response and intervene in the on-site response from the onset of the incident.”<sup>104</sup> On the other hand, it qualifies this conclusion, arguing “if the [operator’s accident] response is assessed to have been inappropriate or inadequate, [the government and the Kantei] should issue an order for the appropriate action.”<sup>105</sup>

The Cabinet-initiated investigation voices dissatisfaction with the performance of Japan’s two nuclear regulatory bodies, NISA and NSC, which were supposed to provide information on the accident’s evolution and advice on the response. While the report does not dwell on the subject in detail, it gives a few examples. For instance, when Prime Minister Kan asked whether injecting seawater into block 1 of the Fukushima nuclear power station could lead to recriticality (i.e. the resumption of the fission process), neither NISA’s vice director-general nor the chairman of NSC “gave an appropriate reply. None of them assumed the job of an expert.”<sup>106</sup>

The report fails to elaborate on the underlying reasons for their unsatisfactory contribution, though.

The **Diet-initiated report** also analyzes the crisis management of TEPCO, the Kantei, and the bureaucratic agencies, but it is generally bolder in expressing criticism. For example, it clearly states that “the Kantei, the regulatory authorities and the TEPCO management lacked the preparation and the mindset to efficiently conduct emergency responses, they were unable to prevent the expansion of the damage.”<sup>107</sup> The idea that a lack of trust existed between the involved actors and institutions runs like a thread through the report. It is most extensively mentioned in the context of TEPCO’s insufficient crisis communication, which “helped [to] create an atmosphere of distrust between TEPCO [...], the regulatory agencies and the Prime Minister’s Office.”<sup>108</sup>

According to the report, Prime Minister Kan was strongly motivated by his distrust of TEPCO when deciding to personally visit the Fukushima power station on March 12.<sup>109</sup> However, the Kantei’s increasing interference in the accident response inadvertently led to a situation in which TEPCO’s management began to display a “mindset of ‘obedience to authority,’” showing the “abdication of [...] responsibilities, despite its position as private-sector entity.”<sup>110</sup> This tendency was exacerbated by the establishment of the Government-TEPCO Integrated Headquarters.<sup>111</sup>

According to the Diet-initiated commission, the Kantei’s direct intervention in nuclear accident management was also spurred by the initial lack of communication and coordination between different institutions, despite government’s crisis manuals prescribing cooperation. The report emphasizes how NISA “failed in the function of collecting and sharing information concerning the progression of the accident and the progress of the response,”<sup>112</sup> thus neglecting to take over the “lead role” it was expected to play.<sup>113</sup> More generally, the commission criticizes all bureaucratic organizations involved in the accident response, arguing that they “maintained the same stance held during normal, non-emergency, times, and acted passively from beginning to end, [...] unable to put aside their mindset of sectionalism, and so could not play their proper roles in the crisis.”<sup>114</sup>

Due to the numerous failures in the planned response system and the prevailing sense of distrust, the Kantei, i.e. Prime Minister Kan supported by a group of advisors, proactively took over the lead in nuclear crisis management. The Diet-initiated investigation does not dismiss the Kantei’s leadership per se, but clearly would have preferred this role to be one of macro-rather than micro-manager. The report finds the “intervention of the Kantei contributed to the worsening of the accident,”<sup>115</sup> “[disrupting] the chain of command and [bringing] disorder to an already dire situation at the site.”<sup>116</sup> Besides, the



Kantei's request for information from TEPCO directly (instead of via the CMC) opened up an additional communication route, thereby "undeniably exacerbat[ing]" the confusion at the nuclear facility.<sup>117</sup> The commission concludes that the responsibility for accident management at the power plant should have been left with TEPCO, while the Kantei ought to "have realized that [the accident] was an unparalleled crisis for Japan, and should have responded [...] by launching an across-the-board effort to mobilize all the organizations and information that the nation had in its possession."<sup>118</sup> The Kantei's failure to do so reveals "a misunderstanding in [its] true role in a crisis," according to the report.<sup>119</sup>

The **private-sector investigation report** examines the Kantei's nuclear crisis management in detail, displaying skepticism about the benefits of direct involvement in the accident management. It states that "in almost all cases, [the Kantei] did not have any influence or caused unnecessary confusion and stress, which increased the risk of worsening the situation."<sup>120</sup> Yet the commission qualifies this evaluation by acknowledging that the Kantei's veto on the (anticipated) total withdrawal of all TEPCO workers from the power plant on March 15 as well as the subsequent establishment of the Government-TEPCO Integrated Headquarters had a "certain effect on the accident management."<sup>121</sup>

The commission scrutinizes the rationale for the Kantei's massive intervention in the on-site

response at quite some length. While finding the intervention in line with Prime Minister Kan's personal management style, the report highlights three further motivations.<sup>122</sup> First, it emphasizes that the government's nuclear crisis management manuals were flawed and based on "inadequate assumptions,"<sup>123</sup> as for example revealed by the failure to anticipate multiple disasters occurring simultaneously. On top of that, Kantei politicians lacked basic knowledge about putting the instructions to use.<sup>124</sup> Apparently, "a practical explanation on the manuals for times of a nuclear disaster or the basic design of the related legislation was not once given to the Prime Minister" before March 15.<sup>125</sup> Second and similar to the Diet-initiated commission, the private-sector investigation highlights the strong distrust the Kantei developed towards TEPCO and NISA, primarily as a result of communication problems and the incompetent crisis management of the latter two. Consequently, the Kantei group around Prime Minister Kan came to believe: "There is no choice but to do it [i.e. the emergency response] ourselves."<sup>126</sup> Third, the report argues the Kantei was motivated by "a strong anxiety" as the severity of the nuclear accident deepened.<sup>127</sup> Thus, compared to the other reports, the private investigation draws particular attention to the psychological and emotional conditions that seem to have influenced the Kantei's crisis response.

With regards to TEPCO's accident management,

the private-sector commission distinguishes between the company's head office in Tokyo and plant manager Yoshida Masao at the Fukushima nuclear facility. On the one hand, it criticizes the head office's staff for "merely staggering around"<sup>128</sup> without identifying a clear plan or proposal on how to proceed. This is seen as proof for the company's deficits in leadership, decision-making and governance. On the other hand, the report commends Yoshida's sense of duty and courage to navigate the nuclear power complex through the disaster, even at the expense of ignoring orders from TEPCO's headquarters. Yet from the crisis management perspective, the private-sector commission finds such a reversal of responsibility rather problematic.<sup>129</sup>

**TEPCO's investigation report** is not particularly self-critical when assessing its own crisis management, often explaining weaknesses in its approach by the earthquake- and tsunami-induced destruction at the power plant or by the unclear division of roles. For example, the report maintains that "information itself regarding the power station was limited" and hard to obtain due to the total loss of electricity at the nuclear facility.<sup>130</sup> TEPCO's report contradicts the findings from the other investigations, claiming that information about the nuclear facility's status as well as accident counter-measures "were appropriately provided [...] to the relevant organizations."<sup>131</sup> The commission indicates that communication difficulties resulted from failures

in the designated communication arrangements, such as the malfunctioning of the Off-site Center.<sup>132</sup>

TEPCO's investigation criticizes the Kantei for its interference in the on-site accident management, albeit using cautious language. As the final report explains: "The mood, statements and behavior, etc., of the [Kantei][...] was understood to be the 'decisions of the Official Residence' and became directly embedded in the accident response. [...] these unstable arrangements for response caused the confusion."<sup>133</sup> Consequently, the Fukushima power station "ended up being an impractical response organization where persons, who did not understand field conditions, were making decisions from places that did not have that information."<sup>134</sup> While such criticism seems to be aimed at the Kantei in particular, the report avoids explicit finger-pointing.<sup>135</sup> Rather, it mentions that these new arrangements deviated from prior training scenarios.<sup>136</sup> Overall, TEPCO's report assigns responsibilities for crisis management problems to all key institutions involved: "As a matter of fact, in many ways, the government, administration, and TEPCO brought about inadequate results in response to the accident."<sup>137</sup>

**All four reports** illustrate the flaws and weaknesses in the nuclear accident response of the three main institutions. They agree that a smooth response was thwarted by problems in communication and cooperation. The Kantei's

crisis management, a central aspect in all but TEPCO’s investigation report, tends to receive negative evaluations. While the Diet-initiated investigation finds the Kantei’s involvement clearly led to the worsening of the situation at the accident site, the reports compiled on behalf of the Cabinet and the private-sector commission concede possible positive contributions to specific crisis management events. Both reports also appreciate the establishment of the Government-TEPCO Integrated Headquarters on March 15. A commonality between Diet- and private sector-initiated investigations is their consideration of emotional and psychological factors to explain the Kantei’s direct interference in the accident response, rather than pointing only to institutional failures. While the Diet-initiated investigation emphasizes the Kantei’s understandable lack of trust in TEPCO and the regulatory agencies, the private-sector investigation considers anxiety as a second major impetus, as Kantei politicians feared a worst-case nuclear catastrophe unless quick action was taken. The Diet report is most explicit about the role the Kantei should have ideally played, i.e. that of a macro- rather than micro-manager, able to mobilize the whole country in support of the accident response.

*Crisis Management Events*

The four investigation reports scrutinize a number of specific crisis management events. Table 2 summarizes the four reports’ assessment

of six important cases, centered on the following questions: (1) Did Prime Minister Kan’s visit to the Fukushima power plant on March 12 impeded the on-site accident response? (2) Did the Prime Minister’s delay in approving the injection of seawater into reactor unit 1 adversely affect the on-site response?<sup>138</sup> (3) Did TEPCO’s leadership personnel request permission for the total withdrawal of all workers from the nuclear facility on March 15, a move that was prevented by Prime Minister Kan? (4) Why was radiation data from SPEEDI (System for Prediction of Environment Emergency Dose) not used for evacuation purposes? (5) How were evacuation efforts were organized? and (6) Was the government’s communication with the public adequate?

**Table 2: Key Points in Selected Crisis Management Events**

Report Issue	Cabinet Investigation	Diet Investigation	Private Sector Investigation	TEPCO Investigation
<b>Kan’s on-site visit</b>	- did not aggravate accident or affect venting procedure - but: problematic to have supreme commander at accident site <sup>139</sup>	- did not hinder emergency response at plant - had no positive effect either <sup>140</sup>	- visit only briefly mentioned in context of venting unit 1 - no effect on venting process <sup>41</sup>	- visit only briefly mentioned, but no judgment made <sup>142</sup>
<b>Seawater injection unit 1</b>	- PM not informed about preparation for injection, told no urgent decision needed - TEPCO argued “no option but to suspend” injection after noting missing PM approval, but plant manager Yoshida continued as “test run” -> highlights communication problems at Kantei. <sup>143</sup>	- Kan’s advisors did not sufficiently explain need for seawater injection to PM - PM initially gave no approval, was unaware that METI minister had ordered injection -> government displayed “chaotic decision-making”, but no effect on seawater injection. <sup>144</sup>	- announcement of plan to inject seawater leads to Kan posing questions about recriticality - despite TEPCO order to halt injection, Yoshida continued on own authority -> Yoshida demonstrated sense of duty and courage. <sup>145</sup>	- TEPCO decided to halt injection without PM approval: viewed PM as top authority, wished not to further impede coordination - Yoshida deemed injection vital, continued -> reveals problems in ad-hoc TEPCO-Kantei response <sup>146</sup>

<b>Question of withdrawal of all personnel</b>	- TEPCO president Shimizu did not explicitly say if personnel would remain - unclear if partial or complete withdrawal was intended <sup>147</sup>	- hard to believe that Kan prevented total withdrawal - misunderstanding based on flawed communication <sup>148</sup>	- unclear whether TEPCO intended total withdrawal and PM stopped it - doubts about TEPCO's portrayal given Shimizu's unusual behavior, e.g. calling key politicians in middle of the night <sup>149</sup>	- complete withdrawal was never intended and not prevented by PM - misunderstanding based on insufficient communication <sup>150</sup>
<b>SPEEDI</b>	- even without ERSS <sup>151</sup> data SPEEDI could have been used - relevant institutions were unclear about this possibility <sup>152</sup> - lack of clarity which organization would be responsible for SPEEDI in case of malfunctioning Off-site Center <sup>153</sup>	- SPEEDI could not be utilized due to lack of emission data to be provided by ERSS - whole system failed <sup>154</sup>	- had SPEEDI predictions reached Kantei, they could have possibly been utilized for decision-making - bureaucratic agencies lacked confidence in SPEEDI; thought it could not be used for decision-making on evacuation zones <sup>155</sup>	- no comment
<b>Evacuation measures by central government</b>	- instructions were imprecise, lacked detail - problem of not considering SPEEDI data - insufficient planning of evacuation procedures in case of nuclear emergency <sup>156</sup>	- insufficient provision of accurate information - chaotic evacuation orders -> "government ... abandoned ... responsibility for public safety" <sup>157</sup>	- insufficient provision of instructions, information, support - enlarging evacuation zone four times within 24 hours problematic, but might have prevented radiation exposure for most residents <sup>158</sup>	- no comment
<b>Government communication towards public</b>	- delay in provision of urgent information - ambiguous information - withholding of press releases -> resulted in public mistrust <sup>159</sup>	- Kantei focused on information accuracy, not on prompt dissemination - government was unresponsive to needs of public <sup>160</sup>	- delays in publicizing information - tendency to extenuate actual on-site situation - vague explanations on risks -> government did not react to anxieties, could not win public's trust <sup>161</sup>	- lack of guidelines on information to be publicized by TEPCO - government required notification prior to TEPCO disclosing information -> time-consuming process <sup>162</sup>

prevented such a move, speaking of a misunderstanding on the part of the Kantei. Yet it assigns primary responsibility to TEPCO president Shimizu Masataka for failing to clearly express his intentions. By contrast, the Cabinet-initiated and private-sector investigations deem it possible that Shimizu spoke of a total withdrawal, although this cannot be ascertained. The private-sector report moreover regards Kan's outright rejection of the anticipated total withdrawal as an important "turning point" in the crisis response, as it led to the subsequent establishment of Government-TEPCO Integrated Headquarters.<sup>164</sup>



Tepco President Shimizu Masataka Bows in Apology

Assessments diverge on the question why SPEEDI data was not utilized for evacuation purposes. SPEEDI predicts the release of radioactive material based on data provided by the Emergency Response Support System (ERSS) on the release of radioactive material. On the one hand, the Diet-initiated investigation argues that SPEEDI predictions would have lacked the necessary accuracy due to missing ERSS<sup>165</sup> data. On the other hand, the reports compiled on

As table 2 reveals, the most striking differences in the reports' evaluations exist regarding questions (3) and (4). Pertaining to the total withdrawal issue, TEPCO flatly denies ever having considered evacuating all workers from the nuclear facility, explaining its view in detail on 15 pages.<sup>163</sup> Similarly, the Diet-initiated report sees no evidence of Prime Minister Kan having

behalf of the Cabinet and private-sector maintain that SPEEDI predictions, based solely on weather and wind data, could have served as reference points when determining evacuation zones.<sup>166</sup> However, it was not until ten days after the accident that NSC started to publish such predictions. By then, many residents had already evacuated, with some moving to areas with comparatively high radiation levels due to lack of accurate information about radiation dispersal. Pointing out the extensive development efforts for SPEEDI over three decades and costs of 12 billion yen (more than 150 million US dollar), the private-sector investigation dismisses the system as a “useless possession” for not having been utilized in the crisis.<sup>167</sup>

### Policy Recommendations

Based on their findings, the four investigation commissions offer various policy proposals. The **Cabinet-initiated investigation** presents the most comprehensive account, touching upon many specific issues causing problems during the Fukushima nuclear disaster. As an underlying theme, it emphasizes the need for a change in the risk attitude by taking into account low probability scenarios.<sup>168</sup> It thus states, “a new approach to safety measures and emergency preparedness should be established [...] regardless of [a disaster’s] probability of occurrence.”<sup>169</sup> The report’s many recommendations are grouped into several categories, covering “fundamental and general

issues” and more “specific and detailed” ones.<sup>170</sup> Among the noteworthy points are the proposal to charge a government body with developing a concept for the exchange of information during an emergency,<sup>171</sup> and the suggestion of a new nuclear regulatory agency that is independent, transparent, well staffed, and solidly financed.<sup>172</sup> Furthermore, the report calls for improvements in the existing governmental response system to a nuclear emergency, e.g. putting forward general suggestions on the crisis management manual and the Off-site Center.<sup>173</sup> However, it fails to address ideas on the specific roles of the different institutions during a nuclear emergency and on the conduct of leading politicians during such crises.<sup>174</sup>

The **Diet-initiated investigation** presents a shorter list of recommendations, centering on the reform of the government-bureaucratic system of nuclear regulation and oversight. Proposals include transforming the regulatory bodies in a similar way as suggested in the Cabinet-initiated report, and setting up a more comprehensive legal framework related to the utilization of nuclear power. In contrast to the Cabinet-initiated report, the Diet-initiated one reflects more on the intervention of the Kantei during the Fukushima nuclear disaster. First, it calls for a clear-cut delineation of roles and responsibilities between the operators, all related government agencies, and the government on the central and local level. Second, it advocates a crisis

management system based on a “consolidated chain of command [...]”<sup>175</sup> Most importantly, the Diet-initiated investigation report suggests the founding of a permanent Diet-committee on nuclear energy issues (supported by an advisory body comprising independent experts and others), and authorized to “supervise the nuclear regulatory authorities and to secure the health and safety of the public.”<sup>176</sup>

Unlike the other three reports, the one compiled by the **private-sector investigation commission** does not include an individual chapter with recommendations, but it does offer a few essential suggestions nonetheless. Some of the ideas resemble those already mentioned, while others are more innovative and far-reaching. For instance, like the other commissions, the report supports the establishment of a highly independent and professional nuclear safety and regulatory body with dedicated staff on a long-term employment scheme (instead of short-term appointment and frequent job rotation as is common in government institutions). At the same time, the report goes further than the other commissions in proposing the founding of an organization comparable to the Federal Emergency Management Agency (FEMA) in the US, which is specialized in coordinating the response to large-scale disasters.<sup>177</sup> Moreover, it recommends the setting up of an independent organ for the evaluation of science and technology (*kagaku gijutsu hyōka kikō*) to advise

the Prime Minister<sup>178</sup> and provide informed guidance in the event of (technology-related) crises.

In contrast to the other three reports, **TEPCO’s investigation report** focuses on technical improvements at nuclear facilities to enhance safety standards, such as tsunami countermeasures and emergency procedures.<sup>179</sup> It also provides suggestions to the government and other organizations. For instance, it calls for logistical cooperation between TEPCO and the Self Defense Forces during nuclear emergencies, and enhanced sharing of information about tsunamis from the sea level height monitoring system to improve disaster preparedness.<sup>180</sup> Additionally, the report considers the possibility of a future nuclear disaster and suggests temporary modification of worker radiation exposure limits at stricken plants at the reactor operator’s “own discretion under a specified set of conditions” to be negotiated with the government.<sup>181</sup> Unlike the other reports, TEPCO’s focuses solely on improving safety conditions and disaster response capacities at nuclear facilities, while omitting recommendations on administrative oversight.

## Conclusion and Outlook

The four different investigation commissions were set up to understand the causes and the development of the Fukushima nuclear accident and to formulate recommendations for

preventing similar accidents. The establishment process was characterized by a lack of confidence by each entity in the findings expected from counterparts. Given that TEPCO and the Cabinet had both played important roles during the Fukushima crisis and were thus a target of investigation, there was widespread suspicion that investigations initiated by these two actors would be biased. One-sided portrayals can be found to a certain extent. TEPCO's report clearly lacks a self-critical perspective, while the Cabinet-initiated report may be seen as cautious in criticizing governmental actors. Overall, it is noteworthy, however, that the investigation reports agree rather than disagree in their identification of fundamental issues and problems (with TEPCO's being the exception at times). This holds true with regards to rather low safety standards without proper implementation, lax regulatory oversight, and flaws in TEPCO's and the government's crisis management system.

While the four reports identify similar key problems, they place different emphasis on each issue and offer diverging perspectives, interpretations, and degrees of criticism. For instance, while all four reports agree that safety standards at the Fukushima nuclear facility were inadequate, they provide different explanations for the lack of preparation. The Cabinet-initiated and private-sector investigation reports both point to the safety myth as root cause. The Diet-initiated investigation highlights collusive ties

and regulatory capture in its explanation, while TEPCO's report claims the tsunami's height to have been beyond expectations.

Given these differences, the four reports used in combination convey a more complete picture of the nuclear disaster's causes and evolution than any single one of them. Furthermore, a comparative analysis clearly highlights open questions and unresolved issues, which are not necessarily addressed in individual reports. This was demonstrated, for instance, in the analysis on the non-utilization of SPEEDI data and on Kan's (possible) prevention of total withdrawal of all nuclear facility workers. In sum, even if only cursory, the comparison presented here underlines the high level of complexity attached to investigating the nuclear disaster. This can also be seen as the primary reason for all but TEPCO's commission to call for the continuation of inquiries into the accident.<sup>182</sup>

Following the release of its final report in June 2012, TEPCO was widely criticized for its unrepentant stance, blaming the accident on the tsunami and defending the company's crisis management. The utility was also admonished for heavily editing the limited video coverage it released of discussions and teleconferencing sessions during the disaster.<sup>183</sup> In hopes of winning public trust in ongoing safety improvements and gaining approval for reactor restarts at its Kashiwazaki complex in Niigata, TEPCO established an internal reform task force,

whose activities are monitored by the Nuclear Reform Monitoring Committee, consisting of Japanese and international nuclear experts in September 2012. This committee includes former US Nuclear Regulatory Commission chief Dale Klein as well as Sakurai Masafumi, who served on the Diet investigation panel. The committee's activities prompted a major reversal in TEPCO's stance on accident responsibility. In October 2012, the company for the first time admitted the disaster could have been prevented. The internal reform task force, led by TEPCO President Hirose Naomi, acknowledged the utility was aware of necessary safety improvements long before the disaster, but failed to act, fearing political, economic and legal consequences of implementing new measures.<sup>184</sup> In December 2012, a task force member furthermore announced TEPCO's acceptance of allegations in the Diet investigation report regarding the company's lack of a safety culture and other "bad habits," including collusive ties with regulators.<sup>185</sup> TEPCO's mea culpa extended to admitting it failed to train workers properly to operate emergency systems, that it did not take appropriate countermeasures, and failed to conduct emergency evacuation drills because this might undermine the safety myth and public trust.

Given the extensive investigations into the Fukushima nuclear accident and subsequent public discussions, to what extent has Japanese

policy incorporated findings and recommendations from the reports since the disaster? Over the past months, the Japanese government has taken some steps to address key problems identified in the Fukushima investigations, particularly in the areas of regulatory oversight and crisis management. While on the surface these reforms follow key suggestions made by the four investigations, it is uncertain whether the mindset of those responsible for ensuring safety has fundamentally changed.



Prime Minister Abe Shinzō Inspects Stricken Fukushima Plant

With regard to administrative oversight, the Nuclear Regulation Authority (NRA) was established in September 2012. Structurally, it satisfies key suggestions made in the investigation reports:<sup>186</sup> the NRA as an institution enjoys legally guaranteed independence and is led by a 'nuclear regulatory commission' of five members, whose nomination must be approved by the Diet. Thus, unlike its predecessor NISA, the new regulator is no longer part of a ministry that simultaneously seeks to promote nuclear energy. Moreover, the creation of regulations on



any aspect of nuclear power is now centralized under the NRA. As some investigations pointed out, too many ministries and other institutions were previously involved in drawing up regulations, thereby blurring responsibilities. Finally, the NRA has pledged greater transparency, for example by releasing records of meetings, including those with electric utilities.

The release in January of the regulatory body's new safety standards draft was greeted by significant protest from the utilities, which fear that total costs of implementing these standards may amount to as much as 1 trillion Yen.<sup>187</sup> These protests seem to be a good initial sign of stricter administrative oversight. The NRA is also re-examining safety assessments on fault lines below existing nuclear plants and has concluded that some reactors are sited on active faults. Nevertheless, one of the greatest challenges for the NRA will be to foster employees with specialized knowledge and expertise who do not have close ties to the nuclear village and will thus ensure institutional independence. Most of the current NRA employees were simply transferred from the previous regulators, NISA and NSC, and many lacked sufficient expertise.<sup>188</sup> Moreover, the five commission members of the NRA have been criticized for their close relations to the nuclear village.<sup>189</sup> In line with the Diet-led commission's suggestion, the Lower House set up a panel in April 2013 to monitor nuclear power administration. However, this panel has

been criticized for its pro-nuclear makeup. A former member of the Diet-led commission suspected the LDP might use it to apply pressure on the NRA to loosen regulations, rather than ensuring strict oversight.<sup>190</sup>



Tanaka Shun'ichi is Chair of the Nuclear Regulation Authority

Secondly, with regard to crisis management and disaster prevention systems, the government has established the Nuclear Emergency Preparedness Commission under the Cabinet. This permanent commission, chaired by the Prime Minister, allows the government and regulators to work together closely and take joint decisions, both in normal times and during a crisis. In case of a disaster, the commission is envisioned to serve as a clearinghouse for information released to the public. Its establishment thus reflects suggestions by the cabinet's investigation commission on enhancing the exchange of information during crises. Moreover, the government issued a new Basic Disaster Management Plan in September 2012, detailing a range of different measures.<sup>191</sup> In case of a disaster, utilities will be asked to set up accident response centers at their company headquarters and allow free access to

representatives from the regulators, for example. The plan also states clearly that the NRA should swiftly release radiation data to ensure local communities can take appropriate evacuation measures. Nevertheless, it remains uncertain whether in the event of a crisis the government's new planning would indeed prevent a repeat of the confusion and disarray in the chain of command seen in the Fukushima accident response. At present, the government seems unlikely to initiate more wide-ranging institutional reforms, such as the establishment of a FEMA-like organization for coordinating disaster responses suggested by the private-sector investigation.

Over the next three years, an expert panel will monitor the government's progress in incorporating lessons from the Fukushima disaster. At the recommendation of the Cabinet- and Diet-initiated investigation committees, a follow-up committee was established by the government in December 2012 to evaluate progress on implementing proposals made in the previous investigations.<sup>192</sup> Among its 15 members are the chairmen of all the investigation committees with the exception of the TEPCO panel. Following an initial round of hearings with relevant government agencies and ministries, the new expert panel issued an interim status report in March 2013. The report concludes that while a number of changes in the government's structure are already under way,

many issues remain to be tackled.<sup>193</sup> The panel reiterates many of the recommendations issued in the previous investigation reports, but highlights areas in which the government should exert particular efforts. For example, the report argues that fostering expertise among employees involved in regulatory oversight should be prioritized. Among other measures, it suggests the establishment of extensive exchange programs on the international level.<sup>194</sup> Moreover, it argues that an international expert peer review of the government's reform efforts might enhance public trust in the changes underway.<sup>195</sup>

In addition to implementation monitoring, in March 2013 a further investigation into the Fukushima disaster was launched by the NRA in March to clarify issues that the investigations thus far had disagreed on or did not answer. A key goal will be to determine whether the earthquake indeed caused critical damage to the cooling equipment in reactor block 1, as suspected by the Diet-initiated commission. The four previous investigation commissions did not conduct on-site inspections of the whole nuclear complex and block 1 in particular, because TEPCO at the time warned of radiation levels and insufficient lighting. If the new investigation finds evidence that seismic activity triggered the breakdown of cooling systems, the NRA might upgrade its seismic safety regulations significantly. Experts estimate the investigation could take years, if not decades, however.<sup>196</sup> In

the meantime, the investigation reports published thus far can serve as reference points for evaluating reform efforts in Japan's nuclear energy sector.

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*Recommended citation: Kerstin Lukner and Alexandra Sakaki, "Lessons from Fukushima: An Assessment of the Investigations of the Nuclear Disaster," The Asia-Pacific Journal, Vol 11 Issue 19, No. 2, May 13, 2013.*

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Iwata Wataru, Nadine Ribault and Thierry Ribault, Thyroid Cancer in Fukushima: Science Subverted in the Service of the State (<http://apjff.org/-Iwata-Wataru/3841>)

Gabrielle Hecht, Nuclear Janitors: Contract Workers at the Fukushima Reactors and Beyond (<http://apjff.org/-Gabrielle-Hecht/3880>)

Paul Jobin, Fukushima One Year On: Nuclear workers and citizens at risk (<http://apjff.org/-Paul-Jobin/3729>)

David McNeill, Crippled Fukushima Nuclear Power Plant at One Year: Back in the Disaster Zone (<http://apjff.org/-David-McNeill/3700>)

Cara O'Connell, Health and Safety Considerations: Fukushima Nuclear Power Plant Workers at Risk of Heat-Related Illness ([http://apjff.org/-Cara-O\\_Connell/3576](http://apjff.org/-Cara-O_Connell/3576))

Matthew Penney, Nuclear Workers and Fukushima Residents at Risk: Cancer Expert on the Fukushima Situation (<http://apjff.org/events/view/100>)

## Notes

<sup>1</sup> The authors would like to thank Matthias Korpak for his valuable research assistance during his internship at SWP. Thank you also to Jeff Kingston, Thomas Berger and Axel Klein for helpful comments and suggestions on earlier drafts of this paper.

<sup>2</sup> Michiyo Nakamoto, Japan looks set to restart its nuclear power programme, *Financial Times*, 4 Januar 2013.

<sup>3</sup> There are, however, a few comparative articles in Japanese, see especially: Keizai sangyō chōsashitsu, Issue Brief: Fukushima daiichi genpatsu jiko to 4tsu no jiko chōsa iinkai [The Fukushima Daiichi nuclear accident and the four accident investigation commissions], Kokuritsu kokkai toshokan Issue Brief, No. 756, August 23, 2012, [here](http://dl.ndl.go.jp/view/download/digidepo_3526040_po_0756.pdf?contentNo=1) ([http://dl.ndl.go.jp/view/download/digidepo\\_3526040\\_po\\_0756.pdf?contentNo=1](http://dl.ndl.go.jp/view/download/digidepo_3526040_po_0756.pdf?contentNo=1))(accessed December 14, 2012); Yomiuri Shimbun, 4tsu no jikochōhōkoku hikaku [Comparison of the four accident investigation reports], July 24, 2012; Nikkei Shimbun, Kenshō: Genpatsu jikochō hōkokusho [Examination: The Nuclear Accident Investigation Reports], July 29, 2012.

<sup>4</sup> None of the four commissions addressed the fundamental question of whether Japan should continue to rely on nuclear power in its energy mix.

<sup>5</sup> Cabinet Secretariat, Establishment of the Investigation Committee on the Accident at Fukushima Nuclear Power Stations of Tokyo Electric Power Company, Cabinet Decision, May 24, 2011, [here](http://www.cas.go.jp/jp/seisaku/icanps/eng/2011/07/05/0524CabinetDcision.pdf) (<http://www.cas.go.jp/jp/seisaku/icanps/eng/2011/07/05/0524CabinetDcision.pdf>)(accessed January 10, 2013).

<sup>6</sup> Secretariat, Establishment of the Investigation Committee, May 24, 2011.

<sup>7</sup> Cabinet Secretariat, Remarks by the Prime Minister Naoto Kan at the First Meeting of the Investigation Committee on the Accident at the Fukushima Nuclear Power Stations of Tokyo Electric Power Company, June 7, 2011, here (<http://www.cas.go.jp/jp/seisaku/icanps/eng/2011/07/06/0607PrimeMinister.pdf>)(accessed January 28, 2013).

<sup>8</sup> Cabinet Secretariat, Remarks by the Prime Minister, June 7, 2011.

<sup>9</sup> Cabinet Secretariat, Establishment of the Investigation Committee, May 24, 2011.

<sup>10</sup> Page numbers for all reports refer to the Japanese language reports. See Yomiuri Shimbun, 4tsu no jikochōhōkoku hikaku, July 24, 2012.

<sup>11</sup> Yomiuri Shimbun, 4tsu no jikochōhōkoku hikaku, July 24, 2012.

<sup>12</sup> Cabinet Secretariat, Establishment of the Investigation Committee, May 24, 2011.

<sup>13</sup> Asahi Shimbun, Fukushima Daiichi Genpatsuno jikochōsai, 12gatsu ni chūkan hōkoku [Interim Report by Investigation Committee on Fukushima Daiichi Nuclear Accident in December], September 28, 2011.

<sup>14</sup> See Kakizawa Mito's remarks in the Lower

House Diet session on May 23, 2011 (All Diet discussions can be accessed at <http://kokkai.ndl.go.jp/>).

<sup>15</sup> See Kusakawa Shōzō's remarks in the Lower House Diet session on October 27, 2011.

<sup>16</sup> See Nakasone Hirofumi's remarks in the Lower House Diet session on September 15, 2011.

<sup>17</sup> Asahi Shimbun, (Shasetsu) Genpatsujikochō: atarashii kokkai no shikinseki [(Editorial) Investigation on Nuclear Accident: Litmus test for new Diet], October 1, 2011.

<sup>18</sup> See the remarks by Minister of Economy, Trade and Industry, Kaieda Banri in the Lower House Diet session on August 25, 2011.

<sup>19</sup> See remarks by Matsumura Yoshifumi in the Lower House Diet session on August 25, 2011.

<sup>20</sup> National Diet of Japan Fukushima Nuclear Accident Independent Investigation Commission, 'About', Undated, here (<http://warp.da.ndl.go.jp/info:ndljp/pid/3856371/naaic.go.jp/en/about/index.html>)(accessed February 10, 2013).

<sup>21</sup> On the selection process, see Upper House of Diet, Tokyo Denryoku Fukushima Genshiryoku Hatsudensho Jiko ni kakawaru ryōgiin no giinuneiiinkai no gōdōkyōgikai – Tokyo Denryoku Fukushima Genshiryoku Hatsudensho Jikochōiinkai. [Joint meeting of the leading parliamentary group on the TEPCO Fukushima

nuclear power plant accident - TEPCO Fukushima nuclear power plant accident investigation committee], January 18, 2012, here ([http://www.sangiin.go.jp/japanese/gianjoho/old\\_gaiyo/179/1797200.pdf](http://www.sangiin.go.jp/japanese/gianjoho/old_gaiyo/179/1797200.pdf))(accessed February 3, 2013).

<sup>22</sup> National Diet of Japan, The Official Report of the Fukushima Nuclear Accident Independent Investigation Commission – Executive Summary, 2012, here ([http://warp.da.ndl.go.jp/info:ndljp/pid/3856371/naiic.go.jp/wp-content/uploads/2012/09/NAIIC\\_report\\_lo\\_res10.pdf](http://warp.da.ndl.go.jp/info:ndljp/pid/3856371/naiic.go.jp/wp-content/uploads/2012/09/NAIIC_report_lo_res10.pdf))(accessed April 4, 2013), from heron referred to as ‘Diet Final Summary’, p. 10.

<sup>23</sup> Diet Final Summary, p. 11.

<sup>24</sup> Asahi Shimbun, Kokkai genpatsu jikochō – Tsuyoi kengen, gensoku kōkai, tōmeisei ni hairyo [Diet nuclear accident investigation – Strong authority and principle of being open to public in consideration of transparency ], September 29, 2011.

<sup>25</sup> Diet Final Summary, p. 20.

<sup>26</sup> Rebuild Japan Initiative Foundation, Purpose of the Establishment of the Rebuild Japan Initiative Foundation, undated, <http://rebuildjpn.org/en/about-us/purpose/>(accessed February 3, 2013).

<sup>27</sup> Funabashi was inspired by the investigation

commissions set up by the US National Aeronautics and Space Administration (NASA) to look into the accidents involving the space shuttles Challenger and Columbia. See Asahi Shimbun, Interview/ Yoichi Funabashi: Fukushima nuclear crisis revealed Japan's governing defects, February 29, 2012, here (<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201202290078>)(accessed January 25, 2013).

<sup>28</sup> Asahi Shimbun, Interview/ Yoichi Funabashi, February 29, 2012.

<sup>29</sup> Rebuild Japan Initiative Foundation, Yoku aru go-shitsumon [Frequently asked questions], undated, here (<http://rebuildjpn.org/fukushima/faq/>)(accessed February 3, 2013). The Foundation has not release specific information on donors.

<sup>30</sup> Asahi Shimbun, Interview/ Yoichi Funabashi, February 29, 2012.

<sup>31</sup> Rebuild Japan Initiative Foundation, Yūshikisha iinkai [Expert committee], undated, here (<http://rebuildjpn.org/en/fukushima/committee>)(accessed February 3, 2013).

<sup>32</sup> Koichi Kitazawa, Message regarding Investigation, undated, here (<http://rebuildjpn.org/en/fukushima/message/>)(accessed February 3, 2013).

<sup>33</sup> Kenji Yamaji, My Thoughts after Participation in an Independent Investigation of the Fukushima Nuclear Accident, July 18, 2012, here (<http://www.energyfed.org.nz/Fukushima%20Report-Special%20Edition.pdf>)(accessed January 15, 2013).

<sup>34</sup> A three-page summary is available in English. Rebuild Japan Initiative Foundation, Independent Panel Issues Report on Fukushima Nuclear Accident, March 1, 2012, here ([http://rebuildjpn.org/wp/wp-content/uploads/2012/03/Fukushima\\_20120301.pdf](http://rebuildjpn.org/wp/wp-content/uploads/2012/03/Fukushima_20120301.pdf)) (accessed April 22, 2013).

<sup>35</sup> Yomiuri Shimbun, 4tsu no jikochōhōkoku hikaku, July 24, 2012.

<sup>36</sup> Asahi Shimbun, Interview/ Yoichi Funabashi, February 29, 2012.

<sup>37</sup> See foreword in: TEPCO, Fukushima Nuclear Accident Analysis Report (Interim Report), 2011, here (<http://www.tepco.co.jp/en/press/corp-com/rel/111202e14.pdf>)(accessed April 4, 2013), hereafter referred to as ‘TEPCO Interim Full’.

<sup>38</sup> See foreword in: TEPCO Interim Full.

<sup>39</sup> Leslie Corrice, March 5, 2012, „A Fukushima investigative scorecard”, The American Nuclear Society’s ‘Nuclear Café’, <http://ansnuclearcafe.org/2012/03/05/a-fukush>

ima-investigative-scorecard.

<sup>40</sup> Jiji Press, Tōden jiko kenshōi wa ‘kengen naki kateikyōshi’ = TV kaigi mo mizu – Yagawa Inchō [TEPCO accident inspection is (like) ‘tutor without rights’ = Commission chairman Yagawa – Not even watched TV conference], July 3, 2012.

<sup>41</sup> Jiji Press, Tōden jiko kenshōi, July 3, 2012.

<sup>42</sup> Jiji Press, Tōden jiko kenshōi, July 3, 2012.

<sup>43</sup> Jiji Press, Tōden jiko kenshōi, July 3, 2012.

<sup>44</sup> Investigation Committee on the Accident at Fukushima Nuclear Power Stations of Tokyo Electric Power Company, Interim Report, December 2011, here (<http://www.icanps.go.jp>)(accessed April 4, 2013), hereafter referred to as ‘Cabinet Interim Full’, p. 38.

<sup>45</sup> Cabinet Interim Full, p. 43.

<sup>46</sup> Cabinet Interim Full, p. 43.

<sup>47</sup> Cabinet Interim Full, p. 25.

<sup>48</sup> National Diet of Japan, Fukushima Nuclear Accident Independent Investigation Commission Final Report, 2012, here (<http://warp.da.ndl.go.jp/info:ndljp/pid/3856371/naaic.go.jp/en/report/>)(accessed April 4, 2013), from here referred to as ‘Diet Final Full’, Introductory chapter, p. 12.

<sup>49</sup> Diet Final Summary, p. 17.

<sup>50</sup> Diet Final Full, Chapter 2, p. 46.

<sup>51</sup> Fukushima genpatsu jiko dokuritsu kenshō iinkai, Chōsa Kenshō Hōkokusho [Report on Inquiry and Investigation], March 2012, Tokyo: Discover/ Rebuild Japan Initiative Foundation (RJIF), hereafter referred to as 'RJIF', p. 41.

<sup>52</sup> RJIF, p. 37.

<sup>53</sup> TEPCO, Fukushima Nuclear Accident Analysis Report (Final Report), June 20, 2012, here ([http://www.tepco.co.jp/en/press/corp-com/release/betu12\\_e/images/120620e0104.pdf](http://www.tepco.co.jp/en/press/corp-com/release/betu12_e/images/120620e0104.pdf)) (accessed April 3, 2013), hereafter referred to as 'TEPCO Final Full', p. 43.

<sup>54</sup> Investigation Committee on the Accident at Fukushima Nuclear Power Stations of Tokyo Electric Power Company, Final Report, July 2012, here (<http://www.icanps.go.jp>) (accessed April 4, 2013), hereafter referred to as 'Cabinet Final Full', p. 476.

<sup>55</sup> Cabinet Final Full, p. 476.

<sup>56</sup> Cabinet Final Full, p. 424.

<sup>57</sup> Cabinet Final Full, p. 493.

<sup>58</sup> Cabinet Final Full, p. 488.

<sup>59</sup> Cabinet Interim Full, p. 554.

<sup>60</sup> Investigation Committee on the Accident at Fukushima Nuclear Power Stations of Tokyo Electric Power Company, Executive Summary of

the Interim Report, December 2011, here (<http://www.icanps.go.jp>) (accessed April 4, 2013), hereafter referred to as 'Cabinet Interim Summary', p. 18.

<sup>61</sup> Investigation Committee on the Accident at Fukushima Nuclear Power Stations of Tokyo Electric Power Company, Executive Summary of the Final Report, July 2012, here (<http://www.icanps.go.jp>) (accessed April 4, 2013), hereafter referred to as 'Cabinet Final Summary', p. 23.

<sup>62</sup> Cabinet Final Full, p. 502-503.

<sup>63</sup> Diet Final Full, Introductory chapter, p. 16; see also Keizai sangyō chōsashitsu, Issue Brief: Fukushima daiichi genpatsu jiko to 4tsu no jiko chōsa iinkai [The Fukushima Daiichi nuclear accident and the four accident investigation commissions], Kokuritsu kokkai toshokan Issue Brief, No. 756, August 23, 2012, here ([http://dl.ndl.go.jp/view/download/digidepo\\_3526040\\_po\\_0756.pdf?contentNo=1](http://dl.ndl.go.jp/view/download/digidepo_3526040_po_0756.pdf?contentNo=1)) (accessed December 14, 2012), p. 2.

<sup>64</sup> Diet Final Full, Introductory chapter, p. 10.

<sup>65</sup> Diet Final Summary, p. 16.

<sup>66</sup> Diet Final Summary, p. 43. Some observers noted that the chairman's message at the beginning of the report differed with regards to key accident causes in the Japanese and English versions. The English version argues the



disaster's causes are found in Japanese culture, characterized by "reflexive obedience" or "reluctance to question authority." (Diet Final Full, p. 9) The Japanese version is more vague, not directly mentioning culture as a factor. As the chairman's message is not necessarily a consensus product of all investigation members, it is not considered in this paper.

<sup>67</sup> Diet Final Summary, p. 43.

<sup>68</sup> See Nikkei Shimbun, Kenshō: Genpatsu jikochō hōkokusho, July 29, 2012.

<sup>69</sup> Diet Final Full, Chapter 5, p. 14 and Chapter 1, p. 45.

<sup>70</sup> Diet Final Full, Chapter 5, p. 57.

<sup>71</sup> Diet Final Summary, p. 17.

<sup>72</sup> Diet Final Full, Introductory chapter, p. 16.

<sup>73</sup> Yomiuri Shimbun, 4tsu no jikochōhōkokuhikaku, July 24, 2012.

<sup>74</sup> Diet Final Summary, p. 43.

<sup>75</sup> Diet Final Full, Chapter 5.

<sup>76</sup> Diet Final Full, Chapter 5, p. 14.

<sup>77</sup> RJIF, pp. 383-384.

<sup>78</sup> RJIF, p. 386.

<sup>79</sup> RJIF, p. 246.

<sup>80</sup> RJIF, p. 246.

<sup>81</sup> RJIF, p. 248.

<sup>82</sup> RJIF, p. 246.

<sup>83</sup> RJIF, p. 385.

<sup>84</sup> RJIF, p. 248.

<sup>85</sup> RJIF, p. 248.

<sup>86</sup> RJIF, p. 292.

<sup>87</sup> RJIF, p. 251.

<sup>88</sup> RJIF, p. 306.

<sup>89</sup> RJIF, p. 292.

<sup>90</sup> TEPCO Final Full, p. 447.

<sup>91</sup> TEPCO, Fukushima Nuclear Accident Analysis Report (Summary), June 20, 2012, here ([http://www.tepco.co.jp/en/press/corp-com/release/betu12\\_e/images/120620e0102.pdf](http://www.tepco.co.jp/en/press/corp-com/release/betu12_e/images/120620e0102.pdf)) (accessed April 4, 2013), hereafter referred to as 'TEPCO Final Summary', p. 8.

<sup>92</sup> TEPCO Final Summary, p. 11.

<sup>93</sup> Yomiuri Shimbun, 4tsu no jikochōhōkokuhikaku, July 24, 2012.

<sup>94</sup> Cabinet Interim Full, p. 568.

<sup>95</sup> Cabinet Interim Full, p. 569.

<sup>96</sup> Cabinet Final Full, p. 434.

<sup>97</sup> Cabinet Final Summary, p. 6.

- <sup>98</sup> Cabinet Final Summary, p. 6.
- <sup>99</sup> Cabinet Final Full, p. 219.
- <sup>100</sup> Cabinet Final Summary, p. 5.
- <sup>101</sup> Cabinet Final Full, p. 498.
- <sup>102</sup> Cabinet Final Full, p. 498.
- <sup>103</sup> Cabinet Final Full, p. 223.
- <sup>104</sup> Cabinet Final Summary, p. 9.
- <sup>105</sup> Cabinet Final Summary, p. 9.
- <sup>106</sup> Cabinet Final Summary, p. 8.
- <sup>107</sup> Diet Final Full,Introductory chapter,p. 13.
- <sup>108</sup> Diet Final Summary, p. 33.
- <sup>109</sup> Diet Final Full,Introductory chapter,p. 13.
- <sup>110</sup> Diet Final Summary, p. 33.
- <sup>111</sup> Diet Final Full,Chapter 3,p. 67.
- <sup>112</sup> Diet Final Full,Chapter 3,p. 33.
- <sup>113</sup> Diet Final Summary, p. 18.
- <sup>114</sup> Diet Final Full,Chapter 3,p. 65.
- <sup>115</sup> Diet Final Summary, p. 34.
- <sup>116</sup> Diet Final Summary, p. 35.
- <sup>117</sup> Diet Final Full,Chapter 3,p. 64.
- <sup>118</sup> Diet Final Full,Chapter 3,p. 65.
- <sup>119</sup> Diet Final Full,Chapter 3,p. 64.
- <sup>120</sup> RJIF, p. 98.
- <sup>121</sup> RJIF, p. 98.
- <sup>122</sup> RJIF, p. 74.
- <sup>123</sup> RJIF, pp. 74, 99.
- <sup>124</sup> RJIF, pp. 74, 99.
- <sup>125</sup> RJIF, pp. 100-101.
- <sup>126</sup> RJIF, p. 102.
- <sup>127</sup> RJIF, p. 74.
- <sup>128</sup> RJIF, p. 392.
- <sup>129</sup> RJIF, pp. 391-392.
- <sup>130</sup> TEPCO Final Full, p. 438.
- <sup>131</sup> TEPCO Final Summary, 13.
- <sup>132</sup> TEPCO Final Full, pp. 80-81.
- <sup>133</sup> TEPCO Final Full, pp. 439-440.
- <sup>134</sup> TEPCO Final Full, p. 440.
- <sup>135</sup> TEPCO Final Full, p. 440.
- <sup>136</sup> TEPCO Final Summary, 45.
- <sup>137</sup> TEPCO Final Summary, p. 45.
- <sup>138</sup> Some media reported incorrectly that the Prime Minister ordered a halt to the ongoing seawater injection at reactor unit 1, which

required cooling due to the cessation of cooling systems. However, the investigation reports find that Kan was not informed that plant manager Yoshida had already started the injection when deliberating the pros and cons with his advisers. Learning of the commencement of the seawater injection, a TEPCO liaison at the Kantei informed the company that Kan had not yet given explicit approval and that the mood at the Kantei seemed against the injection. Eventually, Kan ordered the injection, but it did not make any difference because the plant manager ignored demands by TEPCO's Headquarters to halt seawater injections.

<sup>139</sup> Cabinet Interim Full, 192-197.

<sup>140</sup> Diet Final Full, Chapter 3, 53-55.

<sup>141</sup> RJIF, 82-32. RJIF, 391-392.

<sup>142</sup> TEPCO Final Full, 183-184. TEPCO Final Full, 439-440.

<sup>143</sup> Cabinet Final Summary, p. 8.

<sup>144</sup> Diet Final Full, Chapter 3, p. 53.

<sup>145</sup> Assessment made with reference to description of this situation in Diet Investigation Report, RJIF, p. 97.

<sup>146</sup> TEPCO Final Full, p. 98.

<sup>147</sup> Cabinet Interim Full, p. 83.

<sup>148</sup> Diet Final Full, Chapter 3, p. 55.

<sup>149</sup> RJIF, p. 393.

<sup>150</sup> TEPCO Final Full, pp. 101-116.

<sup>151</sup> The Emergency Response Support System forecasts the *release* of radioactive emission, while SPEEDI predicts its *dispersal* based on the ERSS data being provided. ERSS failed to function during the accident, though.

<sup>152</sup> Cabinet Final Summary, pp. 10-11.

<sup>153</sup> Cabinet Interim Summary, p. 10.

<sup>154</sup> Diet Final Summary, p. 39.

<sup>155</sup> RJIF, pp. 177-179.

<sup>156</sup> Cabinet Interim Summary, p. 11.

<sup>157</sup> Diet Final Summary, p. 38.

<sup>158</sup> RJIF, p. 392.

<sup>159</sup> Cabinet Interim Summary, pp. 12-13.

<sup>160</sup> Diet Final Summary, p. 36.

<sup>161</sup> RJIF, pp. 144-145.

<sup>162</sup> TEPCO Final Summary, p. 47.

<sup>163</sup> TEPCO Final Full, pp. 101-116.

<sup>164</sup> See table 2 for references and *Kokuritsu kokkai toshokan* Issue Brief, No. 756, August 23, 2012, p. 16.

<sup>165</sup> ERSS failed to function during the accident.

<sup>166</sup> See table 2 for references.

<sup>167</sup> Nikkei Shimbun, *Kenshō: Genpatsu jikochō hōkokusho* July 29, 2012; Yomiuri Shimbun, *4tsu no jikochō hōkokuhika* July 24, 2012.

<sup>168</sup> See also final report chapter „Chairperson’s Remarks“, Government Final Full, pp. 522-529.

<sup>169</sup> Cabinet Final Full, pp. 509-510.

<sup>170</sup> Government Final Full, p. 509

<sup>171</sup> Government Final Full, p. 513.

<sup>172</sup> Government Final Full, pp. 517-520.

<sup>173</sup> Government Final Full, pp. 512-513.

<sup>174</sup> For similar criticism see Yomiuri Shimbun, *4tsu no jikochō hōkokuhika* July 24, 2012.

<sup>175</sup> For all recommendations see Diet Final Summary, pp. 18-20.

<sup>176</sup> Diet Final Summary, p. 18.

<sup>177</sup> RJIF, pp. 387-389.

<sup>178</sup> RJIF, p. 394.

<sup>179</sup> TEPCO Final Summary, 47-52.

<sup>180</sup> TEPCO Final Full, pp. 483-484.

<sup>181</sup> TEPCO Final Full, pp. 483.

<sup>182</sup> Cabinet Final Full, p. 520; Diet Final Summary, p. 20; RJIF 2012, p. 397

<sup>183</sup> For an overview of the NRA, see the leaflet Nuclear Regulation Authority, Nuclear Regulation for People and the Environment, November 2012, here ([http://www.nsr.go.jp/english/e\\_nra/leaflet/data/nsr\\_leaflet\\_English.pdf](http://www.nsr.go.jp/english/e_nra/leaflet/data/nsr_leaflet_English.pdf)) (accessed March 15, 2013).

<sup>184</sup> Mari Yamaguchi, Ex-PM slams utility over Japan nuke crisis video, Associated Press, August 8, 2012, here (<http://bigstory.ap.org/article/ex-pm-slams-utility-over-japan-nuke-crisis-video>) (accessed April 23, 2013).

<sup>185</sup> Japan Times, TEPCO finally admits nuke crisis avoidable, October 14, 2012, here (<http://www.japantimes.co.jp/text/nn20121014a1.html>) (accessed April 23, 2013).

<sup>186</sup> Asahi Shimbun, Japanese operator in most frank admission over nuclear disaster, December 14, 2012, here (<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201212140093>) (accessed April 23, 2013)

<sup>187</sup> Asahi Shimbun, Nuke plant operators put tab on new safety standards at 1 trillion yen, February 27, 2013, here (<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201302270063>) (accessed March 2, 2013).

<sup>188</sup> With approximately 500 employees, the NRA is still much smaller than the US Nuclear

Regulatory Commission, which has about 3000 staff members. See Asahi Shimbun, A guide to Japan's new nuclear regulatory agency, February 14, 2012, here ([http://ajw.asahi.com/article/behind\\_news/politics/AJ201202140003](http://ajw.asahi.com/article/behind_news/politics/AJ201202140003)) (accessed March 20, 2013).

<sup>189</sup> Jeff Kingston, Power Politics: Japan's Resilient Nuclear Village, *Asia-Pacific Journal* Vol. 10, Issue 43, No. 1, October 29, 2012.

<sup>190</sup> Asahi Shimbun, Government rewrites rulebook for nuclear disasters, September 7, 2012, here (<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201209070078>) (accessed March 19, 2013).

<sup>191</sup> Asahi Shimbun, Criticism, doubts greet new Diet panel on nuclear issues, April 9, 2013, here (<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201304090066>) (accessed April 30, 2013)

<sup>192</sup> Nikkei Shimbun, 'Genshiryoku giseichō no senmonsei kōjō o' seifu yūshikisha kaigi ga hōkokusho [Government expert conference in report: 'Need to improve expertise within

nuclearregulation authority'], March 6, 2013, here ([http://www.nikkei.com/article/DGXNASDG0603B\\_W3A300C1CR8000/](http://www.nikkei.com/article/DGXNASDG0603B_W3A300C1CR8000/)) (accessed March 8, 2013).

<sup>193</sup> Tōkyo Denryoku Fukushima genshiryoku hatsudensho jiko ni kanshite kokkai oyobi seifuni mōkerareta iinkai no teigen no forōappu ni kansuru yūshikisha kaigi, Hōkokusho [Report], March 2013, here ([http://www.cas.go.jp/jp/genpatsujiko/intellectual\\_meeting/report.pdf](http://www.cas.go.jp/jp/genpatsujiko/intellectual_meeting/report.pdf)) (accessed April 3, 2013), p. 13.

<sup>194</sup> Tōkyo Denryoku Fukushima genshiryoku hatsudensho jiko forōappu kaigi, Hōkokusho, p. 5.

<sup>195</sup> Tōkyo Denryoku Fukushima genshiryoku hatsudensho jiko forōappu kaigi, Hōkokusho, p.13.

<sup>196</sup> Asahi Shimbun, Japanese regulators to investigate nuclear crisis, March 28, 2013, here (<http://ajw.asahi.com/article/0311disaster/fukushima/AJ201303280028>) (accessed April 3, 2013).