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Lessons from Fukushima: Strengthening the International Regulation of Nuclear Energy

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LESSONS FROM FUKUSHIMA: STRENGTHENING THE INTERNATIONAL REGULATION OF NUCLEAR ENERGY

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INTRODUCTION

On the eleventh of March, 2011, Japan was struck not only by the most powerful earthquake to ever hit the islands,[1] but also a devastating tsunami that struck the Iwate and Miyagi Prefectures.[2] The Japanese government confirmed over 15,000 deaths, with close to 3000 people still missing.[3] The natural disasters destroyed or damaged thousands of buildings, left millions without power and water, and triggered one of the most expensive natural disaster clean-up efforts in history.[4] The earthquake and tsunami also caused damage to several nuclear facilities in the area.[5] The most famous and serious of these is the ongoing crisis at the Fukushima Daiichi Nuclear Power Plant Complex, located in the towns of Okuma and Futaba in Fukushima Prefecture.[6] This disaster was responsible for

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[1] *See New USGS Number Puts Japan Quake at 4th Largest*, CBSNEWS (Mar. 14, 2011), http://www.cbsnews.com/stories/2011/03/14/501364/main20043126.shtml.

[2] *Japan Earthquake: Tsunami Hits North-East*, BBC NEWS (Mar. 11, 2011), http://www.bbc.co.uk/news/world-asia-pacific-12709598.

[3] EMERGENCY DISASTERS COUNTERMEASURES HEADQUARTERS, NAT'L POLICE AGENCY OF JAPAN, DAMAGE SITUATION AND POLICE COUNTERMEASURES ASSOCIATED WITH 2011 TOHOKU DISTRICT—OFF THE PACIFIC OCEAN EARTHQUAKE (Feb. 20, 2013), *available at* http://www.npa.go.jp/archive/keibi/biki/higaijokyo_e.pdf.

[4] *Id.*; *Millions of Stricken Japanese Lack Water, Food, Heat*, NPR (Mar. 14, 2011), http://www.npr.org/2011/03/18/134527591/millions-of-stricken-japanese-lack-water-food-heat; *Top 5 Most Expensive Natural Disasters in History*, ACCUWEATHER.COM (Mar. 30, 2011), http://www.accuweather.com/en/weather-news/top-5-most-expensive-natural-d/47459; Victoria Kim, *Japan Damage Could Reach $235 Billion, World Bank Estimates*, L.A. TIMES (Mar. 21, 2011), http://www.latimes.com/business/la-fgw-japan-quake-world-bank-20110322,0,3799976.story.

[5] *3 Nuclear Reactors Melted Down After Quake, Japan Confirms*, CNN WORLD (June 6, 2011), http://articles.cnn.com/2011-06-06/world/japan.nuclear.meltdown_1_nuclear-reactors-fuel-rods-tokyo-electric-power?_s=PM:WORLD.

[6] *Fukushima Accident 2011*, WORLD NUCLEAR ASS'N, http://www.world-nuclear.org/info/fukushima_accident_inf129.html (last updated Jan. 10, 2013); Eliza Strickland, *Explainer:*

widespread power shortages and prompted the evacuation of many thousands of residents.[7]

The Fukushima incident is the largest and most severe since the accident at the Chernobyl plant in 1986, the only other catastrophe classified as a level seven event on the International Nuclear Event Scale ("INES").[8] The plant is owned and operated by Tokyo Electric Power Company ("TEPCO"), and contains six boiling water reactors designed by General Electric.[9] On the day of March 11, three of these reactors were in cold shutdown in preparation for maintenance.[10] When the tsunami hit the plant, it broke the reactors' connection to the power grid, so even though the remaining three reactors shut down automatically as designed after the earthquake, the emergency generators used to control the electronics and coolant systems were left without power.[11] The reactors soon began to overheat, releasing large amounts of radiation into the surrounding atmosphere and causing several hydrogen explosions in the plant in the days that followed.[12] The government soon ordered the emergency response team to use seawater in an attempt to cool the reactors, ruining them for future use,[13] but water levels in the fuel rod pools continued to

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What Went Wrong in Japan's Nuclear Reactors, IEEE SPECTRUM (Mar. 16, 2011), http://spectrum.ieee.org/tech-talk/energy/nuclear/explainer-what-went-wrong-in-japans-nuclear-reactors.

[7] *Japan Quake: Radiation Rises at Fukushima Nuclear Plant*, BBC NEWS (Mar. 15, 2011), http://www.bbc.co.uk/news/world-12740843; *Japan's PM Urges People to Clear 20-km Zone Around Fukushima NPP (Update-1)*, RIANOVOSTI (Mar. 15, 2011), http://en.rian.ru/world/20110315/163008635.html.

[8] *Analysis: A Month on, Japan Nuclear Crisis Still Scarring*, INT'L BUS. TIMES (Apr. 9, 2011), http://in.ibtimes.com/articles/132391/20110409/japan-nuclear-crisis-radiation.htm; Richard Shears, *Fires Still Raging at Stricken Fukushima Nuclear Reactor One Month After It Was Destroyed by Tsunami*, DAILY MAIL (Apr. 12, 2011), http://www.dailymail.co.uk/news/article-1375981/Japan-nuclear-crisis-Radiation-bad-Chernobyl-level-7-reached-2nd-time-history.html.

[9] *Fukushima Accident 2011*, *supra* note 6.

[10] Richard Black, *Reactor Breach Worsens Prospects*, BBC NEWS (Mar. 15, 2011), http://www.bbc.co.uk/news/science-environment-12745186.

[11] *See Fukushima Accident 2011*, *supra* note 6.

[12] *3 Nuclear Reactors Melted Down After Quake, Japan Confirms*, *supra* note 5; '*Melt-Through' at Fukushima? Govt Report to IAEA Suggests Situation Worse than Meltdown*, YOMIURI SHIMBUN (June 8, 2011), http://www.yomiuri.co.jp/dy/national/T110607005367.htm; *Fukushima Nuclear Accident Update Log, Updates of 15 March 2011*, IAEA (Mar. 15, 2011), http://www.iaea.org/newscenter/news/2011/fukushima150311.html.

[13] Thomas H. Maugh II, *Japan Quake: 2nd Reactor Cooled with Seawater to Avert Meltdown*, L.A. TIMES (Mar. 13, 2011), http://articles.latimes.com/2011/mar/13/science/la-sci--japan-quake-reactor-20110313.

drop, causing more overheating.[14] The government ordered evacuations in the surrounding twelve miles, and eventually electrical power was restored to some of the reactors, allowing for automated cooling.[15]

During the emergency, the Japanese government continually brushed off international cries of alarm and initially assessed the accident as only a level 4 on the INES.[16] Many in the international community have criticized the Japanese government for their response. Among the biggest criticisms is of the government's poor communication,[17] regulatory failures,[18] and hesitance to admit the full scale and severity of the disaster.[19] Many continue to be unable to return to their homes,[20] investigations of TEPCO have commenced,[21] and bans on food grown in the

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[14] NUCLEAR EMERGENCY RESPONSE HEADQUARTERS, GOV'T OF JAPAN, REPORT OF JAPANESE GOVERNMENT TO THE IAEA MINISTERIAL CONFERENCE ON NUCLEAR SAFETY—THE ACCIDENT AT TEPCO'S FUKUSHIMA NUCLEAR POWER STATIONS 9 (June 2011), *available at* http://www.ornl.gov/sci/nsed/outreach/presentation/2011/Beatty.pdf.

[15] Kosaku Narioka, *Japan Nuclear Fight May Have Turned Corner*, WALL ST. J. (Mar. 20, 2011), http://online.wsj.com/article/SB10001424052748704021504576210251376606080.html.

[16] *Japan Rates Quake Less Serious than Three Mile Island, Chernobyl*, REUTERS (Mar. 12, 2011), http://www.reuters.com/article/2011/03/12/us-japan-quake-rating-idUSTRE72B2FR20110312; *Japan Earthquake: Meltdown Alert at Fukushima Reactor*, BBC NEWS (Mar. 14, 2011), http://www.bbc.co.uk/news/world-asia-pacific-12733393.

[17] John M. Glionna, *Report: Japan, Utility at Fault for Response to Nuclear Disaster*, L.A. TIMES (Dec. 26, 2011), http://latimesblogs.latimes.com/world_now/2011/12/japans-march-11-earthquake-and-tsunami-fukushima-daiichi-nuclear-power-plant-meltdown.html.

[18] Daniel Kaufmann & Veronika Penciakova, *Japan's Triple Disaster: Governance and the Earthquake, Tsunami and Nuclear Crises*, BROOKINGS (Mar. 16, 2011), http://www.brookings.edu/opinions/2011/0316_japan_disaster_kaufmann.aspx [hereinafter Kaufmann & Penciakova, *Japan's Triple Disaster*].

[19] While the Japanese initially rated the severity of the disaster as a level 4 on the INES scale, several parties argued that this rating was too low and only took account of each reactor as a separate incident, instead of rating the entire disaster together. *See* Simon Shuster, *Fire at Fourth Reactor: Is Worse Yet to Come in the Fukushima Nuclear Disaster?*, TIME MAGAZINE (Mar. 15, 2011), http://www.time.com/time/world/article/0,8599,2059232,00.html; Marie Maitre & Matthew Jones, *UPDATE 1—French Nuclear Agency Now Rates Japan Accident at 6*, REUTERS (Mar. 15, 2011), http://www.reuters.com/article/2011/03/15/japan-quake-nuclear-france-idUSLDE72E2M920110315; GREENPEACE, FUKUSHIMA ALREADY LEVEL 7 CHERNOBYL ACCIDENT: GREENPEACE ANALYSIS CONCLUDES (2011), *available at* http://www.greenpeace.de/fileadmin/gpd/user_upload/themen/atomkraft/INES_7march_25th.pdf.

[20] *Evacuees of Fukushima Village Report Split Families, Growing Frustration*, MAINICHI SHIMBUN (Jan. 30, 2012), *available in English at* http://www.europe-solidaire.org/spip.php?article24296.

[21] Masami Ito, *Official Probe Begins into Nuclear Disaster*, JAPAN TIMES (June 8, 2011), http://www.japantimes.co.jp/text/nn20110608a1.html; THE NAT'L DIET OF JAPAN, THE

area have been considered.[22] The government declared the plant stable on 16 December 2011, but it is estimated that it will take decades to decontaminate the surrounding area and decommission the plant entirely.[23]

The latter part of the 20th century has seen a boom in the support for nuclear power around the world, with countries like France, the United States, and Japan building more plants, creating new reactor designs, and assisting emerging economies like China in the development of their own nuclear power systems. Disasters like Chernobyl seem all but forgotten in this new nuclear age. In the wake of the recent disaster at Japan's Fukushima Daiichi plant, however, many in Japan and around the globe have begun to look more closely at the international nuclear regulatory regime. The International Atomic Energy Agency ("IAEA") oversaw the creation of five Conventions, which outline the international standards for nuclear safety and liability, cooperation in the event of a disaster, and an early notification system between nations.[24] The IAEA has also passed a rather extensive series of nuclear safety principles, guides, and standards, but these are not directly binding on member states.[25] As such, some states have failed to implement these regulations, or have passed implementing legislation and failed to abide by their own rules.[26]

Japan has visibly and consistently gained international attention for its failed nuclear safety regime. Not only does the government often remain in the dark about conditions at the plants, but the private corporations have, in the past, covered up details regarding these conditions and their own culpability. These failures of the national notification system have resulted in damages to public health and well-being, nationwide investigations, and anti-nuclear demonstrations. The disaster at Fukushima highlighted the inability of national regulatory efforts and the current international nuclear safety regime to protect the public well-being in the event of a nuclear incident.

OFFICIAL REPORT OF THE FUKUSHIMA NUCLEAR ACCIDENT INDEPENDENT INVESTIGATION COMMISSION: EXECUTIVE SUMMARY 10–11 (2012), *available at* http://www.nirs.org/fukushima/naiic_report.pdf.

[22] Fredrik Dahl, *Japan Mulls Fukushima Food Sale Ban: IAEA*, REUTERS (Mar. 19, 2011), http://www.reuters.com/article/2011/03/19/us-japan-nuclear-food-idUSTRE72I1X120110319.

[23] *Japan PM Says Fukushima Nuclear Site Finally Stabilised*, BBC NEWS (Dec. 16, 2011), http://www.bbc.co.uk/news/world-asia-16212057.

[24] Karen McMillan, *Strengthening the International Legal Framework for Nuclear Energy*, 13 GEO. INT'L ENVTL. L. REV. 983, 990 (2001).

[25] *See IAEA Safety Standards*, IAEA, http://www-ns.iaea.org/standards/documents/default.asp?sub=170 (last updated Feb. 20, 2013).

[26] *See* McMillan, *supra* note 24, at 998–1005.

This Note proposes that strengthening the international nuclear energy regulatory system could help prevent future accidents like the one that occurred at Fukushima. In particular, a stronger international regulatory body could assist and encourage states to implement better safety regulations. The discussion will begin with an examination of the current regulatory system for nuclear energy. Part I will explore national regulations, focusing on Japan and its nuclear safety history. This section will point out the continuing safety laxness prevalent among even the advanced nuclear states like Japan. It will also explore the differences between the Japanese regulatory system and the American regulatory system in order to determine whether the safety lapses and mistakes are prevalent across states, or are confined to Japan. Part II will continue the examination of the current regulatory system by exploring how the international community attempts to regulate across national borders in an effort to influence states like Japan to improve their safety regulation.

Part III will explore how this international system still has several weaknesses which keep it from effectively promoting international nuclear safety. This section will make several recommendations for how to strengthen international nuclear safety. First, it will focus on what changes states can make to their regulatory systems, including the introduction of increased transparency and public participation measures. The section will then recommend further development of the current peer review process in order to enforce international safety standards. Finally, the section will argue for strengthening the largest and most influential regulatory body, the International Atomic Energy Agency, in order to encourage states to make regulatory changes and enforce broader safety standards across national lines.

I. PROBLEMS WITH NATIONAL REGULATION

A. Current Japanese Nuclear Regulatory System

The starting point for analysis of Japan's nuclear regulatory scheme is the Atomic Energy Basic Law. This law, passed in 1955, states as its objectives the securing of energy resources for the future and the promotion of research, development and use of nuclear energy for solely peaceful purposes.[27] It establishes the basic framework for the regulation of nuclear energy in Japan. However, the most important laws referring to the regulation of specific nuclear activities are the Law for the Regulation

[27] Atomic Energy Basic Act, Act No. 186 of 1955, art. 1, 2 (Japan), *available at* http://www.nsr.go.jp/archive/nsc/NSCenglish/documents/laws/1.pdf.

of Nuclear Source Material, Nuclear Fuel Material and Reactors,[28] the Law Concerning Prevention from Radiation Hazards Due to Radioisotopes,[29] and the Law on Compensation for Nuclear Damage.[30]

In 1998, the Government Reorganization Basic Law ("Basic Law")[31] and various other administrative laws reorganized the Japanese government, merging two important nuclear regulatory agencies into one.[32] Previously, the Science and Technology Agency ("STA") and the Ministry of International Trade and Industry ("MITI") divided the responsibility for the oversight of nuclear regulation.[33] Following the reorganization, the STA was merged with the Ministry of Education to become the Ministry of Education, Culture, Sports, Science and Technology ("MEXT"), while MITI was renamed the Ministry of Economy, Trade and Industry ("METI").[34] At the time of Fukushima, there were several different agencies, each with their own defined, but sometimes overlapping, authorities to regulate the nuclear industry. The Nuclear Safety Commission ("NSC") is responsible for the basic policy of Japanese nuclear safety regulation.[35] The oversight for experimental and research reactors, along with facilities using radioisotopes, was given to MEXT.[36] The Nuclear Industrial Safety Agency ("NISA"), under the umbrella of METI, is responsible for general oversight and inspection of all commercial nuclear facilities and for the enforcement of nuclear regulations.[37] METI also oversees the Agency for Natural Resources and Energy, the primary agency responsible for the promotion of nuclear power.[38]

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[28] Act on the Regulation of Nuclear Source Material, Nuclear Fuel Material and Reactors, Act No. 166 of 1957 (Japan), *available at* http://www.nsr.go.jp/archive/nisa/english/resources/legislativeframework/files/ReactorRegulation.pdf.

[29] Law Concerning Prevention from Radiation Hazards Due to Radioisotopes, Act No. 167 of 1957 (Japan).

[30] Act on Compensation for Nuclear Damage, Act No. 147 of 1961, *as amended by* Act No. 19 of 2009 (Japan), *available at* http://www.oecd-nea.org/law/legislation/japan-docs/Japan-Nuclear-Damage-Compensation-Act.pdf.

[31] Government Reorganization Basic Law, Act No. 103 of 1998 (Japan).

[32] ORGANIZATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT, NUCLEAR LEGISLATION IN OECD COUNTRIES: REGULATORY AND INSTITUTIONAL FRAMEWORK FOR NUCLEAR ACTIVITIES, JAPAN 3 (2011) [hereinafter NUCLEAR LEGISLATION IN OECD COUNTRIES, JAPAN], *available at* http://www.oecd-nea.org/law/legislation/japan.pdf.

[33] *Id.* at 3.

[34] *Id.* at 3.

[35] Gail Marcus, *Japanese Nuclear Regulation: A Call for Change*, NUKE POWER TALK (May 13, 2011), http://nukepowertalk.blogspot.com/2011/05/japanese-nuclear-regulation.html [hereinafter Marcus, *A Call for Change*].

[36] *Id.*

[37] *Id.*; REPORT OF JAPANESE GOVERNMENT, *supra* note 14, at 3.

[38] Marcus, *A Call for Change*, *supra* note 35.

The Atomic Energy Commission ("AEC") and NSC are purely advisory bodies with the ability to make recommendations to these agencies, and are involved in consultation with the agencies regarding licensing and other regulatory activities.[39] The AEC was established under the Basic Law to develop policies regarding the research, development, and use of nuclear energy.[40] It makes recommendations regarding the policies underlying nuclear energy, the coordination of government agencies, the promotion of nuclear research, the policies of professional and technical training, and the collection of data, research, and statistics regarding nuclear energy.[41] The NSC was created in 1978 to separate nuclear safety from the promotion of nuclear energy as handled by the AEC.[42] It may make recommendations defining regulatory safety policies and issue safety guidelines.[43]

Of the many laws that govern nuclear energy in Japan, it is the Law for the Regulation of Nuclear Source Material, Nuclear Fuel Material and Reactors that governs the siting, construction, and operation of Japan's nuclear power plants.[44] The regulations governing the establishment, operation, and decommissioning of facilities are broken down by the type of facility.[45] METI handles electricity reactors, spent fuel storage and reprocessing facilities, and waste disposal centers.[46] MEXT is in charge of granting approval for construction, operation, and decommissioning of reactors, those reactors not used for electricity, and for the facilities using nuclear fuels for those activities not covered under other licenses.[47]

When MEXT grants its licenses, it utilizes what is called the "double check system" in Japan.[48] Under this system, the applicant provides MEXT with the required documentation detailing the design of the planned facility, its financial and technical capabilities, and the characteristics of the site requested.[49] MEXT then reviews these documents against national safety guidelines with the assistance of an advisory specialist group.[50]

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[39] NUCLEAR LEGISLATION IN OECD COUNTRIES, JAPAN, *supra* note 32, at 15–16.
[40] *Id.* at 15.
[41] *Id.* at 15.
[42] *Id.* at 16.
[43] *Id.* at 16; REPORT OF JAPANESE GOVERNMENT, *supra* note 14, at 3.
[44] HIROKI ICHIKAWA, JAPAN ATOMIC ENERGY RESEARCH INSTITUTE, SAFETY REGULATION OF NUCLEAR FACILITIES IN JAPAN 1 (2002), *available at* http://www.ansn-jp.org/images/doc/prearranged-group/FM-L-02.pdf.
[45] *Id.* at 1.
[46] *Id.* at 1.
[47] *Id.* at 1–2.
[48] *Id.* at 2.
[49] *Id.* at 2.
[50] ICHIKAWA, *supra* note 44, at 2.

The second stage of review occurs when MEXT passes this application over to the AEC and NSC for their review.[51] After the general construction is approved at both stages, the applicant must then submit documents to MEXT, which include the detailed design of the facility, the construction and inspection plans, seismic reports, and mechanical stress analysis for the reactors and reactor cores to prove that the facility will comply with the safety principles stated during the previous review.[52]

Once the construction license is granted, no changes may be made without the approval of MEXT.[53] Before operation can begin, MEXT will carry out an inspection to ensure one last time that the finished facility conforms to the approved design, methods, and technical standards from the previous reviews.[54] This includes an analysis of the operator's safety rules and procedures.[55] Once the facility is approved, it will undergo annual inspections by MEXT and must provide operating plans to be reviewed by the ministry and checked against safety requirements.[56] An operating license can be revoked at any time if the operator fails to comply with regulations, any applicable orders made by regulatory authorities, or any license condition.[57]

B. Japan's Nuclear Safety Record

In examining the effectiveness of a national nuclear safety regime, it is important to look at the country's safety record. Japan's safety history is marred by regulatory and safety lapses, pointing to the flawed nature of its regulatory scheme. The first Japan Powered Demonstration Reactor ("JPDR") went into operation in 1963, marking the beginning of successful nuclear power generation on the islands.[58] Shortly thereafter, the private utility companies started building their own reactors, with the first commercial plant opening in 1966 at Tokaimura.[59] By 2004, Japan had become the third-largest producer of commercial nuclear energy in the world after

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[51] *Id.* at 2; NUCLEAR LEGISLATION IN OECD COUNTRIES, JAPAN, *supra* note 32, at 5.
[52] ICHIKAWA, *supra* note 44, at 3.
[53] NUCLEAR LEGISLATION IN OECD COUNTRIES, JAPAN, *supra* note 32, at 5.
[54] *Id.* at 5; ICHIKAWA, *supra* note 44, at 3.
[55] NUCLEAR LEGISLATION IN OECD COUNTRIES, JAPAN, *supra* note 32, at 5; ICHIKAWA, *supra* note 44, at 3.
[56] NUCLEAR LEGISLATION IN OECD COUNTRIES, JAPAN, *supra* note 32, at 5.
[57] *Id.* at 5.
[58] HAJIMU MAEDA, ATOMIC ENERGY COMMISSION, NUCLEAR ENERGY IN JAPAN—CURRENT STATUS AND FUTURE 2 (2004), *available at* http://www.aec.go.jp/jicst/NC/iinkai/teirei/siryo2004/kettei/speech040627.pdf.
[59] *Id.* at 2.

the United States and France.[60] However, during this time a number of safety-related incidents occurred at plants and facilities across the islands.[61]

The first major incident occurred in 1981 at the Tsuruga Nuclear Power Plant in Fukui Prefecture.[62] This accident occurred when a worker forgot to shut down a valve, and despite efforts to quickly contain the resulting spill of radioactive sludge, sixteen tons of waste were spilled into Wakasa Bay on the west coast of Japan.[63] The Japanese government made no public statement, and the public was not informed until a month later when a local newspaper broke the story.[64] The Atomic Power Commission admitted the spill, but denied any serious public exposure to dangerous levels of radiation, despite findings that seaweed in the area had radioactive levels ten times higher than normal.[65] This led to further discoveries that earlier that year, forty-five workers had been exposed to radiation at the same plant, and no mention had been made of this incident to the government or the public.[66]

In 1995, another accident occurred at the Monju reactor.[67] This plutonium facility suffered a serious accident and leaked a sodium coolant into the surrounding environment.[68] While the alarm at the plant sounded at 7:30 AM, the plant did not go into full shutdown until 9:00 AM.[69] Later investigation uncovered that this time had been spent by the semi-government agency in charge of the plant in covering up the extent of the damage, including the editing of a video of the accident presented to the media.[70] The facility was not reopened until 2010 in response to public outcry over the scandal.[71]

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[60] *Id.* at 2.
[61] *Id.* at 4.
[62] Tim Shorrock, *Japan's Nuclear Nightmare*, TIMSHORROCK.COM (Mar. 18, 2011), http://timshorrock.com/?p=1137; *see also Japanese Power Plant Leaks Radioactive Waste*, HISTORY, http://www.history.com/this-day-in-history/japanese-power-plant-leaks-radioactive-waste (last visited Mar. 24, 2013).
[63] Shorrock, *supra* note 62.
[64] *Id.*
[65] *Id.*
[66] *Id.*
[67] MAEDA, *supra* note 58, at 4; Kennedy Maize, *A Short History of Nuclear Power in Japan*, POWERBLOG (Mar. 14, 2011, 10:05 AM), blog.powermag.com /index.php/2011/03/14/a-short-history-of-nuclear-power-in-japan/.
[68] Michiyo Nakamoto, *Japan Reminded of Nuclear Safety Fears*, FIN. TIMES (Mar. 13, 2011, 9:45 AM), http://www.ft.com/cms/s/0/92ce9b50-4cbb-11e0-8da3-00144feab49a.html#axzz2RDi3NgCC.
[69] *Id.*
[70] *Id.*
[71] Maize, *supra* note 67.

In 1999, the nuclear processing plant at Tokaimura experienced a criticality accident, which exposed over a hundred local residents to low levels of radiation and resulted in the first deaths related to the domestic nuclear power industry in Japan.[72] The accident occurred when workers at the facility were preparing enriched fuel for an experimental breeder reactor on site when they accidentally allowed too much uranium into the mixing vessel, causing the material to reach critical mass and causing radiation leakage that later led to two of the workers' deaths.[73] The operator, Japan Nuclear Fuel Conversion Company, had modified its safety procedures without government approval and removed some measures that would have prevented a criticality accident.[74] The IAEA officially stated that the accident was due to "human error and serious breaches of safety principles."[75]

Another scandal occurred in 2002, when it was revealed that TEPCO, the same operator of the Fukushima plant, had been improperly handling internal inspection records.[76] These revelations included the finding that TEPCO had deliberately falsified data on the plant in order to comply with regulations concerning waste discharge into the sea.[77] In response, the government shut down all seventeen of TEPCO's reactors until 2005, but serious doubts about the safety culture of the company remained.[78]

An earthquake damaged the Kashiwazaki Kariwa plant, the world's largest plant, in 2007, which led to a release of radioactive material into the atmosphere in a fashion similar to the Fukushima incident.[79] TEPCO admitted that the plant was not designed to withstand an earthquake of that magnitude and shut down the plant for twenty-one months.[80] This incident further raised doubts about TEPCO's emergency preparedness, especially in light of its previous assurances that the facility was not built in an earthquake zone.[81] This followed a 2005 incident at Onagawa where

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[72] Nakamoto, *supra* note 68; *see also* Megan Brynhildsen, *Problems in the Nuclear Age: The 1999 Nuclear Accident in Japan*, 11 COLO. J. INT'L ENVTL. L. & POL'Y 241 (2000).
[73] Maize, *supra* note 67.
[74] Nakamoto, *supra* note 68.
[75] Maize, *supra* note 67.
[76] MAEDA, *supra* note 58, at 5.
[77] Nakamoto, *supra* note 68.
[78] MAEDA, *supra* note 58, at 5.
[79] Nakamoto, *supra* note 68.
[80] *Id.*
[81] *Id.*

a plant was shut down following an earthquake which seismic monitors later confirmed were beyond its design capacity.[82]

In response to the incident at Tokaimura in 1999, the Japanese government passed the Special Law of Emergency Preparedness for Nuclear Disaster ("Special Law").[83] Under the Special Law, nuclear operators are mandated to prepare emergency plans in consultation with local mayors and prefectural governors.[84] In addition, they must also establish Nuclear Disaster Prevention Organizations responsible for preventing and mitigating nuclear emergencies.[85] The organizations are overseen by managers for nuclear disaster prevention, appointed by the operators, who are tasked with relaying information between ministers, mayors, and governors after an accident has taken place.[86] The operator must also install and maintain safety equipment, including radiation monitors, radiation protection clothing, and emergency communication equipment.[87]

Despite these regulations, TEPCO has been consistently criticized for its response to the Fukushima disaster, as it has been in the past for other incidents.[88] According to the Wall Street Journal, TEPCO "greatly underestimated the scope of a potential accident at its Fukushima Daiichi nuclear plant, calling for only one stretcher, one satellite phone and 50 protective suits" for all the workers at the plant.[89] The emergency plans envisioned by the Special Law are meant to guide responders in emergencies, and are approved by the government.[90] However, TEPCO's plans were overly optimistic and contained no guidance in a worst-case scenario like the one that actually occurred in March 2011, where the plant cannot respond to the situation internally and cannot reach help nearby.[91] What is worse is that experts do not believe that many operators throughout the islands are prepared for a disaster on the magnitude of Fukushima,

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[82] Maize, *supra* note 67.
[83] MAEDA, *supra* note 58, at 4.
[84] NUCLEAR LEGISLATION IN OECD COUNTRIES, JAPAN, *supra* note 32, at 6.
[85] *Id.* at 6.
[86] *Id.* at 6.
[87] *Id.* at 6.
[88] *See* Nathaniel Parish Flannery, *Did Management Problems at TEPCO Cause Japan's $15B Radiation Leak?*, FORBES (May 27, 2011), http://www.forbes.com/sites/nathanielparishflannery/2011/05/27/did-management-problems-at-tepco-cause-japans-15b-radiation-leak/.
[89] Phred Dvorak & Peter Landers, *Japanese Plant Had Barebones Risk Plan*, WALL ST. J. (Mar. 31, 2011), http://online.wsj.com/article/SB10001424052748703712504576232961004646464.html.
[90] *Id.*
[91] *See id.*

pointing to a fault in the government's ability to enforce strict response plans across the industry.[92]

C. Regulatory Problems

What is so wrong with the Japanese regulatory system that it cannot prevent accidents and incidents like those that have occurred across the islands and throughout its nuclear history, nor allow proper and effective emergency response? There are at least three government practices unique to Japan that could be contributing to some of the nation's problems with nuclear energy: the lack of organizational independence, the too-close-for-comfort relationship between the regulators and industry, and the lack of technical ability of the regulatory staff.

The first of these problems is perhaps the most easily fixed. According to Gail Marcus, an independent nuclear power consultant and former employee of the American Nuclear Regulatory Commission,

> the placement of the [regulator] within a government's structure does matter because of both the perception and the real possibility that a regulatory organization that is subordinate to other government functions could be subject to pressures to slant its judgments to help support the other missions of the parent body.[93]

In the Japanese regulatory system, NISA is under the larger parent body of METI, embedding the primary regulatory agency within the nuclear industry promotional department.[94] This means that METI often has two competing roles: to ensure the safety of nuclear power operation and to promote the development of Japanese nuclear technology.[95] On June 1, the IAEA urged Japan to reform this system to ensure more independence

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[92] *See id.*; Daniel Kaufmann & Veronika Penciakova, *Preventing Nuclear Meltdown: Assessing Regulatory Failure in Japan and the United States*, BROOKINGS (Apr. 1, 2011), http://www.brookings.edu/research/opinions/2011/04/01-nuclear-meltdown-kaufmann ("The Fukushima nuclear crisis has exposed NISA's failure to respond to the evolving scientific data and technology and to enforce regulations strictly.").

[93] Gail Marcus, *Japanese Regulation: The Elements of Independence*, NUKE POWER TALK (Aug. 11, 2011), http://nukepowertalk.blogspot.com/2011/08/japanese-regulation.html [hereinafter Marcus, *Elements of Independence*].

[94] Marcus, *A Call for Change*, *supra* note 35; REPORT OF JAPANESE GOVERNMENT, *supra* note 14, at 3.

[95] Yuka Hayashi, *Nuclear Regulator Tied to Industry*, WALL ST. J. (Mar. 28, 2011), http://online.wsj.com/article/SB10001424052748703696704576222340033889606.html.

for the regulatory bodies.[96] The Japanese have since stated that they will create such an independent agency, recognizing that it is often "not clear who has the primary responsibility for ensuring citizens' safety in an emergency."[97]

Much of this closeness between the regulators and the industry is attributed to what is called "the nuclear power village."[98] This close circle is used to denote the "nontransparent, collusive interests that underlie the establishment's push to increase nuclear power despite the discovery of active fault lines under plants, new projections about the size of tsunamis, and a long history of cover-ups of safety problems," a veritable "culture of complicity."[99] The New York Times asserts that like-minded politicians, regulators, scientists, and industry officials have "prospered by rewarding one another with construction projects, lucrative positions, and political, financial and regulatory support."[100]

The nuclear power village depends for its existence on a practice called *amakudari*, or "descent from heaven."[101] This practice is not unique to the nuclear industry, and may stem from American occupation reforms after World War II when the U.S. was attempting to transition Japan from a government-controlled economy to a market economy.[102] This system institutionalizes the movement of retiring government officials into private industries they once regulated.[103] The stepped promotion system leads many public-sector Japanese to retire relatively young from government service, but Japan also suffers from an inadequate pension system, resulting in many people in their mid-to late 50s facing a retirement without a sufficient income.[104]

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[96] *Nuclear Crisis: How It Happened / 'Nuclear Power Village' a Cozy, Closed Community*, YOMIURI SHIMBUN (June 16, 2011), http://www.yomiuri.co.jp/dy/national/T110615005652.htm.
[97] REPORT OF JAPANESE GOVERNMENT, *supra* note 14, at 38.
[98] *Nuclear Crisis*, *supra* note 96.
[99] Norimitsu Onishi & Ken Belson, *Culture of Complicity Tied to Stricken Nuclear Plant*, N.Y. TIMES (Apr. 26, 2011), http://www.nytimes.com/2011/04/27/world/asia/27collusion.html?pagewanted=all.
[100] *Id.*
[101] *Id.*
[102] Gail Marcus, *Fukushima and Amakudari: A Problem with a Long History*, NUKE POWER TALK (May 6, 2011), http://nukepowertalk.blogspot.com/2011/05/fukushima-and-amakudari.html [hereinafter Marcus, *Fukushima and Amakudari*].
[103] Marcus, *Elements of Independence*, *supra* note 93.
[104] Marcus, *Fukushima and Amakudari*, *supra* note 102; Yukiko Yoda, *The Changing Nature of* Amakudari, *in* PROCEEDINGS OF THE NATIONAL CONFERENCE ON UNDERGRADUATE RESEARCH 3450 (Apr. 6–8, 2006).

To remedy this problem, government personnel departments assist these retirees in finding positions in the private sector, particularly in those industries that feel pressured by their relationship with the government body to accept the retirees.[105] Not only does this often place people in ill-fitting positions in private industry, but also fosters a sense of obligation and loyalty between the retiree and his former employer.[106] This revolving door, at the very least, creates a conflict of interest, particularly in the nuclear industry.[107] *The New York Times* points out that from 1959 to 2010, four former high-level ministry officials successively served as vice presidents of TEPCO, a "reserved seat" at the company for ministry retirees.[108]

This system also flows the other way in a process called *amaagari* (or "ascent to heaven"), where former industry professionals retire and are subsequently employed by the regulators as full-time technical experts, despite the fact that they are unlikely to criticize their former employers.[109] This system contributes to the third major problem with the Japanese regulatory system: the lack of technical experts among regulators. Most government employees in Japan are professional bureaucrats, true generalists who spend their career hopping between different sections of the same government body without ever becoming experts in a particular area of their agency's work.[110] This means that the regulators are very reliant on the opinions of experts, as they are unable to develop their own independent assessments.[111] They are also unable to correct any technical mistakes, oversights, or biases in the expert's work.[112] In November of 2011, it was revealed that NISA copied inspection procedures prepared by one of the companies it regulates in order to prepare its own inspection procedures.[113]

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[105] Marcus, *Elements of Independence, supra* note 93; Ulrike Schaede, *The "Old Boy" Network and Government-Business Relationships in Japan*, 21 J. OF JAPANESE STUDIES 293, 311, 314–15 (1995).

[106] Schaede, *supra* note 105, at 297, 299. There is also an argument that this system and the feelings of loyalty toward former government employees it fosters in retirees is linked to deep components of Japanese culture. *See* Jong S. Jun & Hiromi Muto, *The Hidden Dimensions of Japanese Administration: Culture and Its Impact*, 55 PUB. ADMIN. REV. 125, 128–29 (1995).

[107] Kaufmann & Penciakova, *Japan's Triple Disaster*, *supra* note 18.

[108] Onishi & Belson, *supra* note 99.

[109] *Id.*

[110] Schaede, *supra* note 105, at 295; Gail Marcus, *Nuclear Regulatory Independence in Japan: The Role of Technical Capability*, NUKE POWER TALK (July 24, 2011), http://nukepowertalk.blogspot.com/2011/07/nuclear-regulatory-independence-in_24.html [hereinafter Marcus, *Role of Technical Capability*].

[111] Marcus, *Role of Technical Capability*, *supra* note 110; Onishi & Belson, *supra* note 99.

[112] Marcus, *Role of Technical Capability*, *supra* note 110.

[113] *Sloppy Inspection Procedures Threaten Japan's Nuclear Safety Regulations*, MAINICHI

This is but one example of the regulatory staff relying upon the technical expertise of those involved in the industry itself.

D. Japan's Nuclear Future

Despite Japan's problems with the nuclear industry, nuclear power will likely remain an important component of Japan's energy future. The island nation lacks resources such as crude oil and has to import over eighty percent of its required energy.[114] Japan has been aggressively promoting the industry since 1973,[115] is one of the few nations in the world to have a full-fuel cycle system in place, and has fifty main reactors, which supply over thirty percent of the nation's electricity.[116] The government had planned to increase the nuclear energy's share of the entire electrical generation industry,[117] but in the wake of Fukushima support for nuclear energy has shrunk dramatically among the Japanese population.[118]

In response, former Prime Minister Naoto Kan called for a new energy policy that is less reliant on nuclear power.[119] However, past problems

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SHIMBUN (Nov. 5, 2011), *available in English at* http://www.europe-solidaire.org/spip.php?article23463.

[114] *Nuclear Power in Japan*, WORLD NUCLEAR ASSOC., http://www.world-nuclear.org/info/inf79.html (last updated Jan. 2013).

[115] *Id.* *The Economist* notes that nuclear power continues to offer significant advantages in that it offers "reliable power, a degree of energy security, and no carbon dioxide emissions . . . . In terms of lives lost, it has also boasted, to date, a reasonably good record." *Japan's Hydra-Headed Disaster: The Fallout*, THE ECONOMIST (Mar. 17, 2011), *available at* http://www.economist.com/node/18395981.

[116] *Nuclear Power in Japan*, *supra* note 114.

[117] *See id.*

[118] According to Gavin Blair, "more than 80 percent of Japanese now say they are anti-nuclear [sic] and distrust government information on radiation." Gavin Blair, *Beginning of the End for Nuclear Power in Japan?*, CSMONITOR (June 20, 2011), http://www.csmonitor.com/World/Asia-Pacific/2011/0620/Beginning-of-the-end-for-nuclear-power-in-Japan. Some polls conducted in the aftermath showed that "between 41 and 54 percent of Japanese support scrapping, or reducing the numbers of, nuclear power plants." M. V. Ramana, *Nuclear Power and the Public*, 67 BULL. ATOMIC SCIENTISTS 1, 43 (July 2011). In September 2011, thousands marched on central Tokyo to protest nuclear power and urge the government to abandon the industry. *Thousands March Against Nuclear Power in Tokyo*, USA TODAY (Sept. 19, 2011), http://www.usatoday.com/news/world/story/2011-09-19/japan-anti-nuclear-protest/50461872/1.

[119] Ramana, *supra* note 118, at 44. In September, the Prime Minister announced a plan to make the country nuclear free by 2030 by halting construction of new plants, setting a forty year limit on existing plants, and establishing tough new safety standards to be set by a new regulatory agency. Carol J. Williams, *In Wake of Fukushima Disaster, Japan to End Nuclear Power by 2030s*, L.A. TIMES (Sept. 14, 2012), http://latimesblogs.latimes

have not yielded long-term commitments to reducing the nation's dependence on nuclear energy, as officials have recognized that the nuclear program "must continue because Japan does not have sufficient natural resources to do without it."[120] Though the Energy and Environment Council decided to reduce Japan's dependence on nuclear power,[121] it remains unclear how they expect to do so while still meeting carbon emission reduction goals and increased energy independence.

E. The American Nuclear Regulatory System

The American relationship with the peaceful atom began after the Second World War with the passage of the United States Atomic Energy Act of 1946.[122] This Act established the U.S. Atomic Energy Commission ("USAEC") to both foster and control the peacetime development of nuclear energy.[123] Congress decided to divide the USAEC into two separate agencies in the Energy Reorganization Act of 1974[124] in order to separate the regulatory and licensing functions of the USAEC from its other duties.[125] The research and development, nuclear weapons, and naval reactor programs of the USAEC were given to the newly created Energy Research and Development Administration ("ERDA"),[126] while the Nuclear Regulatory Commission ("NRC") was given the authority to regulate and inspect the commercial nuclear power industry.[127] ERDA was combined with the Department of Energy in 1977,[128] but the NRC remains the commercial regulator of nuclear energy, overseeing safety, security, reactor licensing and renewal, and spent fuel management.[129]

.com/world_now/2012/09/in-wake-of-fukushima-disaster-japan-to-end-nuclear-power-by-2030s.html.

[120] *Japan Takes Stock after Tokaimura Nuclear Accident*, CNN (Oct. 2, 1999), http://cnn.com/ASIANOW/east/9910/01/japan.nuclear.02/ (summarizing statement by Chief Cabinet Secretary Hiromu Nonaka).

[121] *Nuclear Power in Japan*, *supra* note 114.

[122] Atomic Energy Act, 42 U.S.C. §§ 2011–2297 (2006).

[123] The Atomic Energy Act states that it is the role of the Commission to take necessary measures in order to fulfill the overarching purpose of the Act: "to promote world peace, improve the general welfare, increase the standard of living, and strengthen free competition in private enterprise." *See id.* §§ 2011, 2304(a), 2305.

[124] *Id.* §§ 5801–5891 (2006).

[125] *Id.* § 5801(c).

[126] *Id.* § 5801(b).

[127] *Id.* § 5841.

[128] Department of Energy Organization Act, 42 U.S.C. § 7112 (2006).

[129] *About Us: History*, NRC, http://www.nrc.gov/about-nrc/history.html#nrctoday (last updated Dec. 18, 2012).

The NRC has been criticized, like the Japanese nuclear regulators, for being too close to the industry. In 1987, a congressional report stated that the NRC "has not maintained an arms length regulatory posture with the commercial nuclear power industry."[130] More recently, the Commission has been criticized by then–Presidential nominee Barack Obama for being "captive of the industries that it regulates."[131] Just days after Fukushima, the Union of Concerned Scientists released a highly critical report about the 2010 NRC performance,[132] while Reuters reported that the Commission had become an international lobbyist for American manufacturers like Westinghouse, "raising concerns about a potential conflict of interest."[133]

While the nuclear industry has a fairly good safety record compared to other industries,[134] there have been some incidents. The first occurred in 1959, when the Santa Susana Field Laboratory's Sodium Reactor Experiment, located in southern California, experienced a partial core meltdown.[135] Another explosion occurred in 1961 at the small test reactor Stationary Low-Power Reactor Number One in Idaho,[136] and a partial meltdown at the Enrico Fermi Nuclear Generating Station in Michigan occurred five years later.[137]

However, the most serious accident occurred at Three Mile Island, Pennsylvania in 1979.[138] This incident began when a non-nuclear secondary system failed, which caused a failure in a primary-system relief valve,

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[130] STAFF OF H. SUBCOMM. ON GENERAL OVERSIGHT AND INVESTIGATIONS, 100TH CONG., NRC COZINESS WITH INDUSTRY: NUCLEAR REGULATORY COMMISSION FAILS TO MAINTAIN ARMS LENGTH RELATIONSHIP WITH THE NUCLEAR INDUSTRY 3 (Dec. 1987).

[131] Justin Elliott, *Ex-Regulator Flacking for Pro-Nuke Lobby*, SALON.COM (Mar. 17, 2011), http://www.salon.com/2011/03/18/jeff_merrifield_nuclear_energy_institute/.

[132] Jia Lynn Yang, *Democrats Step Up Pressure on Nuclear Regulators Over Disaster Preparedness*, WASH. POST (Mar. 18, 2011), http://www.washingtonpost.com/business/economy/democrats-step-up-pressure-on-nuclear-regulators-over-disaster-preparedness/2011/03/17/ABLd66n_story.html.

[133] Ben Berkowitz & Roberta Rampton, *Exclusive: U.S. Nuclear Regulator a Policeman or Salesman?*, REUTERS (Apr. 18, 2011), http://www.reuters.com/article/2011/04/18/us-nuclear-industry-nrc-idUSTRE73H0PL20110418.

[134] Charles Fergus, *Are Today's Nuclear Power Plants Safe?*, RESEARCH PENN STATE (Feb. 19, 2007), http://news.psu.edu/story/141290/2007/02/19/research/probing-question-are-todays-nuclear-power-plants-safe.

[135] SANTA SUSANA FIELD LABORATORY ADVISORY PANEL, REPORT 10 (Oct. 2006), *available at* http://www.ssflpanel.org/files/SSFLPanelReport.pdf.

[136] SUSAN M. STACY, IDAHO OPERATIONS OFF., DEP'T OF ENERGY, PROVING THE PRINCIPLE 138–50 (2000).

[137] *Fermi, Unit 1*, NRC, http://www.nrc.gov/info-finder/decommissioning/power-reactor/enrico-fermi-atomic-power-plant-unit-1.html (last updated Mar. 29, 2012).

[138] *Backgrounder on the Three Mile Island Accident*, NRC (Feb. 11, 2013), http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/3mile-isle.html.

releasing a large amount of reactor coolant.[139] As the operator General Public Utilities and the NRC attempted to control the melting reactor, the regulator allowed the release of 40,000 gallons of radioactive waste in the Susquehanna River.[140] The incident was rated a five on the seven-point INES.[141] Concerns over the safety of the plants, the regulatory capability of the NRC, and the confusing state of communications[142] forced the NRC to tighten its safety controls.[143]

The future of nuclear power in the United States remains unclear. Currently, there are 104 commercial reactors producing nearly twenty percent of the nation's total electric energy, making the United States the world's largest supplier of commercial nuclear energy.[144] However, demand for nuclear construction has slowed over the last few decades since Three Mile Island.[145] Construction on all of the current 104 reactors began before 1974.[146] Popular support for the industry has dwindled, with recent polls showing just sixty-two percent of the population in favor of the use of nuclear energy.[147] Critics point to the lukewarm reception of the industry in the past forty years as a sign that the industry lacks a significant future in the United States.[148] Others point to increasing cost as a sign that the industry is not competitive enough to survive in the American energy market.[149] Proponents respond by claiming that the industry can be effective

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[139] *Id*.
[140] PRESIDENT'S COMMISSION ON THE ACCIDENT AT THREE MILE ISLAND, THE NEED FOR CHANGE: THE LEGACY OF TMI 114–15 (Oct. 1979), *available at* http://www.threemileisland.org/downloads/188.pdf.
[141] *See* IAEA, INES: THE INTERNATIONAL NUCLEAR AND RADIOLOGICAL EVENT SCALE (2008), *available at* http://www.iaea.org/Publications/Factsheets/English/ines.pdf.
[142] *Backgrounder on the Three Mile Island Accident*, *supra* note 138.
[143] Charles Komanoff, *Reflections on the U.S. Nuclear Industry's 25 Lean Years*, 11 SYNTHESIS & REGENERATION (Jan./Feb. 1991), *available at* http://www.greens.org/s-r/11/11-07.html.
[144] *Nuclear Power in the USA*, WORLD NUCLEAR ASSOC., http://www.world-nuclear.org/info/inf41.html (last updated Feb. 2013).
[145] U.S. ENERGY INFO. ADMIN., ANNUAL ENERGY REVIEW 2010 282–83 (Oct. 19, 2011), *available at* http://www.eia.gov/totalenergy/data/annual/archive/038410.pdf.
[146] Matthew L. Wald, *Nuclear 'Renaissance' Is Short on Largess*, N.Y. TIMES (Dec. 7, 2010), http://green.blogs.nytimes.com/2010/12/07/nuclear-renaissance-is-short-on-largess/.
[147] *Americans' Support for Nuclear Energy Holds at Majority Level 6 Months After Japan Accident*, PR NEWSWIRE (Oct. 3, 2011), http://www.prnewswire.com/news-releases/americans-support-for-nuclear-energy-holds-at-majority-level-6-months-after-japan-accident-130981293.html.
[148] AMORY B. LOVINS ET AL., NUCLEAR POWER: CLIMATE FIX OR FOLLY 10 (2009), *available at* http://www.rmi.org/Knowledge-Center/Library/E09-01_NuclearPowerClimateFixOrFolly.
[149] Thomas B. Cochran, *The Future Role of Nuclear Power in the United States*, NATURAL RES. DEF. COUNCIL (Apr. 15, 2004), http://www.nrdc.org/nuclear/pnucpwr.asp.

when combined with other renewable sources to constitute a viable economic and environmental alternative to fossil fuels.[150] Either way, the debate has not reached a decisive conclusion. In December 2011, Southern Company began construction of two new nuclear facilities to be completed by 2017,[151] and the Obama administration continues to express support for nuclear power in the United States.[152]

II. INTERNATIONAL NUCLEAR REGULATION

Nuclear energy may be potentially dangerous, but it does offer some long-term economic and environmental benefits. Not only does nuclear energy help resource-poor countries like Japan meet their energy needs independently,[153] but it also provides a renewable energy source that does not contribute to the carbon dioxide emissions blamed for global warming.[154] However, the accident at Chernobyl taught the world that nuclear energy can have transboundary risks.[155] National governments, as shown in the previous section, are already struggling to maintain high levels of safety through their own regulatory regimes.

International cooperation would allow states to address safety problems that unilateral regulation could not effectively tackle,[156] while promoting common standards across countries.[157] These benefits emphasize

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[150] MASS. INST. OF TECH., UPDATE OF THE MIT 2003 FUTURE OF NUCLEAR POWER: AN INTERDISCIPLINARY M.I.T. STUDY (2009), *available at* http://web.mit.edu/nuclearpower/pdf/nuclearpower-update2009.pdf.

[151] *The Plan*, SOUTHERN CO., http://www.southerncompany.com/nuclearenergy/plan.aspx (last visited Mar. 24, 2013).

[152] *See* Julie Ann McKellogg, *U.S. Nuclear Renaissance Further Crippled by Japan Crisis*, VOICE OF AMERICA (Mar. 17, 2011), http://www.voanews.com/english/news/usa/US-Nuclear-Renaissance-Further-Crippled-by-Japan-Crisis-118272249.html.

[153] Brynhildsen, *supra* note 72, at 248–49.

[154] Mohamed ElBaradei, Address at the European Nuclear Congress: International Cooperation and the Future of Nuclear Power (Oct. 28, 1998); *Factsheets and FAQs: Atomic Energy and the Environment*, IAEA, http://www.iaea.org/Publications/Factsheets/English/environment.html (last visited Mar. 24, 2013).

[155] Ellen B. Moynagh, *The Legacy of Chernobyl: Its Significance for the Ukraine and the World*, 21 B.C. ENVTL. AFF. L. REV. 709, 709–10 (1994); Melanie L. Oxhorn, *The Norms of Nuclear Accidents After Chernobyl*, 8 J. NAT. RESOURCES & ENVTL. L. 375, 376 (1993).

[156] Jacob Katz Cogan, *The Regulatory Turn in International Law*, 52 HARV. INT'L L.J. 321, 360 (2011).

[157] The International Atomic Energy Agency already functions in this capacity. McMillan, *supra* note 24, at 990. The next section of this Note will discuss how the agency can be strengthened in order to more effectively regulate and create common standards and practices. *See infra* Part III.C.

the importance of a strong international nuclear regulatory scheme.[158] Since Chernobyl, the international community has taken steps to set up such a system in order to "shore up and back up states that are thought to be failing in their regulatory responsibilities in critical sectors and to enhance, as well, the capacities of other, more capable states in this regard."[159] This section will examine the current international nuclear energy regulatory regime and how it addresses nuclear safety.

A. The IAEA Mandate

While there are several organizations that deal with nuclear issues on a regional or international level, it is the IAEA that is the largest and most influential.[160] The IAEA is also one of the most prominent agencies in the area of technology and nuclear safety.[161] The agency was created by the United Nations in 1957 in order to monitor and supervise the development of peaceful nuclear energy.[162] The stated safety objectives of the IAEA include the exchange of information and technology, the establishment of safety standards, and the provision of technical assistance to member states and developing countries.[163] To provide this assistance, the agency operates a reporting system, site inspections, and the provision of equipment or safety services.[164] The IAEA may only implement safety standards upon states that have agreed to receive these services, but it may refuse

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[158] It is important to note that a stronger international regulatory scheme would not wholly supplant the states, only that such a system could aid states in many ways, such as by helping to facilitate stronger domestic regulation, providing a voice for domestic public powers on a larger stage, and creating more uniformity among safety standards. Sabino Cassese, *Administrative Law Without the State? The Challenge of Global Regulation*, 37 N.Y.U. J. INT'L L. & POL. 663, 677 (2005); Cogan, *supra* note 156, at 325.

[159] Cogan, *supra* note 156, at 330.

[160] The IAEA is one of several major nuclear agencies, including the European Atomic Energy Community, the Organization for European Cooperation's European Nuclear Energy Agency, the Agency for the Prohibition of Nuclear Weapons in Latin America, the Inter-American Nuclear Commission, the Arab Atomic Energy Agency, the Brazilian-Argentine Agency for Accounting and Control of Nuclear Materials, the World Association of Nuclear Operators, the OECD/Nuclear Energy Agency, the G-24 Nuclear Safety Coordination, and the European Bank for Reconstruction and Development. McMillan, *supra* note 24, at 989.

[161] *Id.*

[162] *About the IAEA*, IAEA, http://www.iaea.org/About/ (last visited Mar. 24, 2013).

[163] Statute of the International Atomic Energy Agency, Oct. 23, 1956, art. II (entered into force July 29, 1957).

[164] *Id.* art. III.

to provide them to a recalcitrant member state.[165] Its most important role, however, is as a forum for the formulation of shared international safety standards, practices, and principles.[166] This role is best exemplified by the creation of the five multilateral conventions regarding nuclear safety: the Convention on Early Notification of a Nuclear Accident,[167] the Convention on Assistance in the Event of a Nuclear Accident or Radiological Emergency,[168] the 1997 Vienna Convention on Civil Liability for Nuclear Damage,[169] the Convention on Supplementary Compensation for Nuclear Damage,[170] and the Convention on Nuclear Safety.[171]

B. Convention on Nuclear Safety

Of these Conventions, the last is the most significant in terms of improving the safe operation of nuclear installations, as it commits all member states to legally binding general principles of nuclear safety.[172] This obligation means that member states must ensure that appropriate procedures relating to siting, design, construction, and operation of nuclear power plants are established and implemented through a legislative and regulatory framework.[173] In addition, the Convention contains a provision

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[165] *Id.*

[166] *See* McMillan, *supra* note 24, at 989.

[167] International Atomic Energy Agency, Convention on Early Notification of a Nuclear Accident, Sept. 26, 1986, 1439 U.N.T.S. 275 [hereinafter Convention on Early Notification], *available at* http://www.iaea.org/Publications/Documents/Infcircs/Others/infcirc335.shtml.

[168] International Atomic Energy Agency, Convention on Assistance in Case of a Nuclear Accident or Radiological Emergency, Sept. 26, 1986, 1457 U.N.T.S. 133 (1987).

[169] International Atomic Energy Agency, Vienna Convention on Civil Liability for Nuclear Damage, May 21, 1963, *as amended by* the Protocol from the IAEA Convention on Civil Liability for Nuclear Damage, Sept. 12, 1997, *available at* http://www-pub.iaea.org/MTCD/publications/PDF/Pub1279_web.pdf.

[170] International Atomic Energy Agency, Convention on Supplementary Compensation for Nuclear Damage, Sept. 29, 1997, IAEA Doc. INFCIRC/567 (1998), *available at* http://www.iaea.org/Publications/Documents/Infcircs/1998/infcirc567.pdf.

[171] International Atomic Energy Agency, Convention on Nuclear Safety, Sept. 29, 1994, IAEA Doc. INFCIRC/449, *available at* http://www.iaea.org/Publications/Documents/Infcircs/Others/inf449.shtml.

[172] *Id.* pmbl. § viii.

[173] *Id.* art. 7, 17–19; *see* McMillan, *supra* note 24, at 993; *see also* Brian McGill, *Developments in Nuclear Safety & Waste Disposal*, 7 GEO. INT'L ENVTL. L. REV. 889 (1995); John L. Woodward, *Comparative Aspects of the French & German Nuclear Energy Regimes: Working Toward an International Legal Framework*, 16 DICK. J. INT'L L. 691, 721 (1998); Sayed Zeidan, *The Procedural Rules and Obligations Under International Law for Construction of a Nuclear Installation: Prevention and Reduction of Environmental Damage*, 23 GEO. INT'L ENVTL. L. REV. 263, 264 (2011).

for scheduled signatory meetings where each member state submits a self-created compliance report to be reviewed by the other members.[174] However, the Convention does not require uniform international safety standards, and contains no provisions allowing the IAEA to enforce its standards with sanctions.[175] Even though it lacks enforcement capability, the IAEA has "established a series of safety standards which promulgate the best technology and practices in an understandable and accessible fashion."[176] These standards are binding once the member state has received assistance from the IAEA by requesting the agency's services or the use of its standards.[177] Once the state has done so, it is bound by the standards regardless of the amount of assistance provided by the IAEA, just as the agency is bound by them in providing its services.[178]

C. Peer Review

One of the most important elements of the international nuclear safety regime overseen by the IAEA through its conventions is the emphasis on peer review and state sovereignty. The Convention on Nuclear Safety states that it is the state with jurisdiction over a nuclear installation that has the ultimate responsibility for safety.[179] The nuclear regime thus focuses on the promotion of domestic implementation of international safety standards through their incorporation into national regulation and legislation.[180] The IAEA is tasked not with imposing safety standards, but with complementing state efforts by making norms and creating uniform safety policies.[181] It is through the peer-process system that the international community monitors state compliance with safety standards,[182] a method chosen due to the reality that, despite the recent expansion of

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[174] *See* Convention on Nuclear Safety, *supra* note 171, at art. 20.
[175] *Id.*; *see* David R. Marples & Tatyana E. Cerullo, *International Nuclear Safety: The Case of the Chernobyl Nuclear Power Station*, 24 VT. L. REV. 1209, 1222 (2000).
[176] McMillan, *supra* note 24, at 995. These standards are created by the Advisory Commission on Safety Standards and the International Nuclear Safety Advisory Group, which prepare reports on nuclear safety and set out general safety recommendations. *Id.*
[177] *Id.*
[178] *Id.*
[179] Convention on Nuclear Safety, *supra* note 171, at pmbl. iii. For more discussion of a state's responsibilities vis-à-vis nuclear safety, particularly during siting and construction, see Zeidan, *supra* note 173, at 265–67.
[180] Monica J. Washington, *The Practice of Peer Review in the International Nuclear Safety Regime*, 72 N.Y.U. L. REV. 430, 435 (1997).
[181] *Id.* at 435.
[182] *Id.* at 430.

international regulatory regimes,[183] "states continue to resist significant intrusions upon their sovereignty in the area of nuclear safety."[184] States prefer to keep safety controls in their own borders, mainly though national legislation, the granting, amendment, extension, or renewal of operating licenses, or through national regulatory bodies.[185] Under a peer review system, the cost of noncompliance is raised through peer pressure and public scrutiny, not through legal compulsion.[186]

The peer review process can be complex, time consuming, and expensive both for the IAEA and the state. It begins with the member state making a request to the IAEA concerning a particular facility, and then the preparatory meeting with the regulator and plant management.[187] Next, technical, independent experts are recruited, usually by the IAEA,[188] and tests of the facility occur, usually building on self-assessment reviews conducted by the plant prior to their arrival.[189] The international experts carry out on-site evaluations of the facility and compare the domestic regulations against the international standards.[190] A final report containing recommendations and findings will be issued by the experts, but the final decision about how to respond to their reports is left to the member state.[191]

In addition to this reporting process, states are also required by the Convention on Nuclear Safety to submit reports on the measures they are taking to implement their treaty obligations and to hold meetings with the other member states to evaluate their progress.[192] A summary report, available to the public, is adopted by consensus after each review meeting.[193] However, if a state is found not to be in compliance or a dispute between states arises, the Convention does not provide for any referral of disputes to a permanent political or judicial body, preferring to leave it up to the states themselves to resolve the dispute through amicable

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[183] *See generally* Cogan, *supra* note 156.
[184] Washington, *supra* note 180, at 440.
[185] *Id.* at 434 n. 11.
[186] *See id.* at 446, 455.
[187] *See* Measures to Strengthen International Co-Operation in Nuclear Safety, Radiological Protection and Radioactive Waste Management, IAEA Doc. GC(39)/INF/8, para. 1 (Sept. 4, 1995); *see also* Washington, *supra* note 180, at 448.
[188] Ferdinand L. Franzen, *Reviewing the Operational Safety of Nuclear Power Plants*, NUCLEAR POWER & SAFETY, IAEA BULLETIN 4/1987, at 13 (1987).
[189] Washington, *supra* note 180, at 448; Zeidan, *supra* note 173, at 315.
[190] Zeidan, *supra* note 173, at 269–70.
[191] *Id.* at 270.
[192] Convention on Nuclear Safety, *supra* note 171, at art. 20.
[193] *Id.* art. 25.

settlement.[194] This entire framework of peer review is meant to facilitate the gradual phasing-in of international standards through a system of incentives and accountability provided by other member states.[195]

Even though the peer review system does not have international enforcement mechanisms and the IAEA cannot force states to comply with its safety regulations, the process does have some benefits. States remain reluctant to allow intrusions into their sovereignty, but technical reviews are becoming "a more accepted and respected means of assisting countries with their regulatory efforts."[196] Many states benefit from the nonconfrontational environment, and the Convention on Nuclear Safety has made inroads into the international nuclear safety culture not only by requiring states to maintain high levels of safety, but also by laying the foundations for even more international cooperation in the field.[197] The peer review process provides flexibility for states to match a country's needs and priorities to its regulations, allows for more information sharing between states, and still respects state sovereignty concerns.[198] In addition, peer review can also raise public confidence in nuclear power by boosting the public opinion that nuclear energy is safely regulated, while the public can lose confidence if it sees that a state is not living up to its obligations.[199]

However, the peer review process was not able to stop an accident like Fukushima, despite its myriad of benefits, which suggests that there is still room for improvement. When a state like Japan fails to properly regulate and/or oversee its nuclear installations, the international system as it stands is forced to rely on the disapproval of and retaliation by other states. If this system breaks down, or other states fail to respond, then the peer review process loses its effectiveness. The IAEA is left helpless under the current system to ensure public safety if the states do not regulate themselves.

III. STRENGTHENING THE INTERNATIONAL REGULATORY SYSTEM

The current international nuclear regulatory scheme is inadequate, allowing states like Japan to continue failing in their own regulatory duties. Because of the inherent weakness of the international system, avoidable

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[194] *Id.* art. 29; Odette Jankowitsch, *The Convention on Nuclear Safety*, NUCLEAR L. BULL. NO. 54 (OECD, Paris, France), Dec. 1994, at 18.
[195] Washington, *supra* note 180, at 459–60.
[196] *Id.* at 460.
[197] *Id.* at 461.
[198] *Id.* at 461.
[199] *Id.* at 462.

accidents like the one that occurred at Fukushima are not avoided. This section will discuss these systemic weaknesses and how they can be overcome. First, it will argue for increased transparency on a national level. Then, it will examine how the peer process and finally the IAEA can be strengthened in order to provide for a more efficient and effective international regulatory system.

A. Increased Transparency on the National Level

1. The Benefits of Transparency

There are some things that the states can do to increase general nuclear safety, and increased safety on a national level will increase safety on a global level as well. The Fukushima disaster and Japan's rather bleak nuclear record teach us that increased transparency can go a long way to reducing the severity and frequency of nuclear incidents, as well as to promote public knowledge and support of the industry. According to Kazuko Hamada of the Japanese Atomic Energy Agency Policy Research Office, many are concerned about nuclear operational safety, nuclear energy's impact on the environment, and nuclear proliferation.[200] Hamada notes that "transparency measures offer potential ways to address these concerns, by sharing the information relevant to nuclear energy use and showing the willingness to ensure that the increase in nuclear energy use does not risk operational safety, the environment, or nuclear proliferation."[201]

Public participation can provide valuable health and safety oversight of both regulators and plant operators, ensuring that practices like *amakudari*, lax safety enforcement, and failed compliance do not go unnoticed.[202] The American Atomic Safety and Licensing Appeal Board recognized the importance of public participation in ensuring nuclear safety, stating:

> Our own experience . . . teaches that the generalization [that public participation does not contribute to safety] has no foundation in fact. Public participation . . . not only "can

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[200] Kazuko Hamada, *Transparency and Nonproliferation in the Asia-Pacific Region: Enhancing Transparency, Strengthening the Nonproliferation Regime*, 50 PROGRESS IN NUCLEAR ENERGY 660, 660 (2008), *available at* http://www.sciencedirect.com/science/article/pii/S0149197007002120.

[201] *Id.*

[202] JEAN-RENÉ JUBIN, INT'L ATOMIC ENERGY AGENCY, TRANSPARENCY AND OPENNESS 7 (2011), *available at* http://www.ansn.org/Common/Topics/OpenTopic.aspx?ID=9087.

> provide valuable assistance to the adjudicatory process," but on frequent occasions demonstrably has done so . . . [and] many of the substantial safety and environmental issues which have received the scrutiny of licensing boards were raised in the first instance by the intervenor.[203]

Jean-René Jubin of the IAEA Department of Nuclear Safety and Security stressed that public involvement at all stages of nuclear construction and operation strengthened safety structures by increasing public scrutiny of safety performance by regulators and operators.[204] A 2006 report by the International Nuclear Safety Group states that "stakeholder involvement makes regulatory organizations and other authorities acutely aware that their actions are under public scrutiny [and] [t]ransparency increases the motivation of individuals and institutions to meet their responsibilities . . . [which] may result in more practical, relevant and coordinated administrative, technical and socially responsible decisions on safety issues."[205] The same report makes a similar observation about the influence of public oversight on plant operators, as it would incentivize a high level of safety performance by the operator.[206] Public participation could help build institutions that are more accountable, prompting stricter adherence to safety standards.[207]

While Japan may require the use of nuclear energy in the long run, it faces the challenge of dwindling popular support for the industry at home. Transparency measures and efforts to inform the populace about the safety and operation of nuclear facilities could help Japan drum up increased public support and endorsement.[208] IAEA Director General Yukiya Amano stated in his address to the Review Meeting of the Contracting Parties to the Convention on Nuclear Safety that "[r]igorous adherence

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[203] Anthony Roisman et al., *Regulating Nuclear Power in the New Millennium*, 26 PACE ENVTL. L.J. 317, 328 (2009) (citing In the Matter of Gulf States Utilities Company (River Bend Station, Units 1 and 2), ALAB-183, Docket Nos. 50-458 and 50-459, 7 A.E.C. 222, 227–28 (Mar. 12, 1974)).

[204] JUBIN, *supra* note 202, at 7.

[205] INTERNATIONAL NUCLEAR SAFETY GROUP, IAEA, STAKEHOLDER INVOLVEMENT IN NUCLEAR ISSUES 3 (2006) [hereinafter STAKEHOLDER INVOLVEMENT].

[206] *Id.* at 3.

[207] *Japan's Hydra-Headed Disaster*, *supra* note 115; Svitlana Kravchenko, *Is Access to Environmental Information a Fundamental Human Right?*, 11 OR. REV. INT'L L. 227, 228 (2009).

[208] SECTION FOR TRANSPORT, ENERGY, INFRASTRUCTURE AND THE INFORMATION SOCIETY, EUROPEAN ECONOMIC AND SOCIAL COMMITTEE, GREATER TRANSPARENCY IN NUCLEAR ENERGY—THE EESC IN ACTION 3 (2009), *available at* http://www.eesc.europa.eu/resources/docs/eesc-2009-19-en.pdf; STAKEHOLDER INVOLVEMENT, *supra* note 205, at 3.

to the most robust international safety standards and full transparency, in good times and bad, are vital for restoring and maintaining public confidence in nuclear power."[209] A study conducted by Eiji Yamamura showed that while public support for nuclear energy declined after Fukushima, transparency measures increased these rates.[210] Public confidence can be gained through a long-standing, demonstrated commitment to public safety, which can then lead to increased credibility for nuclear operators and regulators, a foundation for a successful nuclear program.[211] Transparency is thus integral to the creation and maintenance of any national nuclear program.

2. The International Duty to Inform

In addition to the practical benefits of increased transparency, the public is entitled to timely, accurate, and complete information about nuclear facilities and accidents.[212] The duty a state has to inform the public is an established principle of international law, though that duty is most often framed in state-to-state terms.[213] This duty as it applies to nuclear energy is outlined in part by the Convention on Early Notification of a Nuclear Accident ("Convention"), spearheaded by the IAEA and adopted by consensus at Vienna, Austria on September 26, 1986 following the Chernobyl disaster.[214] The Convention requires that member states notify possible affected states and the IAEA of nuclear accidents and to provide updated information relevant to minimizing its consequences.[215] Under a related convention, the state with jurisdiction over the nuclear installation

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[209] *Nuclear Safety Convention Review Meeting Convenes in Vienna*, IAEA (2011), http://www.iaea.org/newscenter/news/2011/safety_convention.html.

[210] Eiji Yamamura, DEPARTMENT OF ECONOMICS, SEINAN GAKUIN UNIVERSITY, *Effect of Transparency on Changing Views Regarding Nuclear Energy Before and After Japan's 2011 Natural Disasters: A Cross-Country Analysis* (2011), *available at* http://mpra.ub.uni-muenchen.de/30954/1/MPRA_paper_30954.pdf.

[211] STAKEHOLDER INVOLVEMENT, *supra* note 205, at 5.

[212] *See id.* at 1; JUBIN, *supra* note 202, at 4.

[213] *See* Daniel G. Partan, *The "Duty to Inform" in International Environmental Law*, 6 B.U. INT'L L.J. 43, 44 (1988).

[214] Convention on Early Notification, *supra* note 167. For more information on the Chernobyl disaster and its effect on international law, see Devereaux F. McClatchey, *Chernobyl and Sandoz One Decade Later: The Evolution of State Responsibility for International Disasters, 1986–1996*, 25 GA. J. INT'L & COMP. L. 659 (1996); Oxhorn, *supra* note 155.

[215] Marian Nash Leich, *Contemporary Practice of the United States Relating to International Law*, 81 AM. J. INT'L L. 641, 646–47 (1987).

must also "establish and maintain effective defenses in nuclear installation against potential radiological hazards,"[216] as they are charged with maintaining the safety of the facility.[217]

However, these treaties only address those incidents that have actual or potential transboundary effects[218] and only obliges the state to inform other states and the IAEA, as it includes no provisions discussing the state's obligations toward its own people.[219] General international law extends this responsibility to any person or entity "which is empowered by the law of that [s]tate to exercise elements of the governmental authority . . . even if it exceeds its authority or contravenes instructions."[220] This would include the operator of the nuclear installation and government officials charged with ensuring nuclear safety.

Even though the Convention does not place a duty on a state or its actors to inform the public of nuclear incidents or safety problems, international law does recognize a fundamental human right to access environmental information. According to Svitlana Kravchenko, a Professor at the University of Oregon, this right is based in the Universal Declaration of Human Rights, Article 19's protection of freedom of opinion and expression, including the freedom to "seek, receive and impart information and ideas through any media and regardless of frontiers."[221] According to Kravchenko, this right translates into a right of wide access to information, subject only to limited exceptions,[222] where individuals have the ability to request and receive information from government and private entities acting under government authority or jurisdiction.[223] She argues that,

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[216] Convention on Nuclear Safety, *supra* note 171, at art. 1(ii).
[217] *Id.* pmbl. iii.
[218] *Id.* art. 2(1).
[219] ALEXANDRE KISS & DINAH SHELTON, INTERNATIONAL ENVIRONMENTAL LAW 84–85 (3d ed. 2004). The Convention only addresses a state's duty to "ensure that activities within their jurisdiction or control do not cause damage to the environment of other states or of areas beyond the limits of national jurisdiction." Conference on Environment and Development, Rio de Janeiro, Braz., June 3–14, Report of the United Nations Conference on Environment and Development, vol. I, Principle 10, U.N. Doc. A/CONF.151/26/REV.1 (Vol. I) (Jan. 1, 1993).
[220] Resolution on Responsibility of States for Internationally Wrongful Acts, G.A. Res. 56/83, arts. 5, 7, U.N. Doc. A/RES/56/83 (Jan. 28, 2002).
[221] Kravchenko, *supra* note 207, at 229 (quoting Universal Declaration of Human Rights, G.A. Res. 217A, art 19., U.N. GAOR, 3d Sess., 1st plen. Mtg., U.N. Doc. A/810 (Dec. 10, 1948)). She also argues that this right is based in multiple human rights treaties and declarations, international environmental agreements, and national legislation and constitutions. *Id.* at 229–37.
[222] *Id.* at 245–52 (detailing exceptions).
[223] *Id.* at 239–45.

because this right is so widely recognized throughout the international community, it has become a universal human right and that states are thus obliged to guarantee the full exercise of that right.[224] In this case, each and every state must make efforts to positively inform even its own population of nuclear safety and operational incidents, or it will be in violation of international law.[225]

3. Improving Japanese Transparency

The Japanese nuclear power licensing system does take into account public opinion in an effort to increase transparency. According to the Citizen's Nuclear Information Center, Japan has included public involvement requirements and information disclosure as specified by law, by agreement between power companies and local authorities, and as customary practice.[226] The report explains that the process begins when the electric power company seeks local agreement from the mayor, the prefectural governor, and the municipal and prefectural assemblies.[227] Public involvement at this stage is limited to petitioning the local authorities and attending explanatory meetings.[228]

The formal licensing and environmental assessment stage calls for public involvement as mandated by law only twice, both during the construction application and siting phase. The first opportunity is at a public hearing where the power company explains its plan and chosen residents may present their opinions, and the second at another public hearing where METI explains the result of the NISA safety assessment.[229] Throughout this process, the information available to the public is limited to simple explanatory material, with no explanations of safety, radioactivity, or other

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[224] *Id.* at 237–38 (quoting Organization of American States, Inter-Am. Juridical Comm., *Principles on the Right of Access to Information*, OAS/Ser. Q CJ1/Res 147 (LXXIII-O/08) (Aug. 7, 2008)).

[225] For an example of how the Unites States has judicially interpreted and incorporated this duty to inform within its own regulations governing the standard of care owed by a nuclear facility operator to the surrounding population, see Jason Bjorn Aamodt, Comment, *Regulating the Standard of Care Owed to the Public During an Emergency at a Nuclear Power Plant*, 16 ENERGY L.J. 181 (1995).

[226] Baku Nishio, *Public Involvement in Japan's Nuclear Power Licensing System*, CITIZEN'S NUCLEAR INFO. CTR., http://cnic.jp/english/newsletter/nit135/nit135articles/licensing.html (last visited March 24, 2013).

[227] *Id.*

[228] *Id.*

[229] *Id.*

similar concerns unique to nuclear power.[230] This information is released only after the environmental assessment is completed, but by this time it is very difficult to stop the construction of a nuclear facility.[231]

In order to increase transparency, Japan must introduce more inclusive, unbiased, and periodic public hearings and dialogues.[232] Public hearings are meant to inform any potential stakeholders and the media about facilities, their activities, and safety regulations.[233] It is important for the public to be involved throughout the entirety of the process, from licensing to the creation and implementation of the emergency plan.[234] Under the Japanese system, involvement ends once the license has been awarded, depriving the public of the opportunity to truly convey their issues and concerns and to obtain answers.[235] The government should codify these hearings with legislation[236] that clearly outlines not only the procedure for public involvement, but also the process for decision-making, and the expected level of involvement, the balanced representation of stakeholders, scheduled venues and times for meetings, and the provision of any resources the stakeholders may need in order to participate.[237] No matter the content of this legislation, making it clear and accessible to the public would go a long way toward meaningfully involving all sectors of the interested community. As it stands, the legal requirements for public involvement are unclear and leave companies and local authorities in the dark about how to conduct these hearings, leaving them to devolve into simple explanatory meetings.

The hearings should not be merely attempts to inform the public of decisions made without their input, but should be two-way dialogues that include direct interaction between stakeholders and decision-makers.[238] The Japanese hearings do allow residents to state their concerns, and government, company, and local officials often directly respond to these concerns, but they do so while providing very few details about the environmental and regional impact.[239] In addition, the current Japanese system

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[230] *Id.*
[231] *Id.*
[232] *See* JUBIN, *supra* note 202, at 24.
[233] *Id.* at 23.
[234] STAKEHOLDER INVOLVEMENT, *supra* note 205, at 13.
[235] Shorrock, *supra* note 62.
[236] STAKEHOLDER INVOLVEMENT, *supra* note 205, at 8–9.
[237] *Id.* at 11; JUBIN, *supra* note 202, at 28.
[238] JUBIN, *supra* note 202, at 27; STAKEHOLDER INVOLVEMENT, *supra* note 205, at 4.
[239] Nishio, *supra* note 226.

does not allow any formal involvement by those outside the locality in which the facility is to be built.[240]

The hearing process is meant to provide the public with all the information it needs to make an informed and confident decision about nuclear energy and safety, not only in their own community, but throughout the country.[241] To this end, all information that can be reasonably provided should be made available to the public, including information on any potentially harmful consequence of normal operation, abnormal events and their consequences, and emergency procedures, inspection results, and the probabilities of any accidents.[242] In addition, hearings should inform the public of the objective benefits of nuclear energy and any successful operations.[243] However, the Japanese government often emphasizes these benefits in order to allay fears concerning radioactivity, while downplaying any negatives or regulatory failings.[244]

This same information should also be provided regularly to the public through the media and issuances by the regulating authority and/or the government. As the IAEA states, all information should be accurate and complete, while any restrictions should be explained to the public as much as possible without revealing any confidential or potentially dangerous information.[245] The media and the internet can be used to ensure that the public has easy access to all relevant and comprehensive information.[246] It is especially important to provide information to all educators in order to foster general understanding among all segments of the population from an early age.[247] Widely representative surveys should be taken regularly in order to establish the actual concerns of the public, their level of interest and support for nuclear energy, and any misinformation that may need to be corrected.[248]

Finally, all steps should be taken to ensure not only that regulatory bodies remain independent of the government or any nuclear energy promotion bodies,[249] but that any information they provide to the public

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[240] *Id.*
[241] *See* STAKEHOLDER INVOLVEMENT, *supra* note 205, at 6.
[242] *Id.* at 4, 9.
[243] *Id.* at 5.
[244] Shorrock, *supra* note 62.
[245] JUBIN, *supra* note 202, at 11; STAKEHOLDER INVOLVEMENT, *supra* note 205, at 6.
[246] STAKEHOLDER INVOLVEMENT, *supra* note 205, at 5.
[247] *Id.* at 4.
[248] *Id.* at 5.
[249] For further information concerning the independence of Japanese regulators from the government and nuclear energy promotion institutions, see the discussion of *amakudari*

also remains objective and unbiased. The process of public dialogue should be open and inclusive, avoiding any attempts to use emotional reasoning, dogmatism, or complicated or incomprehensible expert information.[250] Only a "high level of safety demonstrated continuously over time" can build public confidence and trust.[251] It is the role of the regulator to ensure the safety of the public, and it can best assure this through its open and transparent participation throughout all stages of the licensing, construction, and operation of nuclear facilities. The Japanese licensing procedure creates a system where "public hearings and public comment processes tend to be proforma [sic] in nature," and many in Japan are dissatisfied with their opportunities for involvement.[252]

4. Improving American Transparency

While Japan has a long way to go to introduce greater transparency into its nuclear regulatory system, it is not the only state that could allow for greater public participation and transparency. The American NRC has systematically reduced the opportunity for public participation in the licensing process out of the fear that an uninformed and irrational public would only slow the licensing process.[253] Under the previous system of the first great age of nuclear power, the USAEC encouraged the "limited

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above. *See supra* notes 101–08 and accompanying text. The industry minister of Japan, Banri Kaieda, announced his resignation and the separation of the NISA from the METI in order to address the conflict between the promotion and regulation of the nuclear industry, but former industry ministry official and professor at the Graduate School of Media Design at Keio University criticized the move as merely "cosmetic" and new appointments are made from within the ministry in keeping with traditional Japanese administrative practice. Tsuyoshi Inajima & Yuji Okada, *Japan's Industry Minister Kaieda to Step Down After Nuclear Plant Disaster*, BLOOMBERG (Aug. 4, 2011), http://www.bloomberg.com/news/2011-08-04/japan-s-industry-minister-to-step-down-after-nuclear-disaster.html. In fact, there have been allegations that government and industry leaders collaborated to sway opinion at public hearings by stacking the audience with nuclear industry supporters in order to give the appearance that there was strong support for nuclear power. *See id.*; Chester Dawson, *Scandal Taints Japan Nuclear Sector*, WALL ST. J. (Aug. 13, 2011), http://online.wsj.com/article/SB10001424053111904823804576499942442007306.html.

[250] STAKEHOLDER INVOLVEMENT, *supra* note 205, at 12.

[251] *Id.* at 5.

[252] *See* Nishio, *supra* note 226 ("We do not present the Japanese system as a model. Japanese civil society groups are deeply dissatisfied with it in many ways."); Shorrock, *supra* note 62 (outlining some of the anti-nuclear protests since the 1980s, including a 1981 demonstration where 7,000 people protested against a hearing for a plant in Hamaoka).

[253] Roisman et al., *supra* note 203, at 318 (2009).

appearance" statement process, viewing it as "an opportunity for the general public to express their views," and receive explanations from industry representatives as to why these concerns "were unfounded."[254] According to Llewellyn King, a nuclear journalist, "[t]he idea was that this openness would encourage the public to take a greater interest in nuclear science and the civilian uses of nuclear [energy]."[255] However, the industry soon came to believe that it was "the NRC's own vigorous examinations and oversight, and the industry's solid commitment to safety and security" that guaranteed true nuclear safety.[256] Public participation became a necessary evil, best utilized as a simple public relations tool.[257]Over time, the public has been squeezed out or disadvantaged by the nuclear regulators and the industry.

In order for a plant to be built in the United States, all applicants must first apply to the NRC, which will conduct hearings and investigations to determine whether or not it will approve the construction.[258] The application process is long, possibly taking many years, and requires the applicant to submit lengthy and detailed documentation that have often been found to be lacking sufficient detail and specifics as required by law.[259] The public, during this period, is at a significant disadvantage. It has no direct access to the applicant, no ability to question the applicant, limited access to documents which the applicant has made public, and is impeded by increasingly strict requirements regarding high burdens of production and evidence.[260] Due to hyper-technical NRC objections of minor infractions of these complicated regulations, many public objectors—specifically those from Native American tribes—have been denied hearings.[261]

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[254] *Id.*
[255] Llewellyn King, *Why Nuclear Power Has Languished*, N. STAR WRITERS GRP. (Sept. 30, 2008), http://004eeb5.netsolhost.com/lk066.htm.
[256] Roisman et al., *supra* note 203, at 319.
[257] *Id.* at 322.
[258] *Id.* at 322.
[259] *See, e.g.*, In the Matter of Entergy Nuclear Operations, Inc. (Indian Point Nuclear Generating Units 2 and 3), New York State Notice of Intention to Participate and Petition to Intervene, Docket Nos. 50-247-LR, 50-286-LR (Nov. 30, 2007).
[260] 10 C.F.R. § 2.309 (2008); *see also* Roisman et al., *supra* note 203, at 336–44; Citizens Awareness Network v. United States, 391 F.3d 338 (1st Cir. 2004) (upholding these regulations despite a challenge by a group of public interest groups claiming that these rules were arbitrary and capricious).
[261] *See, e.g.*, In the Matter of Entergy Nuclear Vermont Yankee LLC (Vermont Yankee Nuclear Power Station), CLI-07-13, Docket No. 50-271-LR (Mar. 15, 2007) (denying intervention petition by Massachusetts Attorney General).

Dale Klein, former chairman of the NRC, has emphasized the importance of high safety standards and public participation in building public confidence.[262] This ignores the fact that many substantial safety and environmental issues were first brought to the NRC's attention by intervenors from the public.[263] Anthony Roisman argued that contrary to popular NRC belief, the NRC record evidences anything but high safety standards or their enforcement, pointing to recent lapses as proof that the regulating authority wishes only to license plants more quickly, not more safely.[264] In addition, he argued that the nuclear industry itself has prioritized profits over safety.[265] According to Roisman,

> At a minimum, such a drastic change in, and reduction of, safety requirements should have been proceeded [sic] by a thorough and publicly discussed analysis in the context of an adjudicatory hearing that demonstrated: that nuclear power had advanced sufficiently to be able to decisively conclude that the plants that had already been licensed were "safe" for their full term; that no important unresolved safety problems existed; and, that the industry had reached sufficient maturity to justify such a change. No such public hearings have been held, and no such findings have been made.[266]

These facts show that the American system, like the Japanese system, was designed to discourage public participation, preferring to keep the public in the dark and trusting the industry and the regulators themselves to ensure safety. In response, the public has lost confidence in nuclear power and its regulators, and this could lead to the end of the second nuclear age.[267]

By redesigning the current system to remove the roadblocks to meaningful public participation, the United States could improve not only

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[262] Dale E. Klein, Chairman, U.S. Nuclear Regulatory Comm'n, Remarks to the U.S. Department of Commerce Nuclear Energy Summit: Promoting Public Confidence in Nuclear Safety through High Standards (Oct. 8, 2008), *available at* pbadupws.nrc.gov/docs/ML0828/ML082820479.pdf.

[263] *See* In the Matter of Gulf States Utilities Company (River Bend Station, Units 1 and 2), ALAB-183, Docket Nos. 50-458 and 50-459, 7 A.E.C. 222, 228 (Mar. 12, 1974).

[264] Roisman et al., *supra* note 203, at 330–33.

[265] *Id.* at 333–34.

[266] *Id.* at 335.

[267] *Id.* at 363.

its safety record, but also public support for nuclear power. While there have not been any major incidents in the United States since Three Mile Island, safety is a moving target, and the NRC should be doing all it can to maintain the highest standards of safety.

B. Promoting the Peer Review Process

There are several changes that can be made at the international nuclear regulatory level in order to ensure greater compliance by states with basic safety measures such as transparency. The current system focuses quite heavily on the role of the states in policing themselves.[268] It should further be encouraged for states to build on this sense of community. The IAEA should promote the idea that each state has a very real stake in the safety of nuclear energy, as the threat from an accident can cross boundaries. Joseph Rees suggests that the "force of peer expectations works best in small face-to-face groups which stay together for long periods of time," and that "group solidarity (and therefore peer pressure) is most likely to flourish under intimate conditions."[269] This suggests that representatives should be appointed for longer periods of time, and meetings should take place in smaller groups in order to foster a more intimate setting.

In addition to these measures strengthening the peer review process, it should be emphasized by the IAEA that states should not favor or bias other states in order to ensure that each safety report is properly reviewed for compliance, as mandated by the peer review system. Increased transparency measures could ensure that not only will states be fact checking each other's reports, but the public will as well.[270] More independent on-site visits by these state representatives could be conducted in order to supplement self-assessments submitted by the states for peer review.[271] However, it is unclear how states would respond to these double-checks on their integrity and visits, particularly by representatives of other nations. The independence of IAEA experts is crucial for many states, however, because the pool of experts in nuclear energy is so small, "most know each other, or know of each other," and no nominated technical-safety expert has ever been refused by the state concerned.[272] The IAEA should be careful to ensure that the experts remain independent and neutral, possibly by

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[268] *See* Jankowitsch, *supra* note 194, at 18.
[269] JOSEPH V. REES, HOSTAGES OF EACH OTHER: THE TRANSFORMATION OF NUCLEAR SAFETY SINCE THREE MILE ISLAND 91–92 (1994).
[270] *See* Washington, *supra* note 180, at 464.
[271] *Id.* at 463.
[272] *Id.* at 449.

hiring its own permanent pool of candidates who would therefore lack allegiances to any one state or company.

C. A Stronger IAEA

A third important change to the current international nuclear regulatory system that should be made in the aftermath of Fukushima is to strengthen the IAEA, the international nuclear watchdog. While the states are and should remain the current major players in the international system, there is potential for the IAEA to expand its role as a regulator. In order to strengthen the IAEA, it must first be made clear to the world that its regulations are to be taken seriously. Syria built a nuclear reactor without informing the IAEA in advance, as is mandated under the international system.[273] The IAEA focuses its attentions on declared sites rather than on the detection of hidden activities, relying on states to be forthcoming about their activities, but Syria showed the supreme lack of information the IAEA possesses.[274] The agency relies mainly on outside information, which also weakens its independence.[275] It seeks to remedy this by diversifying its information sources, but the agency should focus on building even wider connections—particularly with industry—as many facilities are now privately owned and operated. As the Fukushima incident teaches us, it is often the operator who has better access to information regarding a facility than the state that regulates it.

In order to expand its role, the IAEA will also have to address its funding. Currently, technical reviews are funded by both the member states and the IAEA together, with industrial countries paying the full cost of a review visit and developing countries paying only the local expenses.[276] The IAEA share is funded by contributions, mainly from the United States, Canada, the European Union, and Russia.[277] These contributions are partly voluntary and partly according to a scale fixed by the General Conference in proportion to the U.N. funding scheme.[278] In addition, the IAEA can borrow money.[279] This irregular source of funding is a major weakness for the IAEA. As a result, the agency is chronically underfunded, and if it is

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[273] Gregory L. Schulte, *Strengthening the IAEA: How the Nuclear Watchdog Can Regain Its Bark*, 253 STRATEGIC FORUM 4 (Mar. 2010).
[274] *Id.* at 4.
[275] *Id.* at 7.
[276] Washington, *supra* note 180, at 449.
[277] Schulte, *supra* note 273, at 5.
[278] McMillan, *supra* note 24, at 1009; Statute of the IAEA, *supra* note 163, at art. XIV(D).
[279] Statute of the IAEA, *supra* note 163, at art. XIV(G).

to expand its role, it will need more funds.[280] In order to do this, the IAEA should diversify the sources of its funding, revise its contribution scale, and call on greater voluntary contributions.

For states that refuse to implement the safety standards, the IAEA should be given greater enforcement power. Currently, the peer pressure system provides only for the states to police themselves.[281] If the IAEA were given some enforcement power, international regulation would be less hampered by the political maneuverings of states and become more independent, securing even greater international safety.[282] While trade boycotts and political pressures could be effective disincentives, the withholding of safety assistance should never be allowed, as this would frustrate the IAEA's principle mission.[283] An enforcement body could also be useful to the IAEA in order to resolve disputes between states and hear public concerns when the states themselves fail to do so. While the IAEA could conceivably use other courts from other international systems, such as the International Court of Justice, it may be better for the IAEA statute to incorporate an arbitration panel. This would allow the organization to maintain the spirit of cooperation and congeniality between states that prevails under the current system, but also allow for outside dispute resolution when this fails.[284] The way the system operates now, it is unclear whether one can bring a claim against a state for a breach of its obligations regarding nuclear safety under public international law, and how one would even bring such a claim, severely undercutting the IAEA's power to enforce its safety obligations if the other states do not.[285]

Finally, the IAEA should be given greater leeway to conduct inspections. Currently, this power is limited to agency projects and requests by members, but independent inspections could contribute to higher levels of safety.[286] These inspections would not only review the equipment, management, and safety culture of the plants, but also the compliance of the regulatory scheme with international standards, avoiding the pitfalls of vague self-reports.[287] States are already mandated to report their regulatory

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[280] McMillan, *supra* note 24, at 1008–09.
[281] *See* Jankowitsch, *supra* note 194, at 18.
[282] *See* McMillan, *supra* note 24, at 1007–08 (detailing negative incentives for noncompliance).
[283] *Id*.
[284] Cassese, *supra* note 158, at 693–94.
[285] Zeidan, *supra* note 173, at 287–88.
[286] Statute of the IAEA, *supra* note 163, at art. XII, § A; Stuart F. Clayton Jr., *The International Atomic Energy Agency: An Expanding Role in the Post-Chernobyl World*, 12 N.C. J. INTL. L. & COM. REG. 269, 275 (1987).
[287] McMillan, *supra* note 24, at 1010.

efforts to the other states and the IAEA, but there is no assurance that these self-assessments are full and accurate representations.[288] There are also no guarantees under the current system that they contain enough detail for other states to review them for compliance or national regulators to utilize them to improve safety.[289] Increased inspections could fill in the gaps, create a better picture, and ensure that these reports are reliable.

CONCLUSION

In 1986, the world was shocked by the devastating international consequences of the nuclear accident at Chernobyl, prompting the international community to adopt more stringent global safety standards via five unprecedented Conventions on state responsibility and nuclear safety.[290] This boom in international nuclear energy regulation mirrors the overall regulatory turn in international law within the past two decades.[291] This Note recognizes that in advocating for a stronger global effort at regulating nuclear energy, it must face the reality that states may not wish to create such a system that could intrude upon their ability to regulate within their own borders.[292] There are many theories as to why states are sometimes willing to concede their otherwise jealously guarded state sovereignty to an international regime.[293] However, as the regulatory boom after Chernobyl has taught us, the world can be prompted to such action in the wake of an incident that hammers home the truly international nature of nuclear energy and its consequences.

One of the major lessons of Chernobyl was that nuclear accidents can have transboundary effects.[294] Fukushima's lesson is different. It taught the world that the current international system and the national regulations it is meant to oversee are inadequate to provide for effective nuclear safety or to prevent accidents. Japan, with its much-maligned regulatory

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[288] *Id.*
[289] *Id.* at 1010.
[290] Washington, *supra* note 180, at 436–40.
[291] Cogan, *supra* note 156, at 322.
[292] Washington, *supra* note 180, at 440.
[293] *See* Sarah Elizabeth Kreps & Anthony Clark Arend, *Why States Follow the Rules: Toward a Positional Theory of Adherence to International Legal Regimes*, 16 DUKE J. COMP. & INT'L L. 331, 332 (2006) (outlining the major theories on state compliance in international law and advocating a new theory which argues that "the most significant determinants of behavior are the position of that state in the international system as well as the nature of the treaty regime, the extent to which the regime infringes on state sovereignty, the nature of verification/enforcement arrangements of that regime, and the normativity of the treaty regime.").
[294] Oxhorn, *supra* note 155, at 375.

system and sordid history of accidents, cover-ups, and collusion, is a poster child for this failure. While the United States has a much cleaner record, it also has seen its share of regulatory hiccups and has received its own criticisms for its nuclear safety regime. Both nations have suffered in the arena of public opinion, and the future of nuclear energy in both countries is now in doubt. If the nuclear energy industry is to survive in these states—and globally—it must prove to the global public that it remains a viable and safe energy source for the future, and states must prove that they can effectively and reliably provide for this safety.

The current international system was designed to place as much power in the hands of the states as possible, giving them control over the enforcement of safety standards through the peer review process. The IAEA was left with little more than supervisory and advisory power, though it can provide technical and emergency assistance when requested. This Note has made several recommendations to strengthen nuclear safety across this system. First, states should do their part to ensure more safety, primarily through the institution of greater transparency in their regulatory activities. Transparency not only provides myriad benefits for states looking to ensure greater safety and garner positive public opinion about nuclear energy, it is also mandated by international law. Both Japan and the United States have room to institute greater transparency measures, particularly during the siting and permitting processes.

This Note also made recommendations for the international organizations and, above all, the IAEA. The peer review process does provide some benefits to international regulation, and addresses the sovereignty concerns of the states. However, the process needs to be emphasized and given greater significance. This would ensure that states take this process and their responsibilities for monitoring safety in other states, as well as their own, more seriously.

Additionally, the IAEA could be strengthened to ensure that there is another monitoring and enforcing body beyond the states, in case they cannot or will not live up to their peer review obligations. To this end, it should be made clear to the world that the IAEA is a force to be taken seriously, and that it cannot be ignored. It can back this up by being given greater independence in funding, enforcement, and inspection. Currently, the IAEA is hampered by its weak role in international nuclear regulation, but a stronger international regulator could ensure that nations like Japan do not allow another Fukushima to happen because they were sleeping on the job, ignoring their regulatory responsibilities, and failing to implement IAEA recommendations for safety.