

**The 21<sup>st</sup> Century Public Policy Institute**  
**Policy Proposal**

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# **Toward a Comprehensive Solution for Nuclear Policy and Business Challenges**

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**November 2013**



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(This report is the English translation of the Japanese report released in Nov. 2013 by 21st Century Public Policy Institute.)



## **Executive Summary**

# **Toward a Comprehensive Solution for Nuclear Policy and Business Challenges**

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Nov. 14<sup>th</sup>, 2013

### **1. Introduction to the issue**

The accident at Tokyo Electric Power Company (TEPCO)'s Fukushima Daiichi Nuclear Power Plant revealed that the response measures stipulated in the conventional framework centered on the Act on Compensation for Nuclear Damages were insufficient in the event of widespread nuclear disaster. With this in mind, this paper will study a proposal for a new nuclear disaster response system and how Japan should set the stage for the sustenance and continuity of nuclear power operations (power generation and back-end operations). It will discuss strategies to comprehensively manage the various risks related to nuclear power projects (nuclear accidents, enhanced regulations, reduced operation ratios, financing, etc.).

#### **(1) Historical context of nuclear power in Japan**

This subsection reflects on the political and economic background of the initial introduction of nuclear power in Japan, and briefly look back on the context in which it has come to be “privately run under national policy,” the incompatibility between nuclear power business and the deregulation of the electric power system, and Japan’s nuclear fuel cycle back-end policy.

#### **(2) The current status of nuclear power in Japan**

Important changes have occurred in the contextual background of nuclear power generation after the accident at the Fukushima Daiichi Nuclear Power Plant (“Fukushima accident”). Prominent change has been

observed in the political environment. Although the Innovative Energy and Environment Strategy in which the DPJ government resolved to phase out nuclear power was not endorsed by the new administration, the former pro-nuclear policy mood remains absent even with the comeback of the LDP-New Komeito coalition. This is a result of structural changes occurring to the diluting political support for nuclear policy.

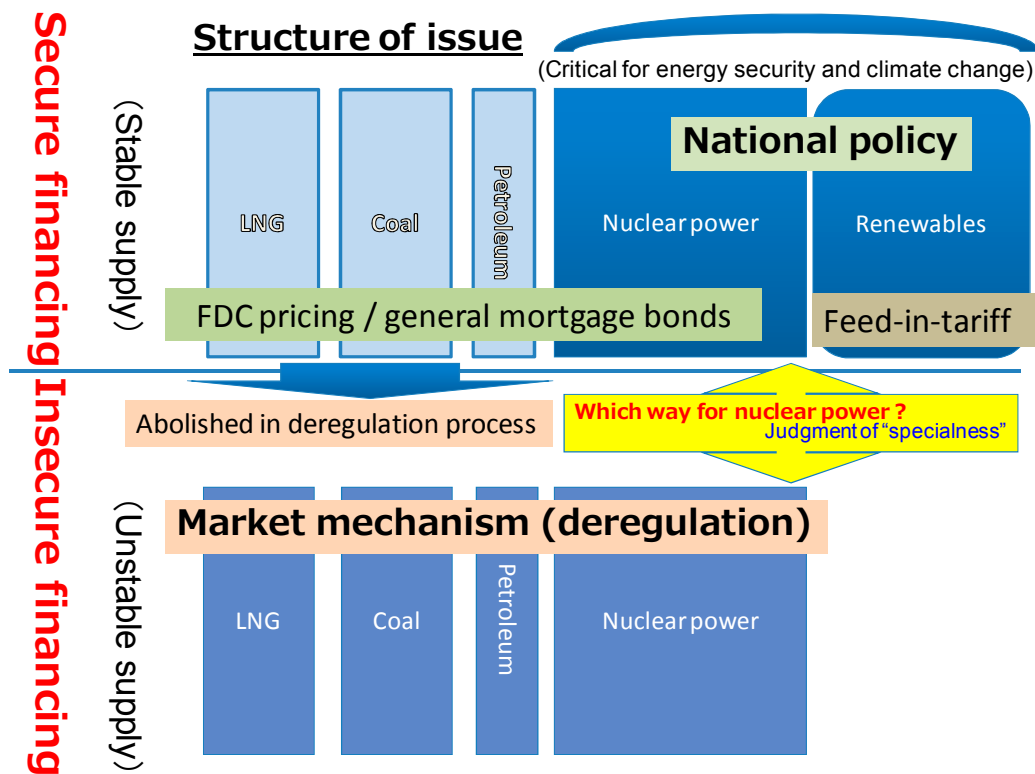
The situation has evolved as such for the following reasons: 1) with anti-nuclear public opinion having sustained in the stalled resolution of the accident, distrust towards the national government and companies has yet to be dispelled; 2) the acknowledgement that energy must be quantitatively secured has been undermined in the prolonged economic recession, along with receding memories of the oil crises; and 3) high expectations for nuclear technology and appreciation of it as state-of-the-art technology have been lost in the Fukushima accident.

It is urgent that nuclear energy is both politically and administratively reaffirmed as a “particularly” vital energy source to Japan from the perspectives of energy security, economic growth, and climate change countermeasures. The national government should reconfirm its commitment to nuclear policy by means of the Basic Energy Plan and other Cabinet decisions from an administrative perspective, and in the form of party decisions adopted by the ruling party, in political terms. This will lay the groundwork for future system reforms and the establishment of relevant budgets.

A second change is the advancement of electric power system reforms. The scheduled blackouts and lack of capacity for mutual provision of electricity which occurred in the aftermath of the Great East Japan Earthquake exposed the flaws of the conventional power system; and therefore, the ongoing electric power system reforms aim to enable the Japanese system to balance supply and demand in the market by deregulating electricity prices. The most important feature of these reforms in relation to nuclear policy is the legal unbundling of the power transmission/distribution sector and the abolishment of tariff regulations based on fully distributed cost (FDC) pricing and general mortgage bonds. These measures have ensured the procurement of funds for installing generation and distribution equipment required for electric power companies to fulfill their legal obligation to supply power under the

Electricity Business Act. The abolishment of such measures and its ensuing changes in corporate finance that will result from the legal unbundling of the transmission/distribution sector will impose an unpredictable impact on nuclear power investment, which calls for stable long-term financing. In addition to detailed discussion on electric power system reforms, deliberation is needed on means to limit the financing risks embraced by nuclear power, including public support measures.

Renewable energy, on the contrary, has been granted the status of a climate-friendly alternative energy source to replace nuclear energy by “national policy,” and its financing risks have been eliminated under the feed-in-tariff (FIT) program, which ultimately amounts to FDC pricing. The structure of these issues is exhibited in Figure 1.



Source: compiled by author

**Figure 1 Structure of issue**

The third change has occurred in safety regulations. The “backfitting” rule is an example of retroactive rules and standards that were not effective at the time of licensing, and poses risks of impairing long-term

investments. Therefore, regulatory risks must also be included among nuclear business risks in the future.

### **(3) Requirements for sustaining nuclear power**

The first requirement is the political and administrative confirmation of the “special importance” of nuclear power. Politicians and government officials share the responsibility to explain not only the necessity of nuclear power as an electric power source but also how the public will benefit from the advantages of sustaining nuclear technology and relevant human resources. If nuclear policy is to be steered in the direction of stronger national government intervention in the process of reviewing and reconstructing nuclear power operations, government assurance that the use of nuclear power is beneficial to the general public as well as to nuclear operators will serve as the rationale behind the policy.

The second requirement is to establish a secure financing environment including public support measures in light of the changes in the contextual background of nuclear power operations aforementioned in subsection 2).

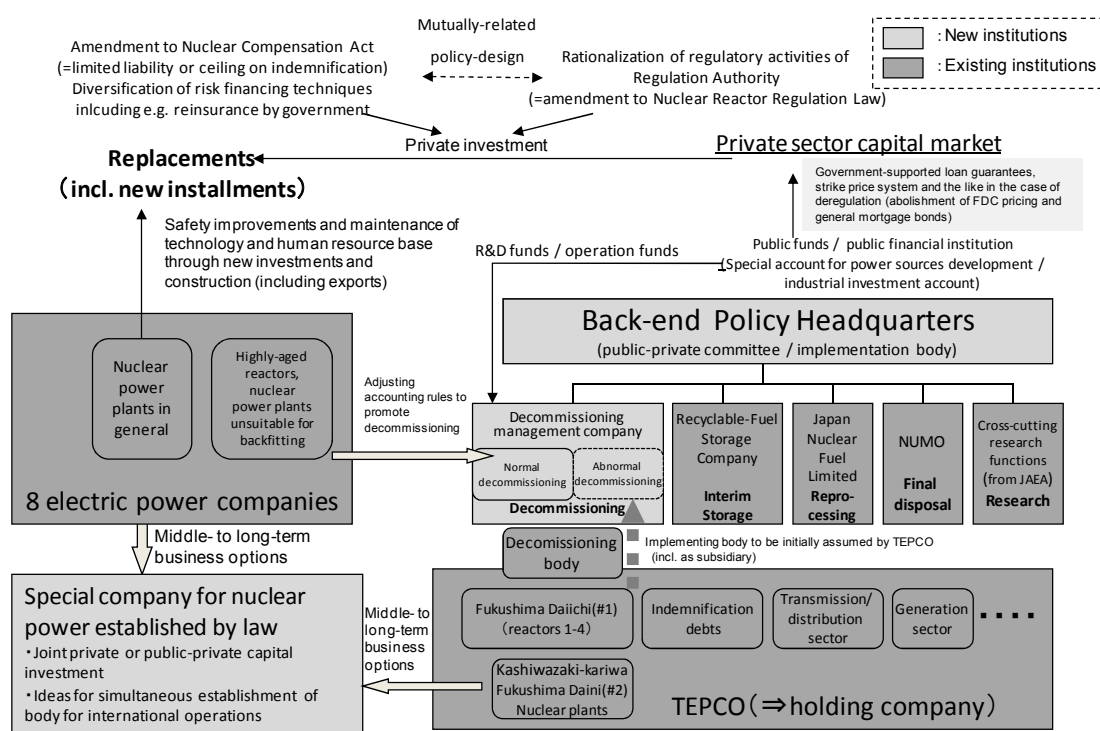
The third requirement is implementing regulations to promote and facilitate technological innovation. In order to advance human resources development and technological succession while encouraging competition for improving safety beyond legal obligation voluntary safety competition among companies in the middle- to long-term as well as promoting the reinstatement of nuclear power and incorporating new technological innovations, the Act on the Regulation of Nuclear Source Material, Nuclear Fuel Material and Reactors (Nuclear Reactor Regulation Law) must be fundamentally reviewed (in terms of desirable regulatory standards, methods and activities). If the Nuclear Reactor Regulation Law and the Nuclear Regulation Authority are to specialize in regulating nuclear safety, then the current Nuclear Reactor Regulation Law, which covers a mixture of operational regulations and safety regulations should be fundamentally restructured from the viewpoint of securing nuclear material management and flexibility in nuclear operations. An administrative body to oversee the peaceful use of nuclear energy in place of the Atomic Energy Commission of Japan (AEC) is also called for.



## 2. Policy proposal for laying the groundwork for nuclear power

This section will propose a policy package to comprehensively resolve the abovementioned challenges. It is important that the national government's commitment to nuclear power is reconfirmed both politically and administratively, for example by bundling the relevant law amendments and new policy measures composing the policy package into the form of a bill on the Management of the Operational Context of Nuclear Power. This would also be premised upon a clarification of the position of nuclear power in the electric power reforms.

The proposed policy package is illustrated in Figure 2 (TEPCO's position requires separate consideration):



Source: compiled by author

**Figure 2 Framework for comprehensive resolution for nuclear issues (Act on the Management of the Operational Context of Nuclear Power)**

## **(1) Private sector-led replacement of highly-aged reactors**

The first important element of the proposed policy package is promoting the replacement (including reconstruction and new installments) of highly-aged nuclear reactors through private initiative. Human resources must be fostered for the robust technological succession required for the retention of nuclear technology. Furthermore, the knowhow and knowledge obtained through actual involvement in the construction work at nuclear power plant sites are indispensable for the improvement of safety at domestic nuclear power plants. International expansion of nuclear operators should also be strongly encouraged in light of promoting technological advancement through competition.

Commercial reactors should be replaced using private funds. However, deregulation will complicate fund procurement; and therefore, electric power companies will have to make decisions regarding the role of nuclear power in its business structure and how much money it will invest and where that money would come from.

In order to facilitate decision-making, the government must clarify whether nuclear power plants will be utility power plants gaining policy support under national policy, or merchant power plants exposed to market competition, as in the case of thermal power. Another idea would be to distinguish replaced power plants and those bearing high policy significance from existing power plants by designating the former “public benefit power sources” (utility power plants), while the latter would be merchant or competitive power sources

Firstly, if nuclear power will continue to be granted the status of a “public benefit power source,” alternative price regulations will be needed to replace the FDC pricing scheme, which will be abolished. Some suggestions include: 1) a debt guarantee scheme backed by the national government (or other public institutions with equivalent credibility); 2) a strike price system as recently taken in UK 3) contracts between transmission/distribution companies or the wholesale electric power exchange and their choice of electric power companies to constantly purchase a fixed amount of electricity sourced by nuclear power.

If nuclear power should newly be designated merchant power, a framework will be needed to allow companies to capitalize lost earnings that have become unrecoverable as a result of regulatory changes,

including those regarding safety regulations, and to recover the stranded costs from wheeling charges.

Furthermore, as the debate on unbundling power generation and distribution develops and the financial management and fund procurement schemes of the holding company and group companies under a legal unbundling model are determined, nuclear power operations may have no other choice but to undergo restructuring (cf. “middle- and long-term business options” in Figure 2), in which case the government will be required to consider providing the funds entailed for restructuring (capital investments, debt guarantees, etc.), implementing tax incentives (registration and license tax exemptions), clarifying its approach to the abovementioned stranded costs, taking Antimonopoly Act-related measures (exemption, clarification of requirements, acceleration of investigation procedures, etc.), retaining operating licenses issued according to safety regulations and accelerating other licensing procedures under relevant laws.

## **(2) National government-led approaches to back-end issues**

The back-end issue, which has become the largest impediment to the sustenance and continuity of nuclear power generation must be addressed by the national government with more proactive responsibility. The government is required to perform its role of implementing policies and be responsible for the processing of spent fuels through to final disposal after reactor decommissioning. A “Back-end Policy Headquarters” should be established directly under the Cabinet, as an administrative body that will plan and draft relevant integrated policies in place of the AEC.

Furthermore, in accordance with the basic principles determined by the “Back-end Policy Headquarters,” a mechanism will be required to adjust the discrepancies between public and private sectors in the progress and scale of operations. Options for such a mechanism include: (i) establishing an “Organization for Nuclear Back-end Operations,” a specially-approved corporate body or special company established by law (For example, the organization could be established as a permanent entity with the government holding a two-third share and electric power companies, a one-third share. Policy continuity and the assignment of responsibility would be made explicit.); and (ii) establishing a loose

public-private partnership, such as a “Joint Committee for Public-Private Coordination of Nuclear Back-end Operations.” (Nuclear interim storage and reprocessing are currently operated by the private sector; and therefore, this option will help avoid confusion induced by drastic changes.)

Back-end operations should be assumed by an entity that will still exist in the distant future (at least one hundred years later), and since the operations do not generate profits, there is no incentive for private electric power companies to continue them. Even if operations are initiated under option (ii), they should appropriately be shifted to option (i) in the middle-to long-term. This will enable a single entity to integrate the entire nuclear back-end process of decommissioning, interim storage, reprocessing, final disposal of radioactive waste and all cross-cutting research under its supervision and assume comprehensive responsibility for their implementation.

From the perspective of minimal costs and effective implementation, the Organization should make the decisions regarding operational strategy but basically outsource actual operations to the private sector, with reference to the UK Nuclear Decommission Agency (NDA)’s scheme.

Although the implementation structure for decommissioning the Fukushima Daiichi Nuclear Power Plant requires separate consideration (TEPCO should take the initiative in the immediate future), other commercial reactors as well as those installed by government institutions (Japan Atomic Energy Agency (JAEA) and the Power Reactor and Nuclear Fuel Development Corporation (PNC)) will eventually be faced with the issue of decommissioning. It will be important for the Organization for Nuclear Back-end Operations to assume the disposal of “negative heritage” for a certain price.

A scheme for the efficient and effective implementation of long-term decommissioning operations –for example, injecting public funds from the Special Account for Energy Policy - is called for to cover disposal costs that will contribute to the advancement of decommissioning technology as a whole. Furthermore, institutional measures should be deliberated in order to recover a portion of the total public funds incurred in the entire decommissioning process by selling the decontaminated land upon completion of decommissioning operations.

### **(3) Rational regulations by the Nuclear Regulation Authority**

The Nuclear Regulation Authority would be unnecessary if Japan were to end nuclear power generation. Nuclear power can be phased out both legally and politically by other means. Nevertheless, the NRA has been retained with the expectations that it will deliberate and implement the safety regulation standards and activities required to safely operate nuclear power generation facilities, which are economic assets based on large investments, and that the national economy will come to enjoy the provision of inexpensive and stable energy supply.

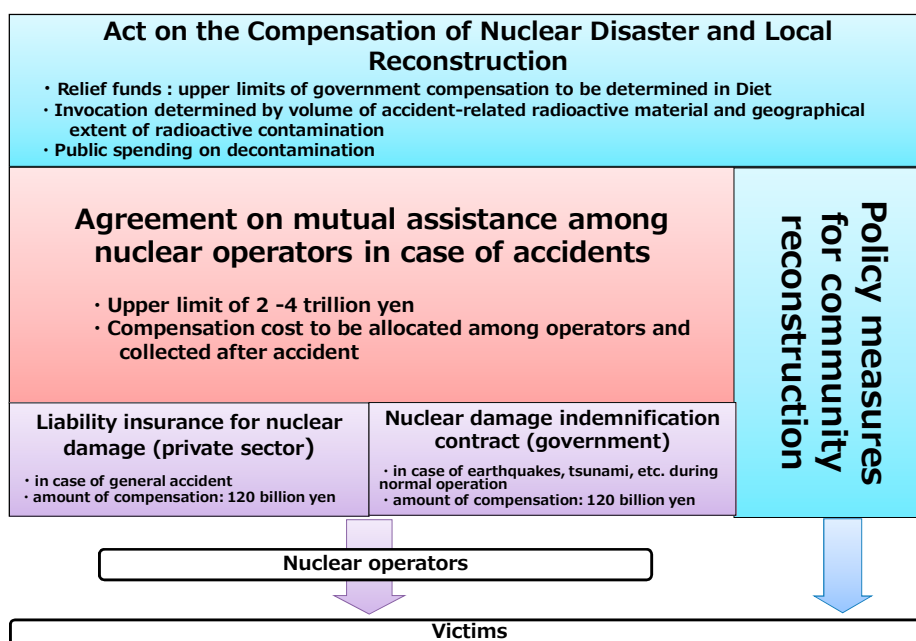
- 1) The general public as well as regulators and the regulated should share the acknowledgement that the safety standards established by the NRA are only requirements for approval of nuclear power operations and that they are not at all evidence of safety in nuclear power plants. A scheme should be designed embedded with incentives to promote safety improvements through competition among operators.
- 2) The regulatory activities of the NRA should no longer be focused on calculating hardware structure and checking for document flaws but should instead be shifted to assessing integrated risks, including organizational governance and human factors, and securing the human resources required for such activities in terms of both quality and quantity.
- 3) In order for thorough engineering technology-oriented deliberation on safety standards and regulatory methods to take place between the NRA and operators, the NRA should enhance its staff functions by establishing a Special Committee on Technology, and operators should establish an organization that will compile expertise and knowhow from operators and manufacturers and serve as a liaison for opinion exchange with the NRA.

Furthermore, the NRA has other critical tasks, which are equally as important as conformity assessments for backfit requirements and fracture zone surveys. These include the collection and announcement of scientific information on low-dose exposure and support for formulating regional disaster prevention plans.

#### (4) Structuring a new nuclear disaster response system

The Fukushima accident brought to light the drawbacks of the current nuclear damage compensation program. The current program 1) fails to address the problem that once an accident occurs, entire communities collapse; 2) obligates nuclear power operators to continue to provide a stable supply of electricity despite being faced with limitless debts related to damage compensation, decontamination and decommissioning; and 3) does not embed incentives for operators to engage in self-governed competition with other operators over safety improvements.

With an aim to resolve such issues, a three-layered nuclear disaster response scheme is proposed (Figure 3). This system reform plan is not limited to making amendments to the Act on Compensation for Nuclear Damage and seeks to be a comprehensive victim compensation measure as well as to distribute damage costs.



Source: compiled by author

**Figure 3 Proposal for new policy architecture for nuclear damage recovery**

Taking into consideration the distrust prevailing in terms of the technological and organizational competence of all nuclear power operators in general in the aftermath of the Fukushima accident, a scheme that penalizes (by imposing economic burden or weighted inspection items) operators that neglect to strive to improve safety levels and awards those who achieve high performance in safety operations is needed.

For example, Japan could adopt a program similar to the US Reactor Oversight Process (ROP), under which the Nuclear Regulatory Commission (NRC) links performance indicators of reactors with a weighted range of additional inspections and makes the findings available for public access. Reactors with high performance could be given the incentive of longer intervals between regular inspections. Furthermore, the insurance premium under the government-sponsored indemnity agreements for compensation of nuclear damage could be linked with performance indicators, and insurance premiums (rates) of the new nuclear energy liability insurances system proposed below could be associated with performance indicators and peer review assessments.

We propose the establishment of an “ex-post-levy-collection-based mutual assistance program,” a larger mechanism that embraces the abovementioned ideas. By introducing this scheme, nuclear power operators would “share a common destiny” in terms of safety operations. This means that once another operator causes an accident that inflicts damage, an operator will immediately suffer significant impacts on its corporate finances.

Since the Fukushima accident, the Japan Nuclear Safety Institute (JANSI) has involved operators in a peer review process on safety at nuclear power plants. An “ex-post-levy-collection-based mutual assistance program” would help enhance the effectiveness of such processes. By limiting damage compensation payments to a certain range, for example 2 - 4 trillion yen, accident risk levels can be measured in advance, thereby resolving some financial issues.

The U.S. Price-Anderson Nuclear Industries Indemnity Act (Price-Anderson Act) also contains a “mutual insurance” arrangement that functions similarly. Concerns that setting an upper limit to the damage compensation payment to be made by operators may constitute moral hazard can be dismissed with the simultaneous establishment of an

effective mutual supervision scheme. Currently in Japan, under the Nuclear Damage Compensation Facilitation Corporation Act, operators must pay a general contribution to the Nuclear Damage Liability Facilitation Fund. The general contribution system would be abolished with the introduction of the new “mutual assistance program” proposed above.

In the case of TEPCO, various supporting and opposing opinions were presented regarding its legal liquidation, which was dismissed on the grounds that it would lead to delayed and inadequate damage compensation and pose serious operational problems in coping with the aftermath of the accident. This decision was based on the judgment that compensation for nuclear damage must be fully made, transactions related to the stabilization of the nuclear accident could be continued, and capital investments should be made for a stable electricity supply.

The establishment of a mutual assistance scheme and a mutual supervision scheme, accompanied by the introduction of upper limits to payments liable in compensation for nuclear damages promise higher safety levels and lower accident risks, and will significantly lower the possibility of operators being hammered by excessive debts, derived solely from compensation for damages. However, the chances of business organization cannot be fully dismissed; and therefore a scheme should be considered in preparation for such cases.

Under a limited liability scheme, when total compensation costs exceed the sum of upper limits for operators and funds available from the mutual assistance scheme, the compensation of victims becomes a national government agenda, thereby invoking the “Act on the Compensation of Nuclear Disaster and Local Reconstruction” proposed in Figure 3. The Swiss nuclear damage indemnification law, which provides for the joint cooperation of the national government and nuclear operators in addressing cost-related issues in major nuclear disasters, should be referred to.

##### **(5) Addressing local community collapses**

In a major nuclear disaster, the damage is widespread geographically, as well as in content and time. Furthermore, damages such as lost local communities and employment issues are difficult to be recovered only by



monetary indemnification. Therefore, it is more than obvious that attempts to resolve such issues according to the current Act on Compensation for Nuclear Damage, which is based on a tort law framework, can only be effective to a limited extent.

In the event of an accident that creates a massive number of victims across a wide geographical area and is likely to be followed by a prolonged aftermath, the government should importantly go beyond providing financial assistance based on the Nuclear Damage Compensation Facilitation Corporation Act to assuming the responsibilities of victim compensation and restructuring affected areas, while requiring the concerned operator to cooperate in those activities..

This could be achieved by incorporating additional disaster compensation (the national government takes over the complaints extended to operators and an organization with pooled funds similar to a relief fund will address them) and various measures on local reconstruction into the same law. An “Act on the Compensation of Nuclear Disaster and Local Reconstruction” could cover decontamination operations run by government funds, industrial policy measures to attract companies to the region as well as encourage the establishment of new businesses in order to secure employment for victims, an increased ratio of public works subsidies available for the reconstruction of local infrastructure, continued free healthcare checkups, and measures to deal with and prevent economic losses and other damages incurred by the spread of bad rumors. Compensation methods employed in past dam construction projects may also be referred to.

### **3. Future processes**

In order to advance the abovementioned measures to slay the groundwork for nuclear power operations, we must consider their correlation with the processes and schedules of the following related policy agenda.

- 1) Formulation of the Basic Energy Plan and preceding deliberations in the Energy Subcommittee of the Advisory Committee on Natural Resources and Energy (joint deliberations on global warming

- countermeasures in the Industrial Structure Council and the Central Environment Council are also closely related)
- 2) Timeline and details of the draft proposal for amendments to the Electricity Business Act (electric power system reforms)
  - 3) Addressing revisions to the Act on Compensation for Nuclear Damage
  - 4) Developments in the NRA's backfit-related screenings for approval and licensing
  - 5) Review of TEPCO's Comprehensive Special Business Plan, including radiation-tainted water (restarting nuclear power plants, tariff-related issues, financing, etc.)
  - 6) Developments towards restarting the Japan Atomic Power Company's Tsuruga Nuclear Power Plant
  - 7) Completion and operation of Japan Nuclear Fuel Limited's reprocessing plant and status of the Recyclable-Fuel Storage Company (RFS)

The details of these elements should be more concrete before the end of the year; and therefore the general framework for a comprehensive solution to the nuclear power issues which has been proposed in this report should be brought to public attention before the turn of the year. Preparations should be made for submission to the ordinary diet session in 2015 so that specific policy measures can be drawn up next year for implementation through various bills and budgets the following fiscal year.

We hope that this report will contribute to the improvement of our country's scheme for compensating victims of nuclear disaster and to the sound development of nuclear power operations.

\*This report is the based on research efforts at the 21st Century Public Policy Institute and does not represent the view of Keidanren.

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Nov. 14<sup>th</sup>, 2013

## **1. Introduction to the issue**

The accident at Tokyo Electric Power Company (TEPCO)'s Fukushima Daiichi Nuclear Power Plant revealed that the conventional compensation framework centered on the Act on Compensation for Nuclear Damages was insufficient in the event of grave and widespread nuclear disaster. With this in mind, this paper will propose a new nuclear disaster response system, encompassing a new compensation scheme as well as special legislation for the restoration of the entire Fukushima area. It will propose an integral framework to address accidents, and simultaneously discuss how Japan should set the stage for the sustenance and continuity of nuclear power operations (power generation and back-end operations) based on the contextual changes introduced below. The report will seek strategies to manage the various risks (risks of accidents, enhanced regulations, reduced operation rates, financing) associated with nuclear operations from a comprehensive approach. The paper is not intended to debate the necessity of sustaining and continuing nuclear power in Japan's energy policy, but to discuss the necessary measures in relation to the operational context of nuclear power.

### **(1) Historical context of nuclear power in Japan<sup>1</sup>**

First, we will briefly look back on the history of nuclear power operations in Japan.

#### **(i) The introduction of nuclear power generation**

Having experienced atomic bombing in Hiroshima and Nagasaki, Japan embraced strong opposition against nuclear weapons in the

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<sup>1</sup> Details can be found in *Toward the Establishment of a New Compensation System for Nuclear Damages: a report by the 21st Century Public Policy Institute Nuclear Policy Issues Committee* (21st Century Public Policy Institute, 2013)

post-World War II era, giving rise to various public campaigns. In the meanwhile, the “Atoms for Peace”<sup>2</sup> speech delivered by then US President Dwight Eisenhower before the United States General Assembly on December 18, 1953 suddenly shed light on the peaceful use of nuclear power, mainly for generating electricity (and other uses including agriculture and medicine). Indeed, acknowledging that the U.S. monopoly of nuclear technology having collapsed and the proliferation of nuclear knowledge could no longer be controlled, the U.S apparently had strategic intentions to prevent nuclear power from inducing change in the international military balance by entrusting an international organization with the unified management of nuclear substances and limiting its use to peaceful purposes. Japan decided to take advantage of the opportunity consequently granted non-nuclear nations including Japan to utilize nuclear power..

Japan, in the midst of postwar reconstruction, was faced with burgeoning electricity demand in the context of high-speed growth. A rising oil dependency rate and increased imports had concurrently aroused concerns that trade balance constraints would cripple further economic growth, and hence, the agendas of energy security and securing an inexpensive and stable electricity supply needed to be addressed urgently. Furthermore, the majority of public opinion was in support of the idea that Japan, having experienced atomic bombing, was in fact entitled to and even bore the mission to promote the peaceful use of nuclear power<sup>3</sup>. Nuclear power may also have been underpinned by the notion that by mastering and controlling/employing the challenging state-of-the-art technology Japan would be able to prove its high technology level to the world. These circumstances advanced Japan towards adopting nuclear power generation.

In 1955, the Atomic Energy Basic Act which provided legal grounds for the peaceful use of nuclear power was adopted based on a joint proposal by the Liberal Democratic Party (LDP) and the Socialist Party of Japan (SPJ). This phenomenal event is an implication of the prevailing optimistic mood that focused on the promising aspects of introducing

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<sup>2</sup> <http://aboutusa.japan.usembassy.gov/pdfs/wwwf-majordocs-peace.pdf>

<sup>3</sup> refer to, for example, Akihiro Yamamoto (2012), *Kaku enerugi no sengoshi 1945-1960 “Hibaku no kioku” to “Genshiryoku no yume” (Post-war history of nuclear energy 1945-1960: “memories of the atomic bomb” and “nuclear power dreams”)*, Jinbunshoin

nuclear energy. Historically renowned politicians such as LDP's Yasuhiro Nakasone and Matsutarō Shōriki and SPJ policy-makers Shigeyoshi Matsumae and Shigeru Goto advocated the peaceful use of nuclear energy.

The Japan-U.S. Nuclear Cooperation Agreement was concluded that same year, followed by the Japan-U.K. Nuclear Cooperation Agreement in 1958, which laid the groundwork for transferring nuclear technology from the two countries. Upon concluding these agreements, Japan was required to accept provisions which exempted the technology supplier from liability in the event of accidents and to facilitate local acceptance of nuclear facilities domestically. Hence, the Act on Compensation for Nuclear Damages ("Nuclear Compensation Act") was adopted in 1961. Politicians were divided concerning how to promote nuclear operations. The controversy between politicians who supported private sector-led operations (Matsutarō Shōriki) and those in support of nationally-led operations employing the Electric Power Developing Co., Ltd. (Ichiro Kono) was politically resolved with the final decision being to advance nuclear operations under private initiative (The Japan Atomic Power Company (JAPC)-model, co-financed by the nine electric power companies).<sup>4</sup> This event marked the dawn of operations "privately run under national policy."

There was further debate over whether to introduce US technology or UK technology first. British technology, which employed gas-graphite reactors was initially introduced but was later replaced with American light-water reactor technology due to various technical problems including quake-resistance.<sup>5</sup>

## **(ii) Period up to 1990**

Obligated to supply electricity under the Electric Business Act, general electric utilities must keep appropriate generation capacity on

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<sup>4</sup> Tetsuo Arima (2008) *Genpatsu, Shōriki, CIA Kimitsu bunsho de yomu shōwa rimenshi (Nuclear power plants, Shōriki, CIA: The inside history of the Showa era told in classified documents)*, Shincho books; Shigeru Goto (2012) *Yukoku no genshiryoku tanjo hiwa (The untold story behind the creation of nuclear patriotism)*, Energy Forum books (written by a former SPJ lawmaker of the House of Representatives about the predawn of nuclear power in Japan); Junichiro Yamaoka (2011) *Genpatsu to kenryoku (Nuclear power stations and power)*, Chikuma books; Makoto Sakata (2011) *Denryoku to kokka (Electricity and national government)*, Shueisha books

<sup>5</sup> Details can be found in Masatoshi Toyota (2008) *Genshiryoku no rekishi to tenbo (The history and future of nuclear power)*, Tokyo Toshō Shuppankai, p12-; Junichiro Yamaoka (2011) *Genpatsu to kenryoku (Nuclear power stations and power)*, Chikuma books, p86-

reserve so that blackouts can be prevented during peak hours. A scheme that recovered equipment-related fixed cost was needed in order for operators to make the investments required to maintain an operating reserve. Hence, the following scheme was adopted under the post-war system embracing nine privately-owned general electric utilities established under the leadership of Yasuzaemon Matsunaga and GHQ. Tariff regulations based on fully distributed cost (FDC) pricing and a general mortgage scheme that gave electric power companies an advantage on issuing electric company bonds (general mortgage bonds which are issued under the Electric Business Act by nine electric utilities with the exception of Okinawa Electric Power Company)<sup>6</sup> guaranteed companies adequate revenue. Furthermore, regional monopoly ensured companies a given amount of sales and market share. This business framework stabilized the management of electric companies and therefore enabled them to assume electric power operations as implementers of national energy policy stable management. Hence, the business environment to promote nuclear power operations under private-public partnership was established.

Nuclear power had been recognized as a necessity for Japan from the time of its introduction, considering Japan's need to hedge geopolitical risks as well as risks of surging fuel prices, due to its a low energy self-sufficiency level. The agenda of developing and promoting the use of alternative energy sources to replace oil was boosted to top policy priority when Japan was struck by two oil crises in 1973 and 1979, thereby accelerating the development of nuclear power generation. Furthermore, with the advancement of technologies to increase the fuel utilization efficiency of uranium by extracting plutonium from spent fuel for domestic reuse in fast-breeder reactors, Japan was determined to let nuclear power assume the key role of "quasi-domestically produced energy" and strongly promoted a "nuclear fuel cycle policy" centered on the reprocessing of spent fuel and operating fast-breeder reactors. It had been commonly understood among nuclear authorities that light-water reactors were not

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<sup>6</sup> Bonds (corporate bonds) which are secured by a mortgage upon the entire property of the issuing company and enable holders to obtain payment in preference to other creditors. Electric company bond issue limits are set at a price two times higher than ordinary industry bonds, and hence, electric company bonds represent a very high ratio of industrial bonds (comprising ordinary industrial bonds and electric company bonds) as a whole.

the “ultimate reactor” but only a transitional technology, and that the practical application of fast-breeder reactors would complete the nuclear fuel cycle, thereby establishing consistency between nuclear technology and policy. Once it was decided that provisions concerning the nuclear fuel cycle would be embodied in the 1968 Japan-U.S. Nuclear Cooperation Agreement, the Power Reactor and Nuclear Fuel Development Corporation (PNC) was established in October 1967 as the research institution to advance nuclear fuel cycle technology development. PNC consecutively launched projects to build an advanced thermal reactor “Fugen” (Tsuruga City, Fukui Prefecture, 1970) followed by an experimental fast-breeder reactor, Joyo (Ooarai Town, Ibaraki Prefecture). (Fugen was shut down in 2003 and awaits decommissioning; and Joyo has not operated after having technical problems in 2007.) Furthermore, in 1971 it started building a reprocessing plant in Tokai Village, Ibaraki Prefecture (fire accident in 1997), and finally in 1985, it began constructing the prototype fast-breeder reactor, Monju.

In 1974, immediately after the First Oil Crisis, the Government established the Special Account for Electric Power Development Facilitation Measures which was funded by a special purpose tax, the power source development tax, in order to facilitate the siting of nuclear facilities. Various subsidies to support local governments hosting nuclear facilities were later formulated under this scheme, encouraging the construction of many new light-water reactors from the 1970s to 80s and thereby pushing the share of nuclear power up to 30 percent of Japan’s power generation portfolio.

### **(iii) Beyond 1990 to present**

In 1980, the nine electric utilities co-financed the establishment of Japan Nuclear Fuel Services Co., Ltd. (currently, Japan Nuclear Fuel Limited (JNFL)). Importing French technology, it began constructing the reprocessing plant in Rokkasho Village in 1993. A year later in 1994, North Korea’s withdrawal from the Nuclear Anti-proliferation Treaty (NPT) marked the beginning of the Korean crisis. Subsequent negotiations led to agreement between the U.S. and North Korea that the U.S. would provide small two light-water reactors with little risk of becoming a source of nuclear proliferation, and the Korean Peninsula Energy Development

Organization (KEDO) was established to implement the agreed framework, which ends in failure. In contrast, the new Japan-U.S. Nuclear Cooperation Agreement which came into effect in 1988 made Japan the only NPT non-nuclear weapon state to be granted comprehensive consent to reprocess spent fuel (under a comprehensive agreement framework). Japan is also expected to set a model for the peaceful use of plutonium under the supervision of the International Atomic Energy Agency (IAEA). Hence, the JNFL internationally bears an important responsibility in its operations.

In the late 1990s, electric demand had been stagnated by the prolonged economic recession following the burst of the economic bubble. Under such economic circumstances, the Government's economic policy was centered on economic structural reform based on deregulation, which would not leave the electric power sector untouched. As discussed later in this report, electric deregulation policy is incompatible with nuclear power policy, which entails massive initial investment as well as capital investment requiring long-term funding, which have only been made possible through stable revenue secured by measures such as tariff regulations based on FDC pricing and regional monopoly that are to be abolished under a deregulated electric power system. Compared to other energy sources, nuclear power requires large initial investment (fixed costs) and low fuel costs (variable costs), and hence, it has a high break-even point (requiring a high operation rate). Once the fixed costs are recovered (after twelve years, or at the end of the depreciation period), it is given a cost advantage which results in high price competitiveness. If fully-depreciated nuclear power plants are restarted, variable costs, which are the equivalent of power generation costs, will be approximately 1 yen/kWh, giving nuclear power a overwhelming cost advantage over its competitors, including of course renewable energy, the prices for which have been deliberately set high under the feed-in-tariff (FIT) system (the purchase price for electricity generated at mega-solar power plants is 38 yen/kWh) and even thermal power, which is priced at approximately 10 yen/kWh. However, in the event that problems at a nuclear power plant leave it inoperative, it will have to be replaced by thermal power, which will incur additional fuel costs (as well as depreciation costs if the fixed costs have yet to be recovered). This will initially impose a great burden on the



management of electric power companies to eventually be recovered by passing increased costs on to customers (and hence raising electricity tariffs), consequently enlarging public burden.

Given popular belief that the economic recession would be protracted, electricity demand had also been projected to decrease. Therefore, the pressing agenda had not been the construction of new nuclear power plants but rather increasing the operation rate of existing reactors and addressing issues related to their aging. These economic circumstances, accompanied by the stoppage of reactors due to operational problems and scandals, hindered the promotion of nuclear power generation which could not exceed a thirty percent share of total power generated, even in the favorable context of emerging climate change issues. Strong demands from industry to reduce costs in domestic infrastructure from the perspective of competition against emerging economies resulted in the advancement of the deregulation of the electric power system. In response, electric power companies accepted the deregulation of electricity sales to large-scale industrial customers and cut down drastically on capital investment in transmission and distribution equipment. Deregulation measures implemented in the context of competitive pressure are estimated to have reduced electricity tariffs by over 5 trillion Japanese yen<sup>7</sup>. The efforts of electric power companies to promote “all-electric” buildings as a corporate strategy for electricity demand expansion only resulted in limited increases in competition for new customers in areas beyond their respective service areas.

Not subject to competition policy, the back-end of the nuclear fuel cycle was to be managed through a cost allocation system newly developed under nuclear fuel cycle policy and integrally supported by the nine electric power companies. After the enactment of the Designated Radioactive Waste Final Disposal Act in 2000, the Nuclear Waste Management Organization of Japan (NUMO) was established as the implementing entity for the disposal of radioactive waste to which electric power companies (nuclear operators) would make annual payments. Furthermore, the Japan Atomic Energy Commission (AEC) confirmed the legal interpretation that the nine electric companies which were joint

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<sup>7</sup> Agency for Natural Resources and Energy, Denryoku system kaikaku to sono kouka (Overview and effects of electric power systems), May 2013, available at: [www.enecho.meti.go.jp/info/committee/sougoubukai/3rd/3rd-3.pdf](http://www.enecho.meti.go.jp/info/committee/sougoubukai/3rd/3rd-3.pdf)

shareholders (400 billion Japanese yen in capital) and joint guarantors (1 trillion Japanese yen) of JNFL collectively supported Japan's nuclear fuel cycle policy and were thus substantially obliged to reprocess all spent fuel<sup>8</sup>. The 2005 Spent Nuclear Fuel Reprocessing Fund Act provided for electric companies to reserve monies to be used for spent fuel reprocessing operations in a fund managed by a third-party fund administration corporation (Radioactive Waste Management Funding and Research Center (RWMC)). With the private sector shouldering the nuclear fuel cycle, a national policy, it became more of an established fact that nuclear operations were "privately run under national policy."

As the business environment for nuclear power operations developed, the Niigata-Chuetsu Earthquake stopped operations at Tokyo Electric Power Company (TEPCO)'s Kashiwazaki-Kariwa Nuclear Power Plant, and TEPCO consequently posted a net loss of 150.1 billion Japanese yen on a consolidated basis in March 2008. Increased thermal fuel costs and repair costs led to a net loss of 84.5 billion in 2009, therefore revealing business risks related to operation rate drops at nuclear power plants.

Furthermore, the construction of JNFL's reprocessing plant is significantly delayed due to technical problems in the vitrification process and may eventually induce the reconsideration of the nuclear fuel cycle policy and increased fiscal burden on the part of electric power companies should their spent fuel pools become full. If JNFL is unable to accommodate spent fuel then it will risk cash-flow complications because neglecting its promised services to electric power companies, it would not be entitled to the monies reserved under the Designated Radioactive Waste Final Disposal Act. Debt guarantors, as aforementioned, the nine electric companies might also be driven into financing difficulties.

Even if the reprocessing plant began operations and continued to steadily operate, it is yet unclear whether the plant has the capacity to accommodate the entire amount of spent fuel generated.<sup>9</sup> There have been

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<sup>8</sup> Atomic Energy Commission, Eleventh meeting for the formulation of new plan, November 2004, Information document No.3, available at: [www.aec.go.jp/jicst/NC/tyoki/sakutei2004/sakutei11/siryos3.pdf#/page=17](http://www.aec.go.jp/jicst/NC/tyoki/sakutei2004/sakutei11/siryos3.pdf#/page=17)

<sup>9</sup> Refer to estimates by Hajimu Yamana, Research Reactor Institute, Kyoto University: Hajimu Yamana, Kakunenryo cycle to genshiryoku seisaku (jo) – genjitukai ha saishori no iji ni yoru kakubusshitsu no zouka youksei (The nuclear fuel cycle and nuclear policy (part1): the realistic answer lies in sustaining reprocessing operations to control increase of radioactive material), web article available at: [www.gepr.org/ja/contents/20121105-02](http://www.gepr.org/ja/contents/20121105-02)

proposals in the past to build a second reprocessing plant which under the current circumstances appear to be extremely infeasible. Against this backdrop, the current agenda is to rebuild a robust nuclear cycle policy under which the amount of plutonium currently possessed is consistent with the time horizon of reprocessing and plutonium use, on the premises that Japan will not possess plutonium in excess to amounts required for power generation (excess plutonium stock) from the perspective of nuclear non-proliferation: i) the feasibility of reprocessing all spent fuel, including the 17,000 tons which have already been accumulated in the spent fuel pools at each nuclear power plant and the spent fuel which will be generated at nuclear power plants that are likely to reinstate operations in the future; ii) the management of the elemental plutonium that is generated in overseas and domestic reprocessing; and iii) estimates of the amount of plutonium that will be consumed in the process of using MOX fuel and the amount of spent MOX fuel that will be generated as a result. This will require a review of the nuclear fuel cycle in terms of its economic feasibility under current circumstances. Based on the conclusions of the review, the cost allocation scheme between the private and public sectors should be re-determined.

## **(2) Current status of nuclear power**

This section will discuss the significant changes that have occurred since the TEPCO Fukushima Daiichi Nuclear Power Plant accident (“Fukushima accident”) in 2011.

### **(i) Political change**

The accident immediately triggered public disapproval against nuclear power plants, suddenly increasing experts and politicians supportive of centering energy policy on nuclear phase-out and promoting renewable energy as an alternative energy source. In the meantime, the Prime Minister Naoto Kan requested that the Chubu Electric Power Company’s Hamaoka Nuclear Power Plant be shut down in the absence of legal grounds and that stress tests be conducted at other nuclear plants as well, thereby undermining “the principle of rule of law” and creating confusion in nuclear policy and nuclear power regulation. In September 2012, the “Innovative Strategy for Energy and the Environment” was

formulated. However, it failed to define a realistic thermal alternative to nuclear power and instead set out an unfeasibly high introduction rate for renewable energy, in pursuit of the policy objective of a zero-nuclear power in the 2030s, not having been able to abandon former Prime Minister Yukio Hatoyama's target of reducing greenhouse gases by 25 percent in 2020. Therefore, the Cabinet adopted a decision to "implement the environment and energy policies while flexibly undertaking continual assessment and review" and took the irregular approach of postponing the decision on the Strategy itself. Furthermore, attempts to make adjustments in the direction of abandoning the nuclear fuel cycle policy caused the U.S. and Aomori Prefecture to express strong concern and objection. Although the nuclear fuel cycle policy was maintained in the end, the confusion has generated profound distrust among relevant parties.

When the Lower House election in December 2012 brought the ruling coalition of the Liberal Democratic Party (LDP) and the New Komeito back into power, it was decided that energy policy would be reconsidered with a clean slate. Despite high expectations that energy policy and electric power policy would both resume their conventional pro-nuclear policy stance, policy has not taken that large a turn back to its original form for various reasons including structural changes in the diluting political support for nuclear policy:

- 1) Anti-nuclear values have sustained over a long period of time and are becoming entrenched in public opinion. The continuing unrest regarding contaminated water issues even after two and a half years since the accident has left public opinion unchanged;
- 2) High expectations for nuclear technology and appreciation of it as state-of-the-art technology which had prevailed at the time of nuclear introduction and had been gradually fading were completely diminished in the Fukushima Daiichi accident. The confusion in communications and lack of information in the aftermath of the accident have aroused public distrust towards the national government as well as nuclear operators;
- 3) Given receding memories of the oil crises, the public has become insensitive to the need to quantitatively secure energy. The prolonged economic recession has masked the importance of nuclear power generation as a "cheap and abundant" energy source.

- 4) Although the victory of the LDP-New Komeito coalition in the recent elections had been induced by such changes in public opinion, partisans might not have been in support of their nuclear policy.
- 5) Few newly-elected Diet members and even mid-career LDP politicians today have had any experience working with nuclear policy, compared to the predawn of nuclear energy. In administrative bodies as well, an older generation of bureaucrats who remember a time when strong recognition of the need for nuclear policy was dominant are retiring and will eventually be replaced by a younger generation whose first encounter with nuclear policy was the TEPCO Fukushima accident.
- 6) Although the LDP's coalition partner, the New Komeito, has exhibited a certain degree of understanding towards the restarting of nuclear plants, it is opposed to their new construction and replacement and lays more importance on renewable energy promotion policy.
- 7) As a result of a combination of the abovementioned reasons, nuclear power has not been formally acknowledged to be "particularly" necessary in terms of national interest and power (as well as local development) since the TEPCO Fukushima accident.

These changes have not yet been recognized by the community<sup>10</sup> of electric power company executives and nuclear engineers who still believe that the nuclear policy paradigm is unchanged from the 1980s and 90s and constitutes the basic notion shared among politicians and administrators. As a result, they cannot understand why nuclear policy has not made great advancements despite the substantial victory won by the LDP-New Komeito coalition in both Upper and Lower House elections. Therefore, disturbing discrepancies between the ideas held by administrative and decision-making parties and private operators regarding the restructuring of nuclear policy are likely to appear.

#### **(ii) Advancements in electric power reforms**

A second significant change that has occurred since the TEPCO Fukushima accident is the advancement of electric power system reforms. The TEPCO Fukushima accident and the tsunami-induced damages to thermal power plants resulted in scheduled blackouts and revealed a lack

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<sup>10</sup> The term "nuclear village," which is often used will not be used in this report because it is not explicitly defined..

of capacity for mutual provision of electricity between electric power companies, thereby exposing the flaws of the conventional power system. Therefore, the ongoing electric power system reforms aim to shift from a system where electric companies (general electric utilities) bear legal obligations to supply power while being granted regional monopoly and FDC pricing under the Electric Business Act to a system where supply and demand are balanced in the market by deregulating electricity prices. Such discussions on electricity system reforms have been continued in the LDP-New Komeito administration and have evolved into deliberation on amending the Electric Business Act. Two important elements in relation with nuclear policy are as undermentioned:

**1) Legal unbundling (the separation of the transmission/distribution sector and generation sector)**

The electric power sector is a typical infrastructure-oriented industry with large electricity transmission and distribution assets. For example, at the end of fiscal 2011, TEPCO's fixed assets for electricity business were 7.4 trillion Japanese yen, 5 trillion Japanese yen of which transmission and distribution assets accounted for. In contrast, nuclear power accounts for only 0.7 trillion Japanese yen. Hence, the operating cash flow is "internally" generated by enormous depreciation costs of transmission and distribution assets (Operating cash flow  $\doteq$  Revenue + Depreciation costs), but with transmission and distribution assets no longer expanding and infrastructure renewal to be conducted relatively automatically, investment cash flow and operating cash flow are well-balanced.

On the other hand, when an electric power company possesses a nuclear power plant, its construction is accompanied by a rapid increase of investment cash outflow which cannot be equalized with inflow, relying solely on the facility's depreciation which takes as long as twelve years. Nuclear power plants could be constructed and investment in safety measures could be continued because the generation and transmission/distribution sectors could mutually accommodate cash under the conventional system of integrally managing power generation and transmission. If legal unbundling procedures advance into segment accounting and separation of ownership without a fundamental review of nuclear power policy, the financing available for nuclear power plants will

unmistakably reach its limits. Therefore, coordination is required between power system reforms and nuclear power policy.

## **2) Abolishment of price regulations based on a fully-distributed cost (FDC) pricing method, general mortgage bonds and regional monopoly**

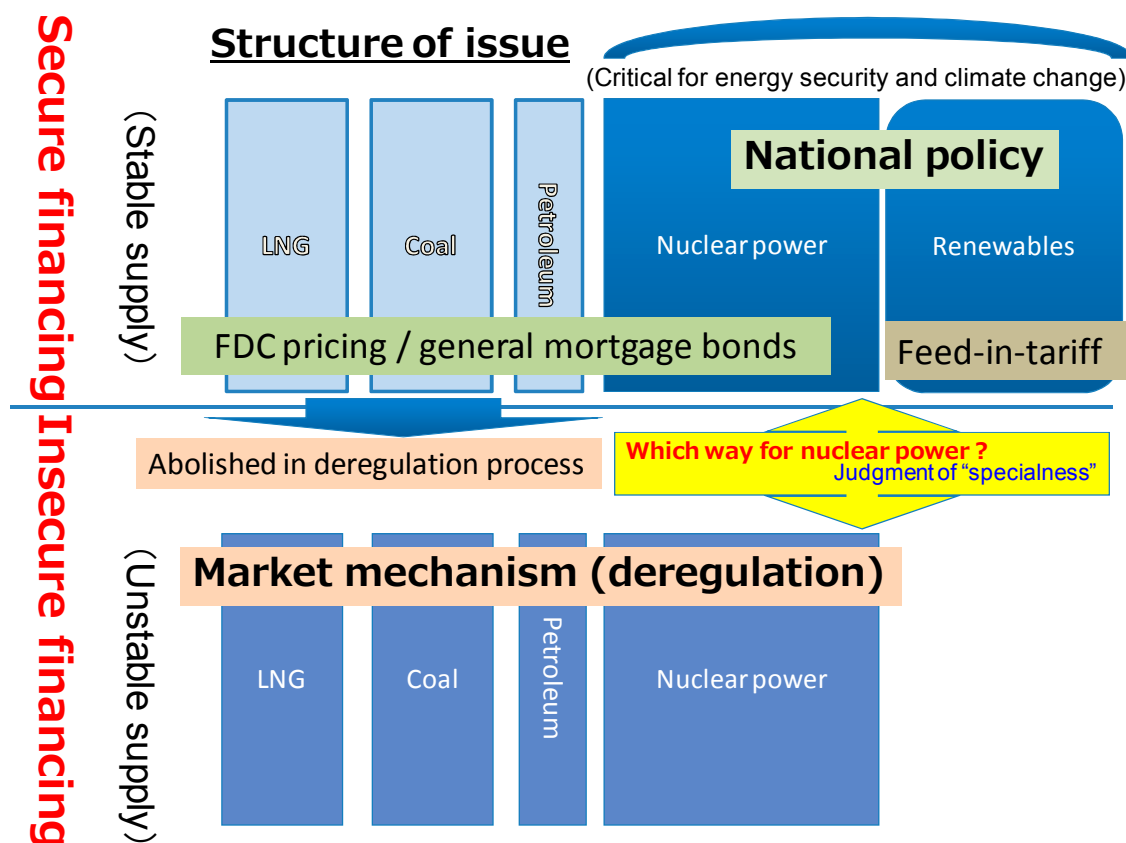
As aforementioned, in order to take advantage of the investments made in nuclear power, electric power companies must take the risk of rising interest-bearing debt ratios. However, precedents from overseas have revealed that once deregulation progresses, the short-term recovery of funds (investments with high discount rates) is preferred by financial and capital markets. Hence, investment has been concentrated in natural gas, and if Japan can import inexpensive shale gas, gas-fired thermal power plants will become the most attractive investment destination in Japan as well.

The risks related with financing nuclear power had been minimized by a system that involved price regulations based on a FDC pricing method, the issuance of electric company bonds with general mortgage and regional monopoly which increased the guaranteed amount of sales. However, as developments are made in electric power system reforms, policy-based guarantees will no longer be available for electric power companies, thereby making it difficult for them to procure investment funds to construct new nuclear power plants or to replace aged plants on the preferable terms that they are used to. Some studies state that projects for constructing new nuclear power plants have been stalled after the electricity market was fully deregulated in the U.S. and Europe. Japan will also inevitably be faced with uncertainty regarding its capacity to sustain nuclear power operations in the future.

While nuclear power has been driven into such difficult circumstances, renewable energy has enjoyed intensive policy protection to support the promotion of its diffusion and expansion. Under a feed-in-tariff (FIT) program, the price of electricity bought by general electricity utilities from renewable energy operators is determined based on estimates provided by the Procurement Price Calculation Committee instead of in the market, ultimately amounting to FDC pricing. Hence, it is reasonable to state that despite its high generation costs and marginal supply capacity, renewable energy has been granted such intensive

guarantee of business financing because of its newly acknowledged status as an energy source promoted under national policy that can contribute to greenhouse gas reduction and replace nuclear energy as well.

The abovementioned structural changes which are occurring as a result of electric power system reforms are illustrated in Figure 1.



Source: compiled by author

Figure 1 Structure of issue

**(iii) Regulatory activities and technological innovation**

Investments for safety should indeed be prioritized and a system should be designed to guarantee the introduction of safety measures based on the most recent findings. However, after the Fukushima accident, business risks have come to involve the impairing of long-term investments due to the application of retroactive rules and standards that were not effective when a nuclear plant was initially licensed to operate. Such risks of policy change are also important emerging factors for



investment decisions. The regulatory activities of the newly established Nuclear Regulation Authority (NRA) should facilitate the autonomous efforts of nuclear operators to engage in safety measures and inspire further technological innovation. However, the regulatory activities of the new organization are also too intensively infrastructure-oriented and take a conventional approach towards severe accidents. Therefore, by demanding the “strict independence” of each layer of “defense-in-depth,” they have inversely undermined “independent effectiveness<sup>11</sup>.”

The regulatory activities of the U.S. Nuclear Regulatory Commission (NRC) are concentrated on critical risks and take a performance-based approach (ROP; to be discussed later in this report) which considers fundamentally safe plants to have high operation rates. It has therefore been successful in encouraging nuclear operators to engage in safety measures and technological innovation.

Other factors are also required of nuclear regulations. The current regulatory activities lack a sense of “efficiency,” which will be an indispensable factor in the face of the difficult financing environment to be created by electric power system reforms. The Fukushima accident shattered the “myth of nuclear safety” and revealed that nuclear power was no exception of the fact that all technologies and systems intrinsically embody risks. Future challenges regarding regulations on the use of nuclear technologies lie not in how to eliminate risks but how to balance the strength of measures to reduce risk and the degree of cost and risk reductions to be achieved. This is the equivalent of “efficiency,” one of the NRC Principles of Good Regulation, which also include independence, openness, clarity, and reliability. The agency states that the “taxpayer, the rate-paying consumer, and licensees are all entitled to the best possible management and administration of regulatory activities,” that “regulatory activities should be consistent with the degree of risk reduction they achieve,” and that “where several effective alternatives are available, the option which minimizes the use of resources should be adopted.”

Based on this principle, under the U.S. backfit rule, the NRC will require the immediate backfitting of a facility without consideration of the costs incurred if it determines that “such regulatory action is necessary to

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<sup>11</sup> e.g. presentation given by Koji Okamoto, professor at the Graduate School of Frontier Sciences, University of Tokyo, at the Denki Shimbun Editorial Forum on August 19, 2013

ensure that the facility provides adequate protection to the health and safety of the public.” If this is not the case, the NRC will judge the necessity of the backfitting by comparing the costs required for modifications and additional investments with the advantages of increased safety.

Despite the lesson learned that “there is no such thing as zero-risk,” public opinion has inversely continued to call for zero-risk in light of the restarting of nuclear power plants. The NRA has sided with such trends by “standing on the safe side in case of grayness.” Considering the social context after the Fukushima accident, it is highly understandable that such management was necessary.

However, it should not be forgotten that the NRA’s fundamental mission is to fully employ nuclear power plants, which are “assets” of all electricity consumers by taking appropriate measures according to risk in order to control safety risks below acceptable levels. The NRA should review its regulatory activities for assurance that it has not been obsessed with the zero-risk curse.

### **(3) Requirements for sustaining nuclear power**

Based on the abovementioned understanding of the status quo, this section will provide a summary of the requirements for sustaining and further developing nuclear operations.

#### **(i) First requirement: political confirmation of the “special importance” of nuclear power**

This report will not discuss the necessity of nuclear power in energy policy or any other policy area in a wider context as it aims to seek what kind of scheme should be formulated to set up the environment to facilitate safe nuclear operations on the premises that they are necessary. However, as discussed in Chapter 1, Section (2) (Current status of nuclear power), public opinion and politics have become undecided about the necessity of nuclear power itself. The necessity and therefore its “special importance” must be discussed in a different forum, the conclusion of which must be documented at a higher political level. The national government should reconfirm its commitment to nuclear policy by means of the Basic Energy Plan and other Cabinet decisions from an administrative perspective, and in the form of party decisions adopted by the ruling party in political terms

in order to lay the groundwork for future system reforms and the establishment of relevant budgets. Both decisions must be approved by the Diet.

Various reasons can be provided to explain why nuclear power is needed. In addition to conventional arguments that it is essential for establishing energy security, securing an inexpensive and stable electric power supply (for both household and industrial use), and contributing to the prevention of climate change, it importantly contributes to developing countries by providing a breakthrough for their energy issues and to the world by setting a model for the peaceful use of nuclear material by a non-nuclear weapon state in the context of nuclear non-proliferation. The nuclear environment has drastically changed both domestically and overseas since the 1950s. The role of nuclear power should be discussed in the wider context of Japan today and in the future.

Policy-makers bear the responsibility to explain not only the necessity of nuclear power as an electric power source but also how the public will benefit from the advantages of sustaining nuclear technology and relevant human resources. As later discussed, if nuclear policy is to be steered in the direction of stronger national government intervention in the process of reviewing and reconstructing nuclear power operations, responsible government assurance that the benefits of using nuclear power will be enjoyed not only by nuclear operators but also by the general public will serve as the rationale behind the policy.

**(ii) Second requirement: establishment of a secure financing environment**

As discussed in the subsection regarding electric power reforms, an important key in financing nuclear power is the risk level that can be accommodated by financial institutions and the capital market in providing the large-scale, long-term funds required for nuclear power generation in light of the abolishment of FDC-based price regulations and other measures that had conventionally provided a secure financing environment as well as higher uncertainties in future operation rates due to tightened regulations. When legal unbundling advances and electric power companies are reorganized into holding companies and group subsidiaries, another critical judgment factor for financial institutions in

financing nuclear power would be how the assets of nuclear power plants will be divided, how cash flow is managed within the corporate group and if financing can be provided to the group instead of to individual companies.

Details of the system reforms that will largely affect the financing environment for electric power companies are yet to be discussed within the government. Potential impacts on financing have not been adequately addressed in past discussions but must be considered in the broad context of system reforms and a framework for nuclear operations, regardless of whether or not electric power system reform issues have been intentionally discussed separately from financing issues.

**(iii) Third requirement; regulatory activities to facilitate technological innovation**

The NRA being a newly established agency, it may be too early to discuss its regulatory activities, but there is a need to fundamentally review the Act on the Regulation of Nuclear Source Material, Nuclear Fuel Material and Reactors (“Nuclear Reactor Regulation Law”) in terms of regulatory standards, methods and activities in order to advance human resources development and technological succession while encouraging self-governed competition for improving safety beyond legal obligation among companies in the middle- to long-term as well as incorporating new technological innovations. If the Nuclear Reactor Regulation Law and the NRA are to specialize in regulating nuclear safety, then the current Nuclear Reactor Regulation Law, which covers a mixture of operational regulations and safety regulations should be fundamentally restructured from the viewpoint of nuclear material management and securing flexibility in nuclear operations<sup>12</sup>.

Measures to limit the life of nuclear reactors to forty years should also be verified whether they are based on sound scientific grounds and if they really encourage higher safety levels as well as technological development and innovation. Furthermore, standards and procedures for extensions beyond forty years will not only significantly affect the cash flow of an electric power company but also business decisions regarding the

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<sup>12</sup> relevant proposals can be found in Tomoyuki Tanabe, *Genshiryoku houkisei no taikai* (Framework of nuclear-related laws and regulations), ed. Keiji Kanda, Yoshihiro Nakagomi, *Genshiryoku seisakugaku (Nuclear policy studies)*, 2009

decommissioning and replacement of nuclear power plants. The new Nuclear Reactor Regulation Law, a lawmaker-initiated legislation, has not been exposed to sufficient deliberation among experts and therefore fails to address such critical legal elements.

The Nuclear Regulation Authority (NRA) was established as a strongly independent government committee, or an Article 3 committee, under the name of “separation of nuclear regulation and promotion,” while the Atomic Energy Commission of Japan (AEC) which has been responsible for nuclear promotion is headed toward major functional downsizing. The check-and-balance system of nuclear administration can only take root when regulations and promotion measures are balanced, but recent trends are likely to lead to regulation-oriented nuclear policy. Limiting the functions of the AEC, which has supported the peaceful use of nuclear energy in Japan as “the guardian of peaceful nuclear use,” together with the exposure of the domestic “excess plutonium stock” issue, is bound to communicate an extremely negative message to the world. If this adversely affects the extension of the Japan-US Nuclear Cooperation Agreement in 2018, the implementation of nuclear policy and operations (reprocessing operations, in particular), which has been founded on the framework of the Agreement, will become increasingly difficult. Therefore, discussions regarding the structure and functions of an administrative body to oversee nuclear administration need to be reinitiated from blueprint.

For these abovementioned reasons, a review of the regulatory activities of the NRA and the Nuclear Reactor Regulation Law in which they are stipulated are urgently called for as a prerequisite for the sustenance of nuclear power.

## **2. Policy proposal for laying the groundwork for nuclear power**

Based on a shared understanding of the current situation of nuclear power, this section will propose a comprehensive policy package to sustain nuclear operations in the future. It is important that the national government's commitment to nuclear power is reconfirmed both politically and administratively, by bundling the Basic Energy Plan and its implementation plan and relevant provisions in new and existing laws into the form of a bill on the Management of the Operational Context of Nuclear Power. Furthermore, the policy must be implemented based on a long-term plan designed by a responsible government body widely known to the public as nuclear power requires very large fixed asset investment. The AEC would assume the role of such the government body under the current framework, but if it is to be abolished, a new administrative body to replace it must be established.

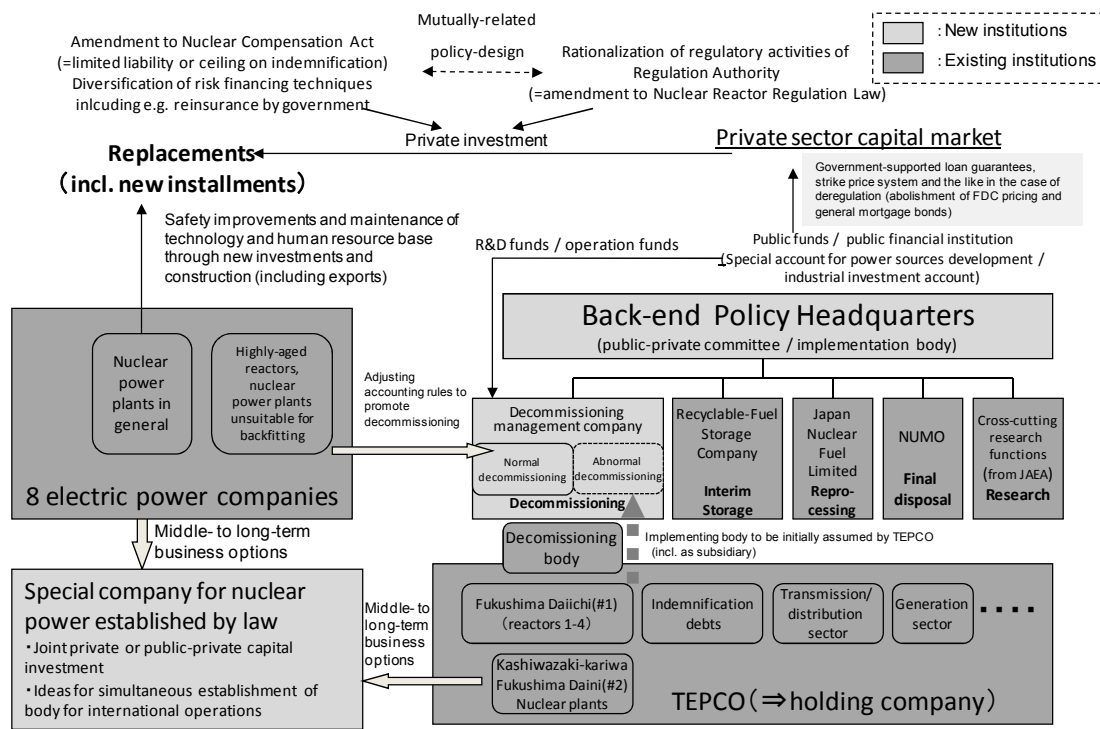
Now that the myth of zero-risk nuclear safety has been shattered, public relations have become an important essence of reestablishing public confidence in nuclear power. The issue of who should bear the role of communicating what kind of information to which audience must be carefully addressed as continuing conventional methods led by private-public initiative will only emphasize lack of remorse or insensitivity to the Fukushima accident. Renewed political and administrative commitment to nuclear energy should be premised upon the fostering of deep public understanding of the advantages and disadvantages as well as the significance of continuing the peaceful use of nuclear power. The contents and perspectives of the information communicated, communication methods and new media should also be considered.

One of the most critical challenges for the immediate future is resolving the discrepancies between the understanding shared among residents of local governments which have hosted the siting of nuclear facilities who take pride in the important role they have played in supporting national energy policy and the perceptions regarding nuclear power issues held by the public in major power consumption areas, the destination of electric power supply services originating in the abovementioned local governments. This would also be premised upon a clarification of the position of nuclear power in the electric power reforms. A government body specializing in providing information and facilitating

mutual communication should be established. The U.S. Nuclear Energy Institute (NEI) could be thoroughly studied as a promising model.

**(1) Basic structure**

The proposed policy package is illustrated in Figure 2 (TEPCO’s position requires separate consideration and will not be elaborated herein. Structural aspects have been written out in the figure.)



Source: compiled by author

**Figure 2 Framework for comprehensive resolution for nuclear issues (Act on the Management of the Operational Context of Nuclear Power)**

**(i) Clarifying the role of nuclear power in the electric power system reforms**

As aforementioned in Chapter 1, Section (2) (ii), the ultimate goal of electric power system reforms is market deregulation which will involve the abolishment of tariff regulations based on FDC pricing, electric company bonds with general mortgage and regional monopoly<sup>13</sup>. It must be clarified

<sup>13</sup> The following papers were referred to regarding “missing money” resulting from the deregulation of the electric power system: Ryuzo Yamamoto, Naoki Toda, Denryoku shijo ga

whether nuclear power will be entitled to policy support as “utility power plants” under national policy as in the case of renewable energy is or if it will be determined, like thermal power, merchant power plants exposed to market competition which will be subject only to limited and complementary market-friendly support measures, if any, to minimize market-distorting effects. This is important for electric power companies in making decisions on how they will address nuclear power in their business structure and how they will invest in nuclear operations through which means of financing. Procedural transparency is also required of the new framework in terms of who will decide whether a nuclear facility is a utility or a merchant power plant – will the national government decide (by law), will nuclear operators be granted the choice, or will the government and nuclear operators be left to negotiate agreements for each reactor or site in accordance with political factors, historical context and current circumstances?

#### **(ii) Private sector-led replacement of aged reactors**

The authors consider it essential to maintain a certain ratio of nuclear power generation in order to achieve the goals of energy policy, namely, energy security, maintaining inexpensive energy prices and addressing climate change issues. In order to achieve these policy goals, the “replacement” (including new installments in the middle- to long-term) of aged nuclear reactors through private initiative must be promoted based on the premise that safety has been secured. Therefore, a scheme to cover various financing-related risks is required. It is important that revisions of the Nuclear Compensation Act, the advancement of electric power reforms (see subsection (iii)), and the formulation of a government back-up scheme for nuclear operation-related risks are discussed in this context. Relevant risks include risk of accident, risk of ex-post policy or regulatory changes and risks related to the stoppage of back-end operations.<sup>14</sup>

Furthermore, given the positive acceleration of nuclear power

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denryoku busoku wo maneku, missing money mondai (koteihi kaishu busoku mondai) ni dou torikumuka (The electricity market to create power shortage: addressing the missing money (unrecovered fixed costs) issue), International Environmental Economic Institute discussion paper, 2013

<sup>14</sup> Details can be found in: *Toward the Establishment of a New Compensation System for Nuclear Damages: a report by the 21st Century Public Policy Institute Nuclear Policy Issues Committee*, 21st Century Public Policy Institute, 2013



development in emerging economies <sup>15</sup> , Japan can make major contributions to securing nuclear safety in Japan and the world by retaining and improving the nuclear power plant technologies possessed by Japanese manufacturers and operational know-how of electric power companies. To assure the retention and succession of nuclear technologies and human resources required for such contributions, the international expansion of nuclear operators should be proactively encouraged, while domestically promoting the replacement of aged reactors. Although fewer competent university students are interested in pursuing nuclear studies today, the expansion of international projects could bring an end to such trends. Knowhow and knowledge obtained through actual involvement in the construction work at nuclear power plant sites are also indispensable for the improvement of safety at domestic nuclear power plants. An implementing body not confined to the business framework of existing entities should be fostered to address international projects in a comprehensive and focused manner.

Overseas companies could also become involved in Japan's nuclear operations. Under a limited liability scheme such as the one proposed herein, in Chapter 2, Section (2) (iii) 1), limited risk may attract investment in domestic nuclear power operations from overseas operators, as seen in the examples of investments by EDF and a Russian electric power company in the U.K., once market deregulation advances. Japan must decide whether it will enthusiastically accept foreign investment or if legal measures will be implemented to restrict it.

### **(iii) National government-led approaches to back-end issues**

Japan must redeem both domestic and overseas confidence in its nuclear fuel cycle policy which was lost under the Democratic Party of Japan (DPJ) administration. Apart from the economic efficiency of nuclear power (fast-breeder reactor), it must take into consideration the significance of reducing radioactive waste volume and related costs as well as transmuting long-lived nuclides, and also Japan's role as a successful model for peaceful use and management of plutonium under the complete supervision of the IAEA as plutonium management will become a serious

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<sup>15</sup> According to the Japan Atomic Industrial Forum, Inc. (JAIC), 76 nuclear power reactors are under construction and 97 reactors are at the planning stage worldwide as of January 1, 2013. ([www.jaif.or.jp/ja/joho/press-kit\\_world\\_npp.pdf](http://www.jaif.or.jp/ja/joho/press-kit_world_npp.pdf))

issue as nuclear development evolves in emerging economies. In order to fulfill its policy of not possessing “excess plutonium stock,” the agenda for nuclear back-end policy deliberations must encompass MOX fuel use for the immediate future, the operation of Monju, whose utilization is also being considered for studies on technologies to burn long-lived nuclides, and the compilation and management of the data collected from operating Monju. Research functions regarding the safety of the nuclear fuel cycle should be allocated to the appropriate institution in these deliberations. We suggest that the government (a “Back-end Policy Headquarters,” to be discussed hereinbelow) formulate a policy roadmap for fast-breeder reactor development including the next step beyond Monju based on all of the abovementioned factors.

In order to facilitate the replacement of aged reactors, a policy framework should be designed to enable nuclear operators to make early decisions on the decommissioning of reactors whose continued operations are no longer economically efficient. Increased government involvement is required in decision-making and financing nuclear back-end operations as a whole. The government should bear increased supervising responsibilities for the back-end process from decommissioning to the geological disposal of high-level radioactive waste, while the private sector, drawing on its technological and operational know-how, assumes implementation responsibilities.

Thus, it is important to efficiently promote integrated efforts to implement nuclear back-end policy and operations as different bodies have conventionally been responsible for implementation and decision-making. With the NRA’s functions weakened, a new body must be established within the government to assume its original role of comprehensively reviewing nuclear back-end policy; otherwise, the attribution of responsibility for the planning and implementation of national nuclear back-end policy will remain ambiguous. If policy is spontaneously determined, then public confidence in the government’s back-end policy will become increasingly undermined.

These issues can be overcome by establishing a “Back-end Policy Headquarters” (Chief of Headquarters: the Prime Minister; Deputy Chief of Headquarters: Minister of Economy Trade and Infrastructure and the Minister of Education, Culture, Sports, Science and Technology) directly

under the Cabinet (Cabinet Office or Cabinet Secretariat) as an administrative body that will oversee the planning and drafting of nuclear back-end policy and assume the final responsibility of implementation. Another organization should be jointly established under public-private cooperation with the mission of coordinating the scale and progress of operations at each stage of the nuclear back-end process from decommissioning (including abnormal decommissioning) to final disposal.

#### **(iv) Rational Regulations by the Nuclear Regulation Authority**

The NRA would be unnecessary if Japan were to abandon nuclear power. Nuclear power could be phased out both legally and politically by other means. The NRA has been retained out of expectations that it will deliberate and implement the safety regulation standards and activities required to safely operate nuclear power generation facilities, which are economic assets made possible by large investments burdened by the general public and electricity consumers, and to provide the national economy with an inexpensive and stable energy supply.

The NRA, as exhibited in the debate regarding active fault issues, neglect engaging electric power companies, the licensees, in deliberations and almost seem to steer discussions only for the purpose of finding reasons not to restart nuclear operations. This attitude is implied in the NRA report which acknowledged the fracture zone at the JAPC Tsuruga Nuclear Power Plant to be an active fault.<sup>16</sup> However, given a legal framework which, under the Nuclear Reactor Regulation Law and the Act for Establishment of the Nuclear Regulation Authority, seem only to demand “implementing measures necessary for ensuring safety in the use of nuclear energy,” there is little meaning in criticizing the attitude of the Authority, more less individual members.

The following three elements are required for the sound improvement of regulation related to the use of nuclear technology:

- 1) The general public as well as regulators and the regulated should share the acknowledgement that the safety standards established by the NRA are only requirements for approval of nuclear power

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<sup>16</sup> Refer to Akihiro Sawa (2013) Denryoku gaisha, Kokumin no futan wo saishogen ni suru hairyomo – gensiryoku iinkai no arikata e no teigen (Minimizing the burden on electric power companies and the general public: a proposal on the role of the Nuclear Regulation Authority), *Energy Forum*, August 2013

operations and that they are not evidence of the safety of a nuclear power plants. A scheme embedding incentives to promote safety improvements through competition among operators should be designed.

- 2) The regulatory activities of the NRA should no longer be focused on designing hardware structure and checking for document flaws but should instead be shifted to assessing integrated risks, including organizational governance and human factors, and securing the human resources required for such activities in terms of both quality and quantity.
- 3) In order for thorough engineering technology-oriented deliberation regarding safety standards and regulatory methods to take place between the NRA and operators, efforts should be made on both sides: the NRA should enhance its staff functions by establishing a Special Committee on Technology, and operators should establish an organization for the compilation of expertise and know-how from operators and manufacturers and serve as a liaison for opinion exchange with the NRA.

Furthermore, the NRA has other critical tasks, which are equally as important as conformity assessments for backfit requirements and fracture zone surveys. These include the collection and announcement of scientific information on low-dose exposure and support for formulating regional disaster prevention plans.

In order to reinstate public trust in nuclear power, the reconstruction of Fukushima and the development of safety measures based on the premise that zero-risk is unachievable are essential. New safety standards focused on severe accident management have been formulated. This is evidence of deviance from the myth of zero-risk nuclear safety which is a step forward.

However, it is unfortunate that fear of radiation exposure has taken root in the wide public, as a result of increasing distrust towards the government for the constant changes made to its decontamination standards and food safety standards as well as the spread of scientifically invalid information after the Fukushima accident. Several different agencies had supervised radiation management, regarding which the NRA

currently has comprehensive authority. NRA Chairman Shunichi Tanaka is an expert of this field. Two years ago government deliberations on low dose exposure were compiled into a report presenting highly objective scientific information but failed to improve public understanding of the issue<sup>17</sup>. With even the most reliable mass media sources persistently providing information based on unscientific grounds, it would be more reassuring for the public if the NRA, which takes a skeptical stance towards nuclear power, were to address low dose exposure issues. This could be the way forward in reinstating public confidence in nuclear power.

Another major role that the current NRA must assume is supporting inexperienced local governments by providing them with expertise regarding the formulation of a disaster prevention plan in preparation of a nuclear accident. With a view to restarting nuclear power plants, the NRA should proactively make an effort to explain to local governments the judgment made in conformity assessments and to address the challenges discussed herein.

#### **(v) Special legislation for the reconstruction of Fukushima**

A critical challenge – almost a prerequisite – in pursuing the comprehensive nuclear measures abovementioned is the restoration of local communities that were destroyed in the Fukushima accident and rehabilitation of livelihoods lost.

Concrete measures should be discussed based on careful judgment of which measures are the most realistic and effective in view of the situation faced by the affected local community and the future of the victims' livelihoods. Creative ideas should be put on the table based on an understanding of the local reality and consideration of the following factors:

- 1) Decontamination standards
- 2) Forms of compensation and reimbursement negotiations
- 3) Infrastructure reconstruction plans by evacuation instruction area
- 4) Measures to create employment opportunities
- 5) Structure of the rehabilitation body

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<sup>17</sup> Cabinet Office (2011) *Report : Working Group on Risk Management of Low-dose Radiation Exposure*, available at: [www.cas.go.jp/jp/genpatsujiko/info/twg/111222a.pdf](http://www.cas.go.jp/jp/genpatsujiko/info/twg/111222a.pdf) (English version available at: [www.cas.go.jp/jp/genpatsujiko/info/twg/Working\\_Group\\_Report.pdf](http://www.cas.go.jp/jp/genpatsujiko/info/twg/Working_Group_Report.pdf))

The rehabilitation of Fukushima involves a close mixture of the abovementioned factors and therefore requires the mapping out of integrated measures taking a comprehensive approach towards them. Administrative bodies need to realize that comprehensive measures embracing the organic relationship between the factors are required instead of segmental optimization of individual factors. Based on that understanding, special legislation on establishing a comprehensive policy framework should be adopted to prevent individual issues such as decontamination from being addressed separately. For example, as property damage compensation progresses, a scheme which enables the comprehensive use of real estate for local rehabilitation purposes may be necessary so that when the ownership of property is transferred from the victim to the party liable, and from the party liable to the national government (possibly without compensation, that is, in the form of donation), the land may be used to create new communities.

A Fukushima Rehabilitation Public Corporation should be established for the long-term and comprehensive implementation of rehabilitation projects. The Corporation should secure human resources from both private and public sectors to work under long-term employment conditions and assume decontamination activities, local development projects including urban planning, project management functions for infrastructure improvement and other projects. The Corporation may also be granted the authority to formulate an overall funding allocation plan so that monies collected from the national government, local government and TEPCO are not randomly used.

## **(2) Policy proposals for individual issues**

### **(i) Replacement and financing risk issues**

Once political and administrative support is gained towards the replacement of aged reactors (including new installments in the long term), the next challenge will be covering risks accompanying financing for new investments. From the perspective that light-water reactors are commercially viable, a majority of the monies required should be procured from the capital market or from private financial institutions. This subsection will discuss the policy measures required for stable financing

under a deregulated electric power system.

Some or all replacements and new installments could be given policy importance by prescribing them in an Important Nuclear Power Source Development Plan stipulated in the proposed Act on the Management of the Operational Context of Nuclear Power. This would serve as legal grounds for implementing the undermentioned measures to recover funds for those plants approved by the government. For example, replaced reactors and those bearing high political significance could be distinguished from existing reactors by designating them “public benefit power sources” (utility power plants), while the latter would be merchant or competitive power sources. The public or competitive character of a reactor would be determined based on its political significance in terms of energy security policy, securing a stable local supply of electricity, climate change measures, and plutonium management or the involvement of business expectations towards it as a source of revenue.

1) Retaining nuclear power as “public benefit power source” under national policy

Considering the large-scale and long-term financing required to cover initial costs, in order to ensure the recovery of fixed assets, the following schemes are suggested: a) a debt guarantee scheme backed by the national government (or other public institutions with equivalent credibility); b) a strike price system, also referred to as a “nuclear feed-in-tariff system” (recently adopted in the U.K.); and c) contracts between transmission/distribution companies or the wholesale electric power exchange and an electric power company that seeks to operate a utility power plant under which the former assumes operation rate risks by paying the latter a standard tariff for the constant supply of a fixed amount of electricity (JNFL model).

2) Newly designating nuclear power to be merchant power

A framework will be needed to allow companies to capitalize lost earnings that have become unrecoverable as a result of regulatory changes, including those regarding safety regulations, and to recover the stranded costs from wheeling charges. Under a deregulated electric power system, a policy support measure such as a debt guarantee scheme, as described

above in the previous subsection, may be necessary even for commercial power plants.

### 3) Restructuring nuclear operations

Furthermore, as the debate on unbundling power generation and distribution develops and details of the new system are designed, decisions will be made whether a holding company can assume financial management and financing for the group as a whole under a legal unbundling model. (According to the report<sup>18</sup> compiled by the Expert Committee on Electric Power System Reforms under the Ministry of Economy, Trade and Industry (METI), this will be possible.) In the event that financing must be addressed by individual subsidiaries, nuclear power operations will be integrated into electric power companies with technology, human resources and financial resources or conducted under a joint business established by nuclear operators. (see “options” on the lower left in Figure 2)

In the event that the restructuring of nuclear power operations is inevitable, the following factors must be comprehensively considered in order to find the optimal design.

- a) Reactor model, current status of location;
- b) Technological level, relationship with subcontractors and manufacturers
- c) Leveling of cash flow by combining investments with different payback periods;
- d) Status of fuel and spent fuel; and
- e) Vision for international business expansion.

If nuclear power operations are forced to undergo business restructuring, the government will be required to consider providing the following support measures:

- a) Provision of funds entailed for restructuring (capital investments, debt guarantees, etc.);
- b) Tax incentives (registration and license tax exemptions,

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<sup>18</sup> Ministry of Economy, Trade and Industry, *Report of the Expert Committee on Electric Power System Reforms*, available at: [www.meti.go.jp/committee/sougouenergy/sougou/denryoku\\_system\\_kaikaku/pdf/report\\_002\\_01.pdf](http://www.meti.go.jp/committee/sougouenergy/sougou/denryoku_system_kaikaku/pdf/report_002_01.pdf)



- aggregation of profit and loss);
- c) Clarifying its approach to the abovementioned stranded costs;
- d) taking Antimonopoly Act-related measures (exemption, clarification of requirements, acceleration of investigation procedures, etc.); and
- e) Retaining operating licenses issued according to safety regulations and accelerating other licensing procedures under relevant laws.

**(ii) Back-end issues**

The back-end issue, which has become the largest impediment to the sustenance and continuity of nuclear power generation must be addressed by the national government with more proactive responsibility. The government is required to perform its role of implementing policies and be responsible for the processing of spent fuels through to final disposal. Therefore, we propose the following options as mechanisms to coordinate the scale and progress of operations at each stage of the nuclear back-end process, based on a basic policy to be set out by government's Back-end Policy Headquarters.

- a. Establishing an "Organization for Nuclear Back-end Operations," a specially-approved corporate body or special company established by law

The coordinating body proposed herein is a permanent entity explicitly ensuring the continuity of policy and accountable management, but with inherent risks of potential inefficiency, as often observed in government corporations. The government share in capital or contributions would require further consideration – the government could have a 100% share (contribution government bonds will require no additional burden) or be granted a golden share; or, the government could hold a two-third share and electric power companies a one-third share, in which case the assessment of contributions in-kind or transfer of assets from electric power companies will have to be determined. Nevertheless, in light of the purpose of the establishment of the Organization for Nuclear Back-end Operations, the government would take the initiative. Decisions must be made to determine details of its

operational management structure, including making business plans and the appointment of executives subject to approval by the governing minister (the Prime Minister, the Chief of Headquarters of the Back-end Policy Headquarters).

b. Joint Committee for Public-Private Coordination of Nuclear Back-end Operations

As interim storage and reprocessing are currently operated by the private sector, drastic change to conventional operations in the direction of stronger government involvement may induce confusion. This option is to insert a step before option a. (Establishing an Organization for Nuclear Back-end Operations) and initially operate under a Joint Committee for Public-Private Coordination of Nuclear Back-end Operations. (It should be noted, however, that this option may lack in transparency regarding the attribution of responsibility.)

Back-end operations should be assumed by an entity that will still exist in the distant future (at least one hundred years later), and therefore, should operations be initiated in the form of option b., they should appropriately be shifted to option a. in the middle term. From the perspective of minimizing costs and implementing operations effectively, the Organization should make the decisions regarding operational strategy but basically outsource actual operations to the private sector, with reference to the U.K. Nuclear Decommission Agency (NDA)'s scheme.

1) Reprocessing and interim storage operations

The Organization for Nuclear Back-end Operations would absorb JNFL, co-financed by nine electric power companies, and the Recyclable-Fuel Storage Company (RFS), a subsidiary of TEPCO and JAPC, or it would purchase a share to establish a new JNFL, and assume a part of the nine companies' debt guarantee (total of 1 trillion yen). It would also change the current system regarding reprocessing costs, so that electric power companies would have to pay a fee upon generation of power, and the new JNFL would bear responsibility for receiving and reprocessing spent fuel. For the immediate future, former JNFL and RPS employees would assume actual operations and the current JNFL will be responsible for meeting the new safety standards to be issued in December 2013 for

government approval and licensing.

The reborn JNFL (or the Organization for Nuclear Back-end Operations) would be expected to take the initiative in siting interim storage facilities. In the event this scheme is adopted, provisions regarding the interim storage of spent fuel within nuclear power plants in the Nuclear Reactor Regulation Law (including whether management and operations will be assumed by electric power companies or the Organization for Nuclear Back-end Operations) and in safety agreements with host local governments will require revision.

## 2) Decommissioning of Fukushima Daiichi Nuclear Power Plant and other nuclear plants

Given the ultra-long-term required for the decommissioning of the Fukushima Daiichi Nuclear Power Plant and the circumstances that the current business model may not be maintained in the future, concerns have been raised whether it TEPCO, a private company, should shoulder the entire process. Other commercial reactors and reactors installed by government institutions (Japan Atomic Energy Agency (JAEA) and PNC) will eventually be faced with the issue of decommissioning, and hence, the same question.

It will be important for the government-led Organization for Nuclear Back-end Operations to assume the disposal of “negative heritage.” From this perspective, the appropriate and required balance of shares would be for the government to have two-thirds, and the private sector, one-third, thereby leaving the private sector responsible for back-end operations to a certain degree.

A scheme that will withstand long-term decommissioning operations must be established in advance by injecting public funds from Special Account for Energy Policy (a portion of which was formerly the Special Account for Measures to Promote the Development of Electric Power Sources). Although the immediate agenda would be to inject public funds into the development of accident-related decommissioning technologies, in the future, institutional measures should be deliberated to recover a portion of the total public funds incurred in the entire decommissioning process, which could be done by separating the accident-related assets to be decommissioned (and involving additional intensive operations

exceeding the scale of normal decommissioning operations) from the electric power company which had the accident and transferring them to the Organization for Nuclear Back-end Operations, which could, in the future, sell the decontaminated land upon completion of decommissioning operations or draw on relevant technologies to launch a new revenue-generating business.

### 3) Integrating and abolishing other back-end operators

It would be natural for the Organization for Nuclear Back-end Operations to merge with NUMO, which has been established under a similar financing scheme.

The future of the Japan Atomic Energy Agency (JAEA) should be deliberated after ongoing discussions of its reform are concluded. Back-end operations are inextricably linked with the plutonium cycle and therefore discussion is required regarding the role the Organization of Nuclear Back-end Operations will play, including the treatment of Electric Power Development Co. Ltd (J-Power)'s Oma Nuclear Power Station.

Furthermore, if the JAEA's functions are transferred to the Organization for Nuclear Back-end Operations, it will have broad research and development functions for studies related to the nuclear fuel cycle as well as the safety of light-water reactors. This means that private sector cooperation will include not only that of electric power companies, the nuclear operators, but also assistance from domestic and overseas heavy electric machinery manufacturers in terms of human resources and technology. Consideration of the proactive participation of these manufacturers in institutional operations will also be required.

The coordination of operations between the government Back-end Policy Headquarters and the Organization for Nuclear Back-end Operations will enable the consistent implementation of the nuclear fuel cycle policy in a realistic manner. However, the high-breeder reactor development plan, which is the largest factor for delays in the nuclear fuel cycle policy roadmap, must be addressed with concrete policy measures. Therefore, the post-Monju policy roadmap, the need for which has been referred to above in Chapter 2, Section (1) (iii)) must at least include the following elements:

- a) Operational entity and period of the Monju

- b) Information and data to be derived from Monju operations (this should be clarified in line with item a). for the purpose of setting out a common policy concerning the term for Monju operations)
- c) Reorganization of research themes under the fast reactor cycle technology development (FaCT) project
- d) Strategy for international joint development of fast-breeder technology
- e) Further development of a plan for plutonium use and its management structure based on an understanding of international trends

### **(iii) Risk of accident**

If nuclear power operations are to be sustained in the future, the scale of damage compensation risks which emerge in the event of an accident will become a major issue. If the drawbacks of the current nuclear damage compensation program which were brought to light in the Fukushima accident are left neglected, the new framework for the operational context of nuclear power will be incomplete. The current Nuclear Compensation Act embraces various issues which are organically intertwined, and therefore require comprehensive review. This report will focus on the following three issues for which solutions should be discussed in light of sustaining nuclear power operations. <sup>19</sup>

- 1) Limiting operator liabilities and establishing a new policy measure for risk coverage
- 2) Diversifying government response
- 3) Establishing a compensation management system

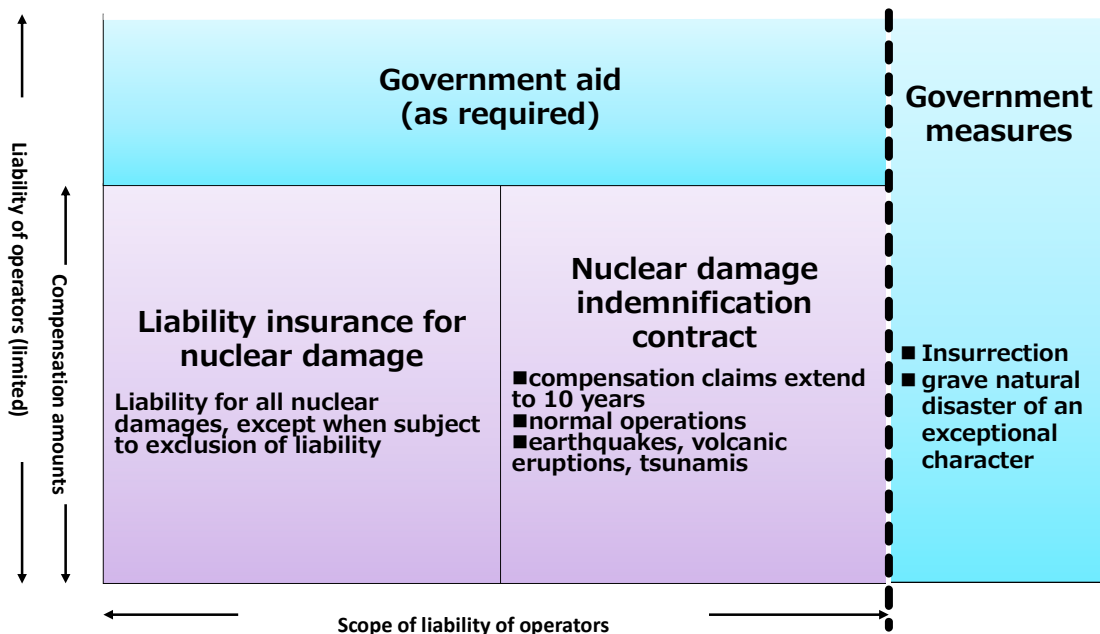
A common theme for all issues is risk allocation between the public and private sectors. We propose the establishment of a new three-layered policy architecture for nuclear damage recovery (Figure 4). For the purpose of comparison, the structure of the current Nuclear Compensation Act is exhibited in Figure 3. It should be noted that the system reforms proposed in Figure 4 seek to implement comprehensive victim indemnification and

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<sup>19</sup> For broader considerations, refer to: *Toward the Establishment of a New Compensation System for Nuclear Damages: a report by the 21st Century Public Policy Institute Nuclear Policy Issues Committee*, 21st Century Public Policy Institute, 2013

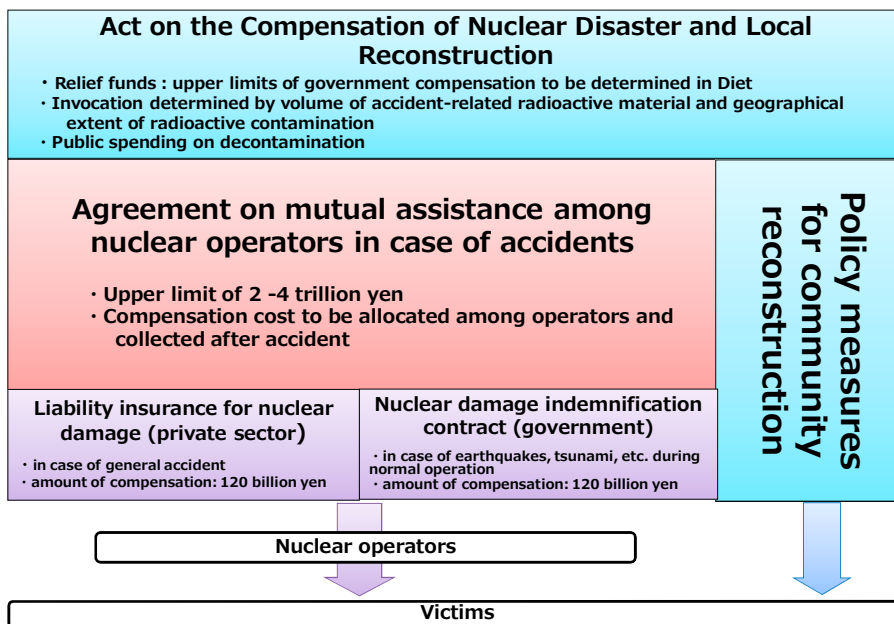
distribution of disaster-related costs and are not confined to amendments the current Nuclear Compensation Act. The Fukushima accident revealed that large-scale nuclear accidents could destroy local communities. The financial compensations provided for in the current Nuclear Compensation Act are not sufficient for restoring local communities and therefore fail to rehabilitate livelihoods in a way victims truly desire. The purpose of our proposal is to encourage the formulation of comprehensive measures for recovery from nuclear damages which will enable the indemnification of victims and the restoring of local communities more promptly and effectively than the current system in order to “protect persons suffering from nuclear damage” and “contribute to the sound development of the nuclear power business” as stipulated in Section 1 of the Nuclear Compensation Act, and to also provide nuclear operators higher predictability of risks.

The current situation of disaster-affected areas fails to provide an idea of the extent to which damage compensation and decontamination costs will increase. This fact, accompanied by the unsettled issue concerning the distribution of costs among nuclear operators, electric power consumers and the national government has complicated resolution. A nuclear damage recovery scheme should be designed to allow concerned parties to estimate total nuclear damage recovery costs and share an idea of the scale of total financial damages, taking into consideration the resources held by the operator, electric power consumers and the national government. Therefore, we propose an amendment to Section 16, paragraph 2 of the Nuclear Compensation Act (and under the Act on the Compensation of Nuclear Disaster and Local Reconstruction in Figure 4) so that it will stipulate the need for determining total costs and relevant procedures (for example, the government could estimate the costs and submit the estimates to the Diet) for decisions following deliberation. It is important that an overall understanding of the damages is shared among concerned parties promptly after an accident occurs, and total costs should be determined in a top-down style of decision-making instead of in a bottom-up process.



Source: Ministry of Education, Culture, Sports, Science and Technology

**Figure 3 Current nuclear compensation system**  
**[Operator liability and compensation amounts]**



Source: compiled by author

**Figure 4 Proposal for new policy architecture**  
**for nuclear damage recovery**

## **1) Limiting operator liabilities and establishing a new policy measure for risk coverage**

### a) Operator liabilities under the current Nuclear Compensation Act

The Nuclear Compensation Act imposes strict and unlimited liability upon nuclear operators but exempts operators from liability “in the case where the damage is caused by a grave natural disaster of an exceptional character or by an insurrection” in an exceptional clause in Section 3, paragraph 1. The Fukushima accident aroused debate over whether the great tsunami that occurred in the Great East Japan Earthquake could be referred to as a “grave natural disaster of an exceptional character.”

TEPCO had originally considered the application on this clause but refrained from pursuing judicial ruling due to strong opposition from the government, public opinion, and developments made in determining the framework of government support pursuant to Section 16 of the Nuclear Compensation Act (which finally led to the formulation of scheme under the Nuclear Damage Compensation Facilitation Corporation Act).

There has been strong criticism for substantial government maneuver in determining how to address the indemnification issues in the aftermath of the Fukushima accident.<sup>20</sup> “If strict and unlimited liability is to be imposed upon a private corporation [...] we have little choice but to admit a certain extent of exemption from liability in order to provide corporate management with predictability.”<sup>21</sup> Sakae Wagatsuma, then professor emeritus in civil law at the University of Tokyo, made this statement when he was called as a witness to a Promotion of Science and Technology & Innovation Special Committee meeting deliberating the Nuclear Compensation Bill<sup>22</sup>, but he also gave a strict reading of “force majeure,” as provided below:

“Regarding strict liability, whereas companies were conventionally not liable in the absence of negligence, they have gradually come to be liable with or without negligence, but being liable without negligence

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<sup>20</sup> Akio Morishima, *Genshiryoku jiko no higaisha kyusai (1)-(3) – songaibaisho to hosho* (Victim relief in nuclear accidents (1)- (3): indemnification and compensation for damages), *Toki no Hourei*, Vol. 1882, 1884, 1888

<sup>21</sup> Akio Morishima, *Genshiryoku jiko no higaisha kyusai (1)-(3) – songaibaisho to hosho* (Victim relief in nuclear accidents (1): indemnification and compensation for damages), *Toki no Hourei*, Vol. 1882, p47

<sup>22</sup> Proceedings of the 38th meeting of the Promotion of Science and Technology & Innovation Special Committee, Vol.14, p4-5



naturally has its own limit, which can be approached from two dimensions: quality and quantity. In terms of quality, [a company] can hardly be liable for a grave natural disaster of an exceptional character that cannot possibly be predicted or an insurrection. This is because, as I stated before, if you are mining copper, you should include in your expenses, costs incurred by reduced rice yield as an inevitable consequence no matter what kind of equipment is used. However, exceptional and grave cannot be calculated. Therefore, if you are considering strict liability for private corporations, exceptional clauses such as this should be taken out. Otherwise, someone will naturally come to say that even without negligence, this [damage] is too much and that qualitative limits should be placed.”

“There seems to be much debate over force majeure as well, this is beyond force majeure. This is unlikely to occur, and if it is unlikely to occur, then we wouldn’t need to write anything about it, but as I have reiterated, strict liability has developed mainly in the context of liabilities of private corporations, and therefore, my reading is that someone will come out and say that even if they are subject to strict liability, it wouldn’t make sense to make them liable for something beyond humans prediction.”

Sakae Wagatsuma also refers to quantitative limits after his statement about qualitative limits. His statement is about limited liability, which is connected with one of the most important issues discussed in this report. Therefore, a quotation is provided below<sup>23</sup>:

“Now, in terms of quantitative limits, this will also be calculated, so the line should be set at around 5 billion [yen] and anything above that they should not be liable for – this is the approach in so far as private corporations are the focus. This bill is also centered on the liability of private corporations which will be supported by the government, and therefore the strict liability theory which has developed in the context of private corporations is embedded in this bill. In so far as private corporations are liable, the private corporation bears strict liability. [...]The portions covered by insurance and the indemnity agreement will be

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<sup>23</sup> Sakae Wagatsuma, Takeo Suzuki, Ichiro Kato, Ryo Inoue, Katsuji Fukuda, Seisho Horii, Shozo Nagasaki, Keiichiro Sugimura, Zadankai: genshiryoku saigai hosho wo megutte (Round-table: compensation for nuclear damages), *Jurist* No.236, October 15, 1961

paid by insurance companies and the government as a legal obligation, but when the costs exceed 5 billion [yen], the Diet decides on the payments, which are not mandatory. Furthermore, no one is held accountable for the exceptional and grave part either. Therefore, from a purely formally perspective, there is a large difference there. In that respect, if the stance taken was changed and the law was to read that the national government was liable under any circumstances whatsoever and for whatever large amounts of money, thereby holding the national government accountable at the very beginning, saying later, provided that [the nuclear operator] is insured, that the insurance reimbursement is to be submitted, and that compensation must be provided for so-and-so causes. Said this way, it is theoretically the complete opposite, and very strong. This is what I said. In this sense, I am personally unhappy [with the bill] but trusting the government and the Diet's wisdom, the conclusion will not be so different. This is what I have been saying."

Wagatsuma's account would seem to be slightly difficult to comprehend as it was given in the following context. On December 12, 1959, the Special Subcommittee on Indemnification against Atomic Energy Risks which was chaired by the late Sakae Wagatsuma had reported that "in the event of damages which cannot be covered by damage compensation measures, government compensation should be applied" to the effect that if nuclear power operations constitute a part of national policy, it should have no flaws in terms of victim protection.

The fundamental policy principle is succinctly presented in the preface: "Appropriate measures must be taken in order to incur heavy liabilities on nuclear power operators so that victims will be adequately indemnified and therefore will not have to suffer in silence, and at the same time so that the liability of nuclear power operators does not impose excessive burden from a business perspective, precluding the sound development of nuclear power." The strong will of the parties concerned who had endeavored to establish a compensation system for damages resulting from nuclear power, a technology of the unknown, can be perceived from the report in its entirety.

However, when the bill was discussed in the government, a strong majority was against government compensation and argued that even if nuclear power operations were to be promoted as national policy, as long

as private entities were the operators, it would be unreasonable for the government to bear direct liability for damages which occur as a result of such operations. Consequently, Section 16, paragraph 1 stipulates no more than that “the Government shall give a nuclear operator such aid as is required for him to compensate the damage”. Because the logic that the government could not directly compensate a victim for damages which occurred as a result of operations by a private-sector operator had prevailed, the law explicitly provided for a structure in which the government would only provide indirect support in the form of financial aid to operators who are primarily liable for damages, instead of being responsible for direct compensation to victims. Given this legal structure, the original purpose of establishing the law which had been “to protect persons suffering from nuclear damage” was replaced with the “sound development of the nuclear power business” and was even about to be omitted, before it was finally redeemed by concerned parties. After adoption of the law, Sakae Wagatsuma criticized it, saying that the adopted law and the report stood on completely different concepts. “The peaceful use of nuclear power is an unprecedented operation in history. Its benefits may be large, but at the same time, it entails risks of grave damage in case of an accident. Therefore, if the government acknowledges the need to advance its benefits and decides to implement it, it should presuppose that not a single victim will suffer in silence.” That having been said, he stated that the government “disguised in the name of operator support and protection, will only indecisively provide “aid” (Section 16). In practice, victims will be protected by the wisdom of the government and the Diet.”<sup>24</sup> The late Akio Takeuchi, then associate professor and later professor emeritus at the University of Tokyo, pointed out that it would be an ideal framework if, as stipulated in the law, unlimited aid as is required to compensate for the damages is promised, but if the reason that the legislation’s deviation from the concept of the report was a reflection of judgment within the government that the government lacked the financial capacity to accept it, it would imply “regression” in terms of government involvement and would therefore put operators in anxiety. Furthermore, he stated that “when the Promotion of Science and Technology and

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<sup>24</sup> Sakae Wagatsuma, *Genshiryoku nihou no kousou to mondaiten* (The framework and flaws of the two nuclear power-related laws), *Jurist* No.236

Innovation Special Committee of the Lower House adopts a peculiar resolution accompanying the enactment of the law that reads, ‘in order to ensure that victims will be protected without regret, the government should provide adequate aid, and simultaneously, in accordance with the purpose of protecting victims, provide guidance [...] to operators [...] on reserving earnings’, it is doubtful whether the government and Diet have any intention to provide support without fail.”<sup>25</sup>

It is evident from the background to the adoption of the Nuclear Compensation Act that the circumstances in which the nuclear operator would be liable and the scope of their liability had been an issue of debate from the time of its legislation because it had been strongly acknowledged that private companies could not make investments if the scope of risks was not limited. However, without adequate indemnification to the victims of an accident, the siting of nuclear facilities could be hindered, therefore stalling the advancement of nuclear operations. Hence, consensus had prevailed among academics who deliberated the Nuclear Compensation Act that if nuclear operations were going to be promoted at all as national policy with a significance distinct from other policy areas, then the government would have to decide to provide full support in regard of compensating victims.

Given the history of this legislation, if the exemption clause is to be retained, the requirements for events which apply should be explicitly identified. Experience from the Fukushima accident has revealed that provisions which present ambiguity concerning the application of laws related to nuclear damages can undermine the efforts of government and operators in the face of confusion caused by a combination of grave natural disaster and nuclear disaster. Therefore, a possible decision would be to remove it.

Even in the event the exceptional clause is applied, victimized citizens shall not be abandoned, and therefore, the government will invariably inject tax money for the indemnification of victims. Under mutual assistance scheme among operators which is proposed below, the issue amounts to which monies -taxes or electricity tariffs collected from nationwide - should be used to recover indemnification costs. A framework

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<sup>25</sup> Akio Takeuchi, *Genshiryoku songai nihou no gaiyou* (Outline of Two Laws Concerning Nuclear Damage), *Jurist* No236

under which the government and nuclear operators come into conflict over the application of an exemption clause (that is, the retention of the current exceptional clause) should be avoided. In the event of war, all resources will obviously converge into government relief regardless of the occurrence of grave nuclear damages (as grave war-induced damages will occur apart from nuclear damages), and therefore insurrections could be retained in an exemption clause.

b) Emerging financial risks revealed in the Fukushima accident and a nuclear operator mutual assistance scheme

Before the Fukushima accident, financial institutions (including bondholders and credit-rating companies) basically viewed the risks related to nuclear power operations to be implicitly guaranteed by the government, given the high operational capacity of nuclear power operators, financial risk reduction measures (tariff regulations based on FDC pricing) under the Electric Business Act and the role of nuclear power operators as implementers of nuclear power policy, an important national policy. However, despite the establishment of the Nuclear Damage Compensation Facilitation Corporation Act (Corporation Act), the Fukushima accident changed that former impression of nuclear power to operations that entail grave risks of jeopardizing the business management and even the existence of an operator once an accident occurs.).

The ratings of TEPCO's corporate bonds were lowered, affecting other electric powers companies, which could not issue corporate bonds in the months following the accident. However, once the Corporation Act gained wide acknowledgement that it was a part of the support measures provided for in Section 16 of the Nuclear Compensation Act, corporate bonds could be issued again and the issue has been resolved for the present. However, as aforementioned, with electric power system reforms advancing while the restarting of nuclear power plants remains stalled, electric power companies are bound to be exposed to financial risks again. Risks of accidents should be reviewed as corporate ratings will impact the conditions for bond issue as well as the amounts procured and loan terms. In setting the contextual background for future nuclear power operations, the national government's acknowledgement of nuclear power as a

particularly important technology in terms of national interest and its commitment to promote nuclear power should be reconfirmed both politically and administratively. That having been accomplished, the allocation of compensation/indemnification risks between public and private sectors under the Nuclear Compensation Act should be reformed based on the consensus which had existed among academics at the time of legislation.

However, given the public distrust prevailing in terms of the technological and institutional competence of nuclear operators in general since the Fukushima accident, compliance with safety standards determined by the NRA is certainly insufficient. A new scheme where nuclear operators are penalized for negligence to strive to improve nuclear safety levels (by imposing economic burden or weighted inspection items) or rewarded for high performance in safety operations is called for. Some ideas are provided below:

- i. A program similar to the US Reactor Oversight Process (ROP)<sup>26</sup>, under which the Nuclear Regulatory Commission (NRC) links performance indicators of each reactor with a weighted range of additional inspections and makes the findings available for public access. Reactors with high performance are to be granted of longer intervals between regular inspections.
- ii. Indemnity fees (rates) under government-sponsored indemnity agreements for compensation of nuclear damage that is linked with abovementioned performance indicators
- iii. Insurance premiums (rates) of a new private insurance-based nuclear energy liability insurance are reported by nuclear operators to the NRA. Figures are made available for public access.
- iv. Effective peer review assessments are conducted among nuclear operators

In order to embed these ideas into a larger mechanism, we propose the establishment of an “ex-post-levy-collection-based mutual assistance program.” By introducing this scheme, nuclear power operators will “share a common destiny” in terms of safety operations, meaning that once

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<sup>26</sup> Information on ROP can be found at: [www.nrc.gov/NRR/OVERSIGHT/ASSESS](http://www.nrc.gov/NRR/OVERSIGHT/ASSESS)

another operator causes an accident and becomes liable for damages, an operator will immediately suffer significant impacts on its corporate finances. Since the Fukushima Daiichi Nuclear Power Plant accident, the Japan Nuclear Safety Institute (JANSI) has involved operators in a peer review process on safety at nuclear power plants. An “ex-post-levy-collection-based mutual assistance program” will help enhance the effectiveness of such processes. The U.S. Price-Anderson Nuclear Industries Indemnity Act (Price-Anderson Act) also contains a “mutual insurance” arrangement that functions similarly.<sup>27</sup> It could also effectively dismiss concerns that limiting liability may generate a moral hazard.

Given the scale of compensation payments made by TEPCO, the upper limit of damage compensation payments could be set at 2 - 4 trillion yen. The scheme would require nuclear operators to pay retrospective insurance premiums in the event another operator causes a nuclear accident. The current scheme under the Corporation Act where operators must pay a general contribution to the Corporation would be abolished with the introduction of the new “mutual assistance program.”

The payment of general contributions that nuclear operators are currently obligated to pay is stipulated in Article 38 and the amounts paid are determined in Article 39. However, the only purpose provided for these contribution in Article 38 is “to be allocated for the expenses necessary for the business of the Corporation,” which could be understood to imply that the scheme is merely a lockstep approach to soliciting contributions from all the banks which was resented by the public when it was taken more than a decade ago by the Ministry of Finance in relation to saving some problematic banks with excessive non-performing loans. It has been explained that it is reasonable to ask operators to make payments from ordinary times as the Nuclear Damage Liability Facilitation Fund is obligated to provide financial aid to nuclear operators in case of an accident. The Fund has also asserted that it is collecting the hidden costs of nuclear power, but these “nuclear power generation costs” have already been disclosed by the series of laws which determine the costs incurred for nuclear back-end operations. Furthermore, the scheme lacks concrete

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<sup>27</sup> German nuclear damage compensation law sets out a similar mutual assistance scheme for nuclear operators

standards to calculate contribution amounts which are currently determined abstractly. Hence, the scheme could risk arbitrary use,<sup>28</sup> and if its purpose is truly to be prepared for future accidents, then it could be replaced with a mutual assistance scheme among operators and general contributions would no longer be required.<sup>29</sup>

Once an accident occurs, the operation rates of all nuclear facilities will be inevitably affected. In order to minimize electricity tariff raises, an upper limit should be set, as is the case in the U.S., on the retrospective insurance premium due (with the Nuclear Damage Liability Facilitation Fund (Facilitation Fund) covering for shortfall amounts through contribution government bonds). Furthermore, following the U.S. model, after the first year when compensations are urgently needed, the court or a third party would be responsible for prioritizing payouts and for formulating an allocation plan based on which compensations would be paid in order to facilitate the process<sup>30</sup>. This would enable compensation for late onset injuries. This will also provide clarification for important issues regarding compensation in tort law such as adequate causation and scope of damage, and hence, a breakthrough for the conventional practice where compensation policies set out by the Dispute Reconciliation Committee for Nuclear Damage Compensation which only has the authority to mediate reconciliation have formed precedents and have led to “creative” legal interpretations. Furthermore, the court or third party managing the fund could be given the authority to judge whether damages can be attributed to government instructions or standards.

**(Reference: U.S. Price-Anderson Nuclear Industries Indemnity Act (Price-Anderson Act))**

The proposed mutual assistance scheme among nuclear operators is

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<sup>28</sup> Yasufumi Takahashi, *Kaisetsu Genshiryoku songai baisho shien kiko hou- genshiryoku songaibaisho seido to seifu no shien no wakugumi (The Nuclear Damage Compensation Facilitation Corporation Act explained: the nuclear compensation system and the framework of government assistance)*, Shoji Houmu, p127, p173-177

<sup>29</sup> Issues related to general contributions can be found in: *Toward the Establishment of a New Compensation System for Nuclear Damages: a report by the 21st Century Public Policy Institute Nuclear Policy Issues Committee*, 21st Century Public Policy Institute, 2013

<sup>30</sup> The Gulf Coast Fund, a trust fund for disaster relief established after the deepwater drilling accident in an oil field in the Gulf of Mexico caused by BP can also be referred to. Discussion on the accident and damage indemnification can be found in: *Toward the Establishment of a New Compensation System for Nuclear Damages: a report by the 21st Century Public Policy Institute Nuclear Policy Issues Committee*, 21st Century Public Policy Institute, 2013, Part III, Chapter 2



based on the mutual assistance scheme, or the Second Tier, under the U.S. Price-Anderson Nuclear Industries Indemnity Act (Price-Anderson Act). The Price-Anderson Act was enacted in 1957 as part of amendments made to the 1954 Atomic Energy Act in order to address the reluctance among electric power companies to bear the risk of accidents and technology development costs related to nuclear power, despite government calls for domestic electric power companies to engage in nuclear power generation under then President Eisenhower's policy for the peaceful use of nuclear power.

The main objectives of the Act are:

- i. to eliminate the concerns of private operators reluctant to enter the nuclear power industry for fear of potential liability beyond its own resources in the event of a devastating nuclear power plant accident
- ii. to secure a compensation scheme to ensure adequate compensation to the victims of a devastating nuclear power plant accident

Upon adoption, the Act placed a ceiling of 560 million dollars on the public liability of a nuclear operator per one nuclear accident, requiring companies to obtain 60 million dollars in private nuclear energy liability insurance and provided for further government commitment of up to 500 million dollars to cover any claims in excess of the private insurance. Having been amended several times, the recent revision was enacted in 2005 when it was determined that the structure for damage compensation to be maintained by nuclear power operators would comprise Tier 1, or "the maximum amount of liability insurance available at a reasonable cost and on reasonable terms from private sources" (375 million dollars), and Tier 2 (introduced in the 1975 amendment), or an ex-post-levy-collection-based mutual assistance program (secondary financial protection) (premium of 111.9 dollars per unit, payable at a rate not to exceed 17.5 million dollars per year, which multiplied by the number of currently licensed reactors amounts to total compensation funds of an equivalent of over 1 trillion Japanese yen).

The constitutionality of the Price-Anderson Act was challenged<sup>31</sup> on two grounds – first, that "limited liability" was a form of legal abuse

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<sup>31</sup> *Duke Power Co. v. Carolina Environmental Study Group* (1978)

because the Act did not ensure adequate compensation for victims of accidents, and second, that it was a violation of equity before the law because it treated nuclear accidents differently from other accidents. However, the Supreme Court ruled that it did not violate the Constitution. An outline of the ruling is provided below as similar debate could be expected in Japan if “limited liability” is to be adopted.

- i. The imposition of a statutory limit on liability will encourage private industry participation and hence bears a rational relationship to Congress' concern for stimulating private industry's involvement in the production of nuclear electric energy. Therefore, it is not unreasonable to treat nuclear accidents differently from other accidents.
- ii. Even in the event the compensation fund of 560 million dollars cannot guarantee full indemnification of damages in all potential circumstances, this will not constitute grounds that limited liability is unreasonable or that it is a due-process violation.
- iii. In view of the extremely remote risk of a major nuclear accident in which damages will exceed the statutory limit on liability and Congress' intention to implement all necessary and appropriate measures to for the indemnification of victims in the event of such an accident, Congress' decision to impose a statutory limit of 560 million dollars lies within its discretion and does not constitute a violation of due process.
- iv. The ruling of a lower court that a limited liability scheme would generate moral hazard is irrelevant as such a scheme would not affect the screening process for licensing nuclear facilities and electric power companies themselves will be the largest victims in an accident.

After several amendments, the Price-Anderson Act currently does not explicitly stipulate operators' “limited liability” but is more focused on defining a “payment limits scheme”. When damages exceed the maximum fund value, the President and Congress will formulate a compensation plan as provided for in the Act. The compensation plan will involve retrospective contributions from various sectors including industry. It should be noted that the Act does not dismiss the possibility of additional payments being required of nuclear power operators in the compensation plan.

The proposed mutual assistance scheme accompanied by upper limits to compensation payments liable could be established within two legal frameworks: firstly, amending the current Nuclear Compensation Act under which nuclear operators are subject to unlimited liability so that they would have limited liability; and secondly, retaining the unlimited liability of nuclear operators and instead placing a cap on the payments made by operators to the compensation and covering for shortfalls by government compensation. Both schemes would be founded on the following grounds:<sup>32</sup>

- i. The equitability of imposing unlimited liability and limits on the application of exemptions
- ii. Private companies should not be liable for compensation amounts that would impede the continuity and development of industrial facilities
- iii. If a technology has reached a degree of maturity that its benefits can be enjoyed by the general public, the general public should bear a certain amount of risk within the limits of acknowledged benefits
- iv. Limits on compensation amounts to be paid in the event of an accident are a prerequisite for government guarantees (in order to enable the limitation, and thus estimation of the risks involved)

Given the current circumstances that the Fukushima accident has called for reconsideration of operator liability, the latter scheme may be the more natural step. The Swiss nuclear damage indemnification law (Act on Nuclear third Party Liability), Section 29, provides an important model for the joint cooperation of the national government and nuclear operators in addressing cost-related issues in major nuclear disasters (government compensation includes the contributions pooled by nuclear operators) under a scheme where operators bear unlimited liability.<sup>33</sup>

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<sup>32</sup> Refer to: 21st Century Public Policy Institute (2013) *Toward the Establishment of a New Compensation System for Nuclear Damages: a report by the 21st Century Public Policy Institute Nuclear Policy Issues Committee*, Part II, Chapter 3 and Soji Yamamoto, *Kokusaihou ni okeru kikensekininshugi (Absolute liability principle in international law)*, p16, p224

<sup>33</sup> Refer to: 21st Century Public Policy Institute, (2013) *Toward the Establishment of a New Compensation System for Nuclear Damages: a report by the 21st Century Public Policy Institute Nuclear Policy Issues Committee*, Part II, Chapter 3

**(Reference: Swiss Act on Nuclear Third Party Liability, Section 29)<sup>34</sup>**

Section 29 (Principles for major occurrences)

1. If there are grounds for anticipating that the financial resources of the person liable, the private insurer and the Confederation, available for covering the damage, will not be sufficient to satisfy all claims (major occurrence), the Federal Assembly shall establish an indemnity scheme by means of a Federal Order of general application, not subject to referendum. This Order may cancel the right of recourse against the person liable of all public and private insurers and sickness insurance funds, subject to the provisions of Section 20. If necessary, the Confederation may pay additional contributions in respect of damage not otherwise covered.
2. The Order shall determine the general principles for compensation of the injured parties in order to ensure the equitable distribution of all available funds. In so doing it may derogate from the provisions of this Act.
3. The Federal Assembly may entrust a special independent body with the implementation of the indemnity scheme. Appeals to the Federal Court against decision of this body shall be permissible.
4. The Federal Council shall take any provisional measures that may be necessary.

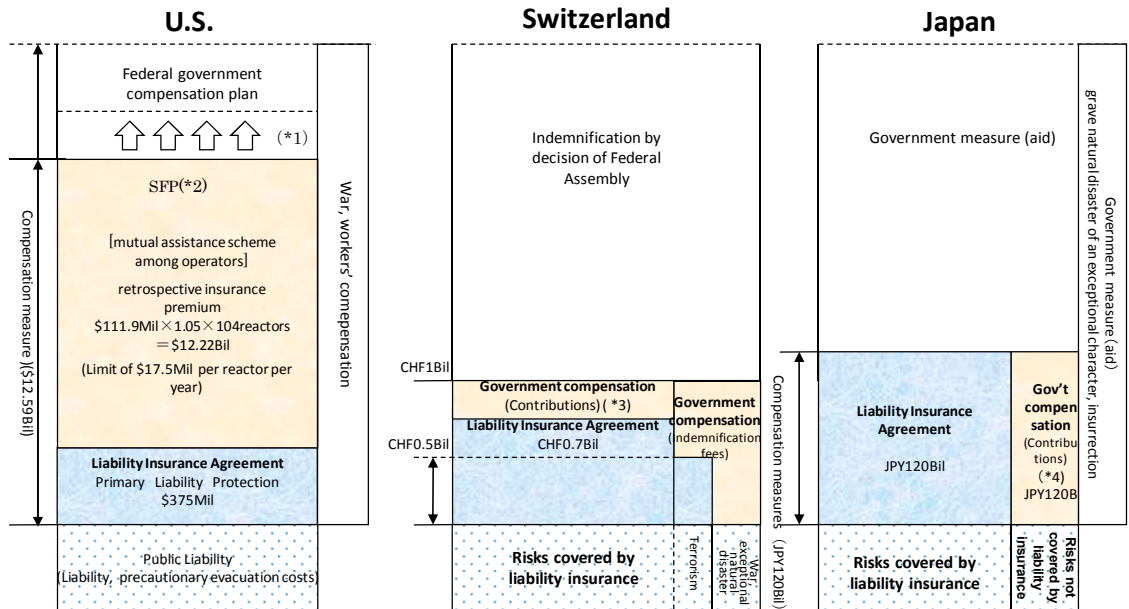
Figure 5 compares the nuclear compensation schemes of Japan, the U.S., and Switzerland, including the U.S. Price-Anderson Act referred to above.

c) Establishing procedures for business reorganization

Shifting to a limited liability scheme and establishing a mutual assistance scheme for nuclear operators should significantly lower the possibility of operators being hammered by excessive debts derived solely from compensation for damages in a major accident. However, as seen in the aftermath of the Fukushima accident, the burdens of decommissioning a reactor damaged in an accident are substantial; and therefore, in the middle- to long-term, the optimal policy option would be to concentrate these operations in a single newly established government-led organization. Otherwise, decommissioning operations may drive a company into insolvency, depending on its scale. Increased thermal fuel

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<sup>34</sup> Japan Atomic Industrial Forum, Inc. website:  
[www.jaif.or.jp/melmag\\_db/2012/1126genbai.pdf](http://www.jaif.or.jp/melmag_db/2012/1126genbai.pdf)



(\*1) Possible increase of compensation measures (\*2) Secondary Financial Protection  
 (\*3) Contributions are collected from nuclear operators and compiled in a nuclear damage fund (*Nuklearschadenfonds*) (CHF290Mil, as of 2001)  
 (\*4) No funds accumulated as premiums under liability insurance agreement

Source: compiled by author based on material provided by Noboru Utatsu

**Figure 5 Comparison of nuclear compensation schemes (Japan, U.S., Switzerland)**

costs may also constitute a threat to corporate finances.

Even under such circumstances, a company may be able to manage to retain a working cash flow by using the “government aid” provided under the current Corporation Act, and such an option could perhaps be maintained in the new framework. However an additional scheme would be required if a company seeks to remain a going concern. The corporate reorganization scheme should prepare for cases in which no other electric power company is willing to merge with the company by establishing a transient “bridge electric power company” financed by the Facilitation Fund (which would require an amendment to the Corporation Act to add a new item to its operations) in order to appropriately handle its prime assets and non-performing assets (by, for example, transferring prime assets to other electric companies, to the Organization for Nuclear

Back-end Operations proposed in the previous section).

In TEPCO's case, various opinions were presented in support of and in opposition against its legal liquidation, which was finally abandoned on the grounds provided below.<sup>35</sup> The decision was based on the judgment that compensation for nuclear damage must be fully made, transactions related to the stabilization of the nuclear accident could be continued, and capital investments should be made for a stable electricity supply.

- i. Damages would not be appropriately compensated  
e.g. Claims for damages could be cut off. Victims' right to claim compensation for damages would be subordinated to general mortgage rights held by bondholders
- ii. Compensations would be delayed and inadequate damage compensation  
e.g. Victims would be imposed with the burden of taking part in legal liquidation procedures.
- iii. Serious operational problems would arouse in regard to coping with the aftermath of the accident and decommissioning operations  
e.g. Payments of accident-related costs might not be promptly approved

Other concerns included increased financing costs for TEPCO in the coming months.

Furthermore, considering the fact that one of the purposes of the Nuclear Compensation Act is to prevent compensation for damages from impeding "the sound development of the nuclear power business," allocating government aid to avoid TEPCO's insolvency could be referred to as an appropriate decision in light of law.

Under a limited liability scheme, when total compensation costs exceed the sum of upper limits for operators and funds available from the mutual assistance scheme, the compensation of victims would become a national government agenda, thereby invoking the "Act on the

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<sup>35</sup> Yasufumi Takahashi, *Kaisetsu Genshiryoku songai baisho shien kiko hou- genshiryoku songaibaisho seido to seifu no shien no wakugumi (The Nuclear Damage Compensation Facilitation Corporation Act explained: the nuclear compensation system and the framework of government assistance)*, Shoji Houmu, p60-71

Compensation of Nuclear Disaster and Local Reconstruction” (Figure 3) which will be discussed later herein.

## **2) Diversifying government response<sup>36</sup>**

The response called for in a nuclear accident is varied according to the scale of the accident. It would be best if damage costs did not exceed the limits of the proposed private liability insurance and the mutual assistance scheme among operators, and the financial impact upon the nuclear operator was limited. An accident of the Fukushima accident’s scale is unlikely to occur under the new safety standards, but given the Fukushima accident, it remains important for us to be prepared for unexpected incidents.

The features of a nuclear accident which were revealed in the Fukushima accident in relation to compensation issues are as follows:

- i. Damages are widespread geographically, as well as in content and time.
- ii. Various factors other than the accident complexly and significantly affect the occurrence and spread of damages (complex disaster interlinked with natural disaster, harmful rumors, the integrity of safety standards, problematic initial evacuation measures taken by national and local government).
- iii. Some damages (destroyed local communities and employment of victims) cannot be recovered by monetary compensation.

Some emerging problems can be attributed to the abovementioned factors:

- i. With many complications in settling disputes between concerned parties (TEPCO and victims) and therefore increased administration costs, much of the resources for compensation have been lost to transaction costs.
- ii. Some instances have been observed where the Dispute Reconciliation Committee for Nuclear Damage Compensation’s

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<sup>36</sup> The ideas presented in this subsection were greatly inspired by discussion in the following reference: Tanabe, Tomoyuki, M. Maruyama (2012) Fukushima Daiichi Genshiryoku Hatsudensho Jiko ga Teikishita waga kuni no genshiryoku songai seido no kadai to sono kokufuku ni muketa seido kaikaku no houkousei (The issues concerning Japan’s compensation system for nuclear damages raised by the accident at Fukushima Daiichi Nuclear Power Plant and the direction of system reforms to overcome the challenges), Central Research Institute of Electric Power Industry. The proposal made herein differs from the policy option proposed in Tanabe and Maruyama (2012). [criepi.denken.or.jp/jp/kenkikaku/report/detail/Y11024.html](http://criepi.denken.or.jp/jp/kenkikaku/report/detail/Y11024.html)

guidelines present an extended interpretation of precedents on adequate causation. This has been supported by a public tendency to find reasons to criticize the “inadequateness” of victim compensation.

- iii. Compensation-related operations are sometimes conducted based on the easiness of a certain compensation payment instead of the actual need for it, and therefore, the compensation for more urgent damages have been delayed and a sense of injustice has been enhanced among victims.

It is well understood from the situation that a major nuclear accident cannot be effectively resolved in full under the current Nuclear Compensation Act which is based on tort law, which governs relationships between individuals. In the event of an accident which victimizes a massive number of people across a wide geographical area and is likely to be followed by a prolonged aftermath, the government should not be confined to providing financial assistance in the form of loans under the Corporation Act, and under the new framework for nuclear operations should jointly or complementarily assume the responsibilities of victim compensation and restructuring affected areas with the concerned operator who is primarily liable for such damages.

This can be achieved by embedding both additional disaster compensation (the national government would take over the complaints extended to operators to let them be addressed by an organization with pooled funds similar to a relief fund) and various measures regarding local rehabilitation into a single bill. The purpose of the bill would be the prompt and effective resolution of accidents and restoration so that it will be legislatively acceptable to fit the two elements in to one bill, which is important in order to gain a comprehensive understanding of the damages and inject required resources where they are most needed for efficient local rehabilitation and consequently true victim compensation. Having two different legal platforms for additional disaster compensation and local rehabilitation will hinder the comprehensive consideration of damages and may even result in their implementation (governance) by different government agencies. Different implementation bodies may of course be assigned even under a single framework, but even then it would be better to have a legal framework that constantly requires the consideration of



both aspects together in case of amendments or further legislation.

In the event of complex disaster, a government body to address the restoration of local communities destroyed by a nuclear accident should be established under the Reconstruction Agency or its equivalent. If damages have occurred from common natural phenomena such as a tsunami, compensation monies required for local rehabilitation should be allocated not from nuclear damage compensation funds but from the general account budget.

The proposed Act on the Compensation of Nuclear Disaster and Local Reconstruction should incorporate the following provisions with regard to the abovementioned issues. Items iv. and v. may be considered with reference to compensation schemes which were employed in dam construction projects to compensate for livelihoods in sinking local communities (compensation of costs incurred for the relocation of entire communities and in-kind compensation). Implications from a thorough study and analysis of past cases should be drawn upon in formulating effective policy measures.

- i. Firstly, stipulate the procedures to determine whether this law is applicable, based on: a) the amount of radioactive material released as a result of the accident; b) geographic coverage; and c)temporal impact
- ii. Stipulate that in the event this law is applied, damages exceeding the amounts covered by the nuclear operator liability insurance and mutual assistance scheme shall be compensated for by the government
- iii. In the event that this law is applied, indemnities (compensation) within the framework of the nuclear operator liability insurance and mutual assistance scheme should not be distinguished from indemnities (compensation) to be covered outside of the framework. By applying this law, the nuclear damage compensation scheme shifts from a scheme governed by tort law for compensation between individuals to one bearing a public law character and including compensation for the livelihoods of individuals and communities. Legal grounds and precedents as well as overseas legislations are yet

to be studied regarding the shift from tort law to public law. A scheme is also required to determine which damages should be prioritized in the allocation of funds and what process should be followed when indemnification or compensation amounts are likely to exceed the framework.<sup>37</sup>

- iv. With reference to the issues that aroused in the legislation of the Law Concerning Pollution-Related Health Damage Compensation and other Measures and the effectiveness of its implementation, compensation procedures, including the scope of damages (e.g. the extent to which economic damages should be included is yet to be discussed), the framework for the acknowledgement of damages, and administrative review procedures (the Dispute Reconciliation Committee for Nuclear Damage Compensation will govern only administrative reviews) should be determined.
- v. Provisions on local reconstruction should include decontamination. The law will absorb the current Act on Special Measures concerning the Handling of Pollution by Radioactive Materials in which case the exceptional clause of Section 3, paragraph 1 of the Nuclear Compensation Act should be amended so that if the exceptional clause is to be applied, the government, not nuclear operators, will compensate for damages (see right-hand side of Figure 3). The law should stipulate that decontamination targets shall be determined thorough joint deliberation by the NRA and other technology organizations. The implementation framework and institution required to ensure the effective implementation of operations need to be determined.
- vi. Examples of local reconstruction measures are provided below. The appropriateness of the provisions of the Act on Special

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<sup>37</sup> Other issues requiring consideration include: i) determining whether the contact for compensations and negotiations should be the operator or national government (or local government) depending on the subject of indemnification / compensation; ii) whether shifting to a compensation system governed by public law will inhibit the equity of individual compensations depending on the damages incurred (as, in theory, damage relief will be provided as a group, instead of to the individual). As these issues need to be resolved in discussion between operators and the government, the basic framework should be determined by law to maintain a more transparent and flexible system, the roles of concerned bodies and relevant procedures of which should be made explicit at the time of enactment.

Measure for the Rebirth of Fukushima should be determined based on a study of its effects and an analysis of the current state of affected areas.

- industrial policy measures to attract companies to the region as well as encourage the establishment of new businesses in order to secure employment for victims;
- an increased ratio of public works subsidies for the reconstruction of local infrastructure;
- continued free healthcare checkups; and
- measures to address and prevent economic losses and other damages incurred by the spread of bad rumors.

### **3. Future processes**

In order to advance the abovementioned measures to lay the groundwork for future nuclear power operations, we must consider their correlation with the processes and schedules of the following related policy agenda.

- 1) Formulation of the Basic Energy Plan and preceding deliberations in the Advisory Committee on Natural Resources and Energy (joint deliberations on global warming countermeasures in the Industrial Structure Council and the Central Environment Council)
- 2) Timeline and details of the draft proposal for amendments to the Electricity Business Act (electric power system reforms)
- 3) Addressing revisions to the Act on Compensation for Nuclear Damage
- 4) Developments in the NRA's backfit-related screenings for approval and licensing and subsurface structure surveys conducted in the Shimokita Peninsula
- 5) Review of TEPCO's Comprehensive Special Business Plan, including radiation-tainted water (restarting nuclear power plants, tariff-related issues, financing...)
- 6) Developments towards restarting the JAPC Tsuruga Nuclear Power Plant
- 7) Completion and operation of JNFL's reprocessing plant and status of the Recyclable-Fuel Storage Company (RFS)

The policy direction and framework of these agenda should be more concrete before the end of the year; and therefore the general framework for a comprehensive solution for nuclear power issues which has been proposed in this report should be brought to public attention at this time. Specific policy measures should be drawn up next year in preparation of making a submission to the ordinary Diet session in 2015 for implementation through various bills and budgets the following fiscal year.

However, some of the issues discussed in this report may need to be addressed at an earlier time. Therefore, concerned parties should at least have internal discussions regarding their approach to these issues. We hope that this report and its policy proposal can contribute to constructive discussion on these matters.

# **Toward a Comprehensive Solution for Nuclear Policy and Business Challenges**

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**November 2013**

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