# Our path to a nuclear-free Japan: an interim report

## *Executive Summary*

Citizens' Commission on Nuclear Energy (CCNE)

October 2013

The full report in Japanese is available at: www.ccnejapan.com

## Introduction

The following document — *Our Path to a Nuclear-Free Japan* — is an interim report, summarising key issues and providing an account of the results of our discussion and research up to this point. We expect this report to serve as a catalyst for generating opinions and comments from experts and concerned citizens within Japan and abroad, and we hope to incorporate their constructive feedback in *Policy Outlines for a Nuclear Phaseout*, a final report scheduled for publication in March 2014.

### 0.1 The severity of the Fukushima disaster: ten characteristics of the Fukushima nuclear accident

The nuclear accident at Fukushima Daiichi Nuclear Power Station caused by the Great East Japan Earthquake of March 11, 2011 has caused damage on an unprecedented scale. The following ten points describe the key characteristics of the tremendous damage inflicted by this accident.

1. Seismic-nuclear disaster – a complex disaster became a reality.
2. Multiple reactor unit explosions resulted in widespread and severe radioactive contamination.
3. Many nuclear accident-related deaths occurred.
4. Many individuals are being exposed to radiation and experiencing health effects.
5. Inland areas suffer serious radioactive contamination.
6. The marine environment suffers serious and expanding radioactive contamination.
7. Stabilisation of the situation is not on the horizon.
8. Stabilisation of the accident requires a large number of workers who are inevitably exposed to radiation.
9. Financial losses alone are totalling hundreds of billions of dollars.
10. Various forms of social conflicts and divisions have arisen.

## 0.2 The case for a nuclear-free society

Since its initial development in the 1950s, great expectations have been placed on nuclear power generation for its capacity to supply energy at extremely low costs. Under the nationwide expansion plan, operators greatly benefited from the protection and political support of the central government. These generous provisions followed from the fact that the development of nuclear power was aligned with Japan's economic, political, and diplomatic motivations. Yet despite government support, nuclear power remained a high-risk venture for power companies due to several economic and managerial shortcomings, including risk of severe accidents, treatment and disposal of nuclear waste, and huge capital investments. Through a comprehensive evaluation of policy options, it becomes clear that Japanese society should choose to enact legislation to abolish nuclear power. However, before opting to abolish nuclear power it is imperative to examine whether this would create possible power shortages and whether the added cost of alternative energy systems would be socio-economically viable. In the late 2000s, nuclear energy accounted for around 10% of Japan's total supply of primary energy and it is expected that energy consumption will naturally decline in the future due to population decline. Furthermore, there is considerable potential for expanding both energy efficiency and renewable energy, and this will go hand in hand with fostering a sense of empowerment and self-determination in citizens by firmly placing energy production and consumption decisions in their hands. All things considered, achieving a nuclear-free society will not be as challenging as it may at first appear. It is clearly necessary to advocate for a nuclear phaseout.

## 0.3 Creating the political conditions for a nuclear phaseout

Several stages can be observed in the recent German history of adopting nuclear phaseout policies. The first was that political parties in favour of a nuclear phaseout took office and enacted relevant laws. The second was that even the government of Prime Minister Merkel, which once opted for extending the life span of the country's nuclear power plants, quickly reversed these plans immediately following the Fukushima disaster.

In Japan the key political conditions for achieving a nuclear phaseout are the formation of a political regime determined to seek a nuclear-free future and tenacious adherence to nuclear phaseout oriented policies. However, any future regime aiming to phase out nuclear power will need to neutralise and overcome three key political obstacles. First is the resistance of special interest groups fully entrenched in the political structure and the centralised administration governing nuclear power in Japan. The second obstacle is the alliance between Japan and the United States, and particularly the latter's insistence that Japan continue to rely on nuclear power for both politico-economic and techno-developmental reasons. The third obstacle is the resistance from the local governments that host nuclear power plants and nuclear processing facilities. Whatever the difficulties, Japan must overcome these three obstacles and achieve a nuclear energy free society. The devastating experience of the Fukushima nuclear accident demands that Japan play this role in the international community.

### 0.4 *Policy Outlines for a Nuclear Phaseout* – process from here to the Final Report

Since nuclear power generation has tremendous impacts on individuals and society, nuclear power related decisions must be conducted in a way that reflects the consensus of the people. However, decisions on nuclear power policy in Japan have been overwhelmingly led by individuals and organisations directly involved with nuclear power development. Nuclear policy decision-making has to be fundamentally re-structured, and the Citizen's Commission on Nuclear Energy aims to incorporate the views of a broad array of citizens' voices into nuclear phaseout policies. To that end, not only science and technology, but also the viewpoints of the humanities and social sciences need to be incorporated. Moreover, in order to design policies on the basis of accurate scientific knowledge, it is important to ensure the autonomy of 'science forums'. It is also imperative to be aware of the domain of "trans-science", i.e. questions that cannot be answered with science alone but which must be to left to public opinion.

Technological and economic rationality has so far been the main criterion of debate on nuclear policy. By contrast, we propose that policies ought to be evaluated in the light of the following four criteria. Together, these four criteria make up what can be referred to as "social reasonability"

1. Safety: avoiding the health impacts of radiation and environmental pollution should be the top criterion.
2. Social Equity: it is desirable for benefits and burdens to be evenly distributed both spatially and temporally across generations.
3. Fairness: all stakeholders have the right to voice their opinions and the right to take part in decision-making; disclosure and sharing of information are also essential.
4. Sustainability: the current system of production and consumption requires moderation and we should not pass the accumulation of pollutants and resource depletion on to future generations.

As the late Jinzaburo Takagi, renowned nuclear chemist who warned us of the danger and the unethical nature of nuclear power, once pointed out, "we must make the possibility of absolute destruction absolutely zero." The prerequisite for securing safety and prosperity in the future must be to apply lessons learned from the Fukushima seismic-nuclear disaster and to choose the path to a nuclear free society.

## 1 The full extent of the damage and restoration of damaged lives

This chapter gives an overview of the disaster triggered by the Fukushima Daiichi Nuclear Accident. It also illustrates the varying aspects of the damage, which is on-going and expanding. It will then discuss potential ways – principles and directions – to rescue victims and restore affected areas. Shortcomings of the current public administration and its policy measures are pointed out. In our research, we attach particularly high value to the following: "freedom from exposure", basic human rights, the

precautionary principle, no underestimation of potential damage, thorough investigation of all who are involved and of onsite situations, and the need for legislation. In the course of the possibly protracted process of addressing various disaster-related issues, adhering to these principles will pave the way toward "Restoration of Humanity" in this process.

### 1.1 The reality of the Fukushima nuclear accident and unanswered questions

Prior to the accident, both the government and TEPCO were optimistic in their assessment of the risk from large earthquakes and tsunamis; their lackadaisical attitude resulted in inadequate emergency planning. When the accident occurred, radiation exposure among local residents was inevitably severe, as contingency plans hardly worked at all. The accident was a clear case of a manmade calamity.

In December 2011, the Japanese government declared, "The nuclear reactors are stable". However, the reality was, and still is, different. The accident is ongoing and radioactivity continues to travel beyond the plant site. Workers are forced to struggle relentlessly on site. Inside the reactor buildings, the radiation level is too high to conduct any inspection on important facilities. With situations not allowing investigation on damage caused to equipment and pipe systems, it has been impossible to gather information that could be used to prevent future accidents. In sum, the situation remains grave. Other persisting matters include groundwater influx into the reactor buildings, highly radioactive discharges, and leaks of contaminated water from storage tanks into the groundwater and to the ocean.

### 1.2 The full extent and the nature of the Fukushima nuclear disaster

Underestimation of the harm caused led to delays and cursory countermeasures, and concealing of information is exacerbating anxiety and mistrust among people. Furthermore, a one-sided approach to decision-making in which actual victims are unable to voice their opinions means the effectiveness of the policy measures devised is markedly diminished. Radioactive contamination spread over a wide area is causing physical, social, and psychological impacts. The truth is that the contamination has spread across a wide area and that it will last for an extended period of time. The government does not acknowledge the multi-layered and intricate nature of the damage, and attempts to "restore" the situation by partial measures or compensation. This is only causing even more profound harm to people and communities.

### 1.3 Countermeasures against widespread contamination

At this point, radioactive contamination of the ecosystem has not been examined fully. Further data analyses will be carried out and possible measures considered. The findings will be incorporated into our *Policy Outlines* to be published in March 2014.

Countermeasures will be considered for the following:

1) contamination of forests

2) issues related to the forest industry and forestry products

3) impact on wild flora and fauna

4) contamination of freshwater systems

5) contamination of estuaries and the ocean

Information sharing regarding forests and water systems is lagging. As things stand now, a number of government institutions and research institutions are conducting radiation monitoring, but in a uncoordinated manner. We expect that there will be a need for enacting a fundamental law clearly setting out the aim of radiation monitoring, as well as the establishment and use of a common database to facilitate this.

### 1.4 Protecting health – "the right to freedom from radiation exposure"

Avoiding unnecessary radiation exposure is a fundamental human right. We propose specifically that this right consists of 1) the right to evacuate, 2) the right to avoid or reduce radiation exposure in everyday life, and 3) the right to receive regular medical check-ups and appropriate medical care and consultations.

The annual additional dose of 20 millisievert (mSv/pa) – which is currently set as the threshold for evacuation directives – needs to be reviewed and a new and safer evacuation criterion should be set. People should not be forced to return home until the annual additional dose falls below 1 millisievert (mSv/pa). Necessary compensation and support should be provided until this dose level is achieved.

The Japanese government's claim that doses of up to 100mSv should not be a health concern has no scientific basis. Instead of making such consolatory claims, the following practical measures can and should be taken:

- provide medical and health support to prevent health hazards;
- improve and expand systems for children's radiation detox, such as periodical retreats and short-term school relocation;
- establish long-term health monitoring systems including the issuance of health cards; and
- set, devise and operate systems aligned with the local conditions and needs.

A permanent national institution should be set up in order to provide medical health support to the affected people and to manage various health-related data in an integrated manner.

### 1.5 Food safety and the reconstruction of agriculture and fisheries

Diffusion of radioactive substances across the nation has been jeopardising the sustainability of agriculture and fishery. The belief that "rumor is controlled" by ensuring risk communication and

providing other relevant information is obsolete. It guarantees neither job security, occupational safety, nor food safety. In order to protect farmers from radiation, it is imperative to conduct careful radiation monitoring. Measures regarding food inspection and production management must be strengthened not only in Fukushima but also in other neighbouring prefectures, such as Iwate, Miyagi, Ibaraki, Tochigi, Gunma, and Chiba – all prefectures where radioactive contamination of lands and waters have been verified. Other nation-wide arrangements that should be made include development of a fundamental law on food radiation control and substantial investigation of supply chains.

Further urgent practical measures are the following: conducting multi-layered radiation inspection on food products; creating a database on transfer factors of radionuclides; and advancing radiation measurement, mapping and zoning of farming lands and other environments associated with the primary industry. To induce synergistic effects among these measures, a systematic and long-term approach is desirable. As for radiation measurements carried out voluntarily by citizens, there is a welcome advancement in the establishment of networks and databases, aided by rapid progress in technology. Such data may eventually be used to complement and/or verify data from public inspections.

### 1.6 Support for reconstructing livelihoods and communities

A support system must be put in place to rebuild evacuees' lives. This system must consider the reality that victims face at its core, and be distinguished from indemnity. Measures and policies on this matter must reflect the philosophy embraced in the "Nuclear Disaster Victims Relief Law". However, the basic principles relating to the implementation of this law[1] are flawed, and must be reviewed.

It is harmful to assume that the only way to restore evacuees' life is "early return home". Residents' opinions must be given substantial weight in determining when to lift the "evacuation directives". Any forced lifting of the directives is undesirable. Besides support for individuals, support measures aiming at the restoration of communities and municipalities should also be discussed.

### 1.7 On compensation

The official guideline of the Dispute Reconciliation Committee for Nuclear Damage Compensation needs a thorough review so that it fits the real picture of the damage incurred. The guideline for the Dispute Tribunal simply sets out the minimum conditions for which compensation can be made. TEPCO should be aware of this standard setting and should not reject compensation requests for the reason that the said request is not mentioned in the guideline.

The Nuclear Damage Compensation Dispute Resolution Centre (Alternative Dispute Resolution Centre: ADR Centre) should be independent from the Dispute Reconciliation Committee for Nuclear Damage Compensation. The statute of limitations regarding the Fukushima nuclear accident should be reviewed, or even abolished. (See Chapter 3 for an account of Japan's Nuclear Liability Laws.)

[1] Announced by the Reconstruction Agency in August 2013

### 1.8 Policy on decontamination and waste

Decontamination plans of both national and local government are behind schedule. Moreover, only limited reduction in radiation dose has been observed. Localised decontamination and surface remediation should be seen as being distinct from each other, and the aim, methods, and priority in the decontamination process should be re-examined. Furthermore, the fact that there are decontamination plans should not be used to justify anybody from being denied their "right to evacuate/relocate".

Every effort should be made to reduce radiation exposure of workers engaged in decontamination work. Supervision must be strengthened to monitor illegal acts, including exploitation of salaries by intermediaries through multiple subcontracting. How to store radioactive wastes resulting from decontamination works and where to build such facilities must be discussed with and agreed by concerned regions. Waste from decontamination work should be carried out based on "social reasonability" (see 0.4), and this principle should also apply to the management of any other radioactive waste.

### 1.9 Workers' health management and reduction of radiation exposure

On-site at the Fukushima Daiichi Nuclear Power Plants, approximately 3,000 workers per day continue to engage in demanding operations, exposing themselves to high radiation doses. Over 80% of those workers are subcontractor workers. In the two and a half years since the accident, approximately 30,000 workers have worked at the Fukushima Daiichi. Their collective dose during this period already amounts to as much as 10% of the total collective dose of all workers at all nuclear power plants in Japan over the 40 years prior to the accident. This calculation does not include the doses of people who were most likely exposed to a very high level of radiation during emergency operations in March 2011 – such as fire-fighters, rescue workers, and SDF personnel.

There are multiple problems concerning radiation protection and working environment (safety, health, and employment conditions) of the workers at the Fukushima Daiichi Nuclear Power Plant, and fundamental improvements are necessary in all aspects. On top of all these, it seems that a serious shortage of manpower is currently being experienced and is expected to continue in future, due to the amount of work that is and will be required to bring the situation under control and to decommission the plants. This labour shortage is serious and we demand immediate solutions.

## 2 Treatment and disposal of radioactive waste

This chapter focuses on radioactive waste in general, including nuclear substances associated with the so-called "back end" of the nuclear fuel cycle. If we aim for a society without nuclear power plants, the nuclear fuel cycle policy will be unnecessary and useless. Consequently, spent nuclear fuel, separated plutonium produced through reprocessing, and reprocessed uranium would all become nuclear waste.

Recommendations are also made with regard to the waste resulting from the Fukushima Daiichi nuclear accident, including radioactive substances scattered beyond the premises. However, it does not

deal with policies related to contaminated soil, treatment, and disposal of debris, as they were already covered in Chapter 1.

We define basic principles regarding the treatment of radioactive waste as follows:

1. Minimisation of environmental pollution: to minimise environmental degradation caused by radioactive materials in inland and marine areas.
2. Minimisation of radiation exposure: this includes minimisation of workers' exposure to radiation, as well as minimisation of radiation exposure among the public through environmental release of radioactivity.
3. Minimisation of the burden placed on taxpayers: the burden on taxpayers should be minimised, without compromising the abovementioned principle on minimising radiation exposure.

Based on these principles, this chapter puts forward recommendations on the matters below.

### 2.1 Constructing "forums" for debate and consensus-building

There is a need for different stakeholders to come together, all with a clear sense of ownership, and with the shared premise of achieving a phaseout of nuclear power. Important in this dialogue process are steady efforts to deepen discussion, to decide on measures to be taken, and to build consensus. We recommend creating such a "platform" for building consensus.

### 2.2 Treatment of the Fukushima Daiichi reactors and disposal of accident-derived waste

To manage the radioactive water issue (a top-priority issue at present) an entity taking charge of decommissioning should be established. At the core of this entity should be the Project Management Office (PMO) as is usually the case with large-scale/long-term projects of combined plant construction.

TEPCO is currently discussing a mid- and long-term road map on decommissioning and waste disposal. However, the prematurity of these plans demonstrates the compelling need for a fundamental revision of their approach. An ideal plan would need to be far-sighted, and include measures such as a "sarcophagus" over the reactor buildings.

### 2.3 Change the reprocessing policy

An immediate decision should be taken to stop reprocessing irradiated fuel. Neither should reprocessing be commissioned overseas. Radioactive waste at the Rokkasho Reprocessing Plant should be put in interim storage. Repository sites should be identified based on the principle of fair burden. Measures should be taken to abolish the Rokkasho Reprocessing Plant (Rokkasho Village, Aomori) and the Tokai Nuclear Complex (Tokai Village, Ibaraki). Liquid HLW accumulated to date must be solidified, stored, and managed until disposal methods are agreed upon. In order to minimise radiation exposure during the reactor dismantling process, it is recommended not to aim to rapidly return the sites to greenfield status.

Japan Nuclear Fuel Ltd. (JNFL) should withdraw from the reprocessing business and proceed with the necessary procedures required for debt disposal. The government should clearly indicate that it will shift its policies on nuclear fuel reprocessing and promptly apply all appropriate measures.

### 2.4 Risk reduction for spent nuclear fuel

Spent nuclear fuel (including spent MOX fuel) is currently stored in wet pool storage. However, it should be swiftly relocated to dry cask storage, where the spent fuel will be safely managed until it is disposed of as HLW. Further technical consultations will be required if it is judged that this temporary storage will last for more than a few hundred years.

At the moment, the most reasonable policy would be to make it a basic principle to keep the fuel within the plant site, where the spent fuel originated, and in dry cask storage. Nuclear fuel tax (including tax on spent nuclear fuel), which is a local discretionary tax, should continue.

### 2.5 Plutonium treatment and disposal policy (including pluthermal)

Plutonium should be seen as radioactive waste and its disposal method should be discussed. Plutonium from reprocessing facilities in the UK and France may be exchanged with other radioactive waste. Alternatively, returning it to the respective utilities as contracted could be considered, but only after applying all possible safety measures. Whether MOX utilisation should be allowed as a way of consuming plutonium may be discussed.

### 2.6 Permanent disposal of high-level radioactive waste (HLW)

The Nuclear Waste Management Organization of Japan (NUMO) has led the establishment of the current system concerning permanent disposal of HLW. A new policy framework must be established based on thorough debates involving the entire population. HLW will have to be kept at the current sites for the time being; in the meantime, construction of temporal storage facilities in each plant site should be considered as a practical choice. This is especially cogent from a "fair burden" perspective.

Responsibility of those involved in the production of HLW through the use of nuclear energy must be taken seriously. Time should be taken to find acceptable measures, while advancing research on system designs and other technical matters

*In addition to the issues above (2-1 to 2-6), the final report in March 2014 will also include more detailed elaboration on the matters below (2-7 to 2-10).*

### 2.7 Fast breeder-reactors (FBR)

Plans to develop fast breeder reactors should be abolished immediately. Likewise, the plan to use the prototype FBR Monju as a fast-neutron reactor for the transmutation of long-lived radionuclides should

be abandoned forthwith. Halting basic research using the experimental FBR Joyo should also be considered.

### 2.8 Low-level radioactive waste (LLW) treatment

The most appropriate ways to treat and dispose of various kinds of low-level radioactive waste (LLW) should be clearly indicated, based on the aforementioned three principles.

### 2.9 Treatment and disposal of decommissioned nuclear facilities

In the past, it was conventional to assume that nuclear power plants and other facilities related to the nuclear fuel cycle would be fully dismantled and returned to greenfield conditions. However, hasty implementation of such procedures may have adverse impacts. As such, it is recommended that consideration be given to leaving the facilities as they are for an extended period of time.

### 2.10 Nuclear security and non-proliferation

Nuclear facilities for uranium enrichment and reprocessing, as well as Fast Breeder Reactors (FBR), are inextricably linked to a high risk of diversion to military use. The same applies to nuclear materials, such as plutonium and MOX fuel. All possible measures to protect nuclear facilities and nuclear materials must be discussed.

## 3 Steps to a nuclear-free society

### 3.1 An outline of the steps necessary for achieving a nuclear-free society

Given the Fukushima Nuclear Accident and the many shortcomings found in Japanese civil nuclear policies, Japan – under national consensus - should make it a national virtue to ban the use of atomic energy for power generation and to achieve a society free of nuclear power. A "society free of nuclear power" here means a status where decisions have been taken to decommission all existing nuclear reactors and the process of decommissioning has begun.

In order to achieve a shift towards a sustainable energy system, a Fundamental Law on Energy Shift should be enacted. Further, administrative and financial reform should be carried out with the aim to overcome all the past problems associated with energy policies.

### 3.2 Review of nuclear liability regime

The current compensation scheme for nuclear damage is defective and therefore should be reformed. There is a need for a new system to provide sufficient compensation for the damage caused by nuclear accidents and to provide relief for all the accident victims.

The Nuclear Liability Law should be amended so that nuclear operators are liable for all damage

compensation, thus factoring the risk of nuclear accidents into market calculations.

As for compensation for damage caused by the disaster at TEPCO's Fukushima Daiichi plant, the aim should be full compensation, with aid in the form of active government involvement to deal with the current crisis as an exception.

### 3.3 An energy system for a sustainable society

Existing energy policy should be radically reviewed, with a view to shifting the energy system to one that will lead to a sustainable society.

An energy shift should be strongly promoted through policies concerning both supply and demand sides of power generation. This shift should have the following objectives:

1. **Achieve a total shutdown of all nuclear power plants**: speedily establish a society that can flourish without any nuclear power plants.
2. **Mitigate climate change**: mitigate climate change because of its long-term and catastrophic consequences; bring energy policy in line with long-term measures on global warming.
3. **Achieve energy self-sufficiency (both at the national and regional levels)**: reduce dependence of Japan's energy supply on other countries and achieve national energy security; promote the use of local distributed energy, and strive to achieve energy independence at the local level.

### 3.4 Easing impacts on electricity supply and on the economy

In the course of phasing out nuclear power, appropriate measures should be applied to alleviate short-term impacts on power supply. In order to meet current electricity demand without nuclear power generation, use of fossil fuels has increased. However, it is desirable that serious efforts be made to reduce absolute power demand. To this end, a power-saving plan with clear targets combined with varying electricity prices depending on the consumption rate should be considered.

It is often argued that two factors are pressing the management of electric utilities: increasing cost of procuring fossil fuel, and costs related to nuclear power plants – for maintenance and safety precautions. By phasing out nuclear power, the latter cost will no longer be incurred. Adverse impacts on the economy can be further alleviated with policies promoting electricity saving and the introduction of renewable energy.

To recapitulate, the vision is twofold: on the one hand, power consumption will be curbed with serious power-saving plans; while on the other hand local distributed renewable energy business will stimulate the local economy.

To ease economic impacts on municipalities with nuclear power plants and other affiliated industries, it is important to understand the reasons why those local authorities hosted nuclear power plants in the first place. A good understanding of such matters will be the key to effectively facilitating support

policies that can revive primary industry (agriculture, forestry and fishing), that make full use of resources available in the regions, and that promote local-led energy policy, especially focusing on renewable energy sources.

### 3.5 Decommissioning of nuclear stations and liquidation of electric utilities and related nuclear energy companies

The following proposal is offered in regard to the "decommissioning process" and management issues associated with electric power companies. It is addressed to TEPCO and the eight other general electric utilities[2] operating nuclear power plants in Japan.

Generally, taking responsibility for mismanagement ultimately implies going bankrupt. The electric power industry is a public-utility industry. In Japan, however, private companies have been in charge of this industry. As long as the electric companies are private enterprises, they cannot avoid taking responsibility as private businesses.

Therefore, the responsibility of each party involved in promoting nuclear energy needs to be clarified. Based on this, special legislation should be introduced to facilitate TEPCO's legal liquidation. The government must take responsibility for all remaining matters related to the financial burden, crisis management, and decommissioning.

### 3.6 Nourishing national consensus on a nuclear phaseout

Nuclear policy and energy policy are associated with the most fundamental aspects of people's life. Therefore, any review of these policies requires efforts to bring together the various stakeholders (industry groups, consumer organisations, local governments, civil society organisations (CSOs), experts, victims of the nuclear accident, and the general public).

It is necessary to devise a mechanism that can not only absorb but also incorporate opinions from a wide range of people. Such a mechanism must ensure that public concerns are incorporated in the following four stages: 1) policy discussion and co-ordination; 2) provision of information; 3) organisation of "nation-wide debate"; and 4) a process to reflect the outcome of the "nation-wide debate".

### 3.7 Nuclear export and Japan's global responsibility

Japan should suspend export of nuclear power plants – this is the responsibility Japan bears to the international community. Japan's efforts towards creating a society free of nuclear power must be linked with international efforts to break with nuclear power generation.

The experience of seismic-nuclear disaster at Fukushima must be considered as a worldwide wake-up

[2] Hokkaido, Tohoku, Chubu, Hokuriku, Kansai, Chugoku, Shikoku and Kyusyu Electric Power Companies in respective regional monopoly; In Japan, Okinawa Electric Power Co. alone is nuclear free.

call to re-examine the use of nuclear power. The Japanese government, private corporations, and civil society all have obligations to tell the world about their experience. Japan should give up all plans and negotiations associated with the export of nuclear power plants. Existing bilateral nuclear agreements and safety standards require fundamental reviews.

*In addition to the issues above (3-1 to 3-7), the final report in March 2014 will also include more detailed elaboration on the matters below (3-8 to 3-10).*

### 3.8 Comprehensive review of international treaties and agreements (including bilateral ones)

### 3.9 Utilisation of nuclear reactors other than light water rectors (LWR) (e.g., thorium molten salt reactors (MSR), nuclear fission)

### 3.10 Information disclosure, publicity, and education on the issue of atomic power

## 4 Nuclear safety and regulation

### 4.1 Is nuclear safety achievable? – The role and limits of nuclear regulation

When compared with other technologies, nuclear technology is unique in entailing the risk of large-scale accidents (severe accidents) resulting in widespread radioactive contamination. Hence, the safety (or danger) of nuclear power plants cannot be discussed by probability-based risk evaluation.

The "safest and most secure" option would be to immediately close down all nuclear power plant. We believe that the decision to have or not to have nuclear power plants should be a fair and collective one, with the greatest focus being on safety.

Regulation standards should be based solely on safety. Regulation should mean applying all possible measures with technologies available at any given point in time.

In the case of nuclear power plants, the scale of potential accidents is too vast. As such, any decision to operate nuclear power plants should be accompa nied by stringent regulation criteria.

Lastly, neither "safety" nor "security" is possible without public trust in electric utilities and the nuclear regulatory authority. Transformation of these entities is imperative.

### 4.2 Structural defects in the New Regulatory Standards

Structural defects in the New Regulatory Standards include:

1. Evaluation of the design earthquake was not reviewed, despite the fact that this forms the basis of plant design. Furthermore, "residual risks" do not receive enough consideration (see 4.3);

2. Site evaluation, which examines the appropriateness of nuclear power plant siting, is omitted (see 4.4);

3. It still adheres to "design-basis (DB)" safety standards which only take into account a single failure criterion, as opposed to assuming the case of multiple machines breaking down simultaneously and/or accumulation of successive human errors (see 4.5);

4. Severe accident countermeasures are insufficient. There are no effective measures indicated against potential destruction caused by aircraft crash, terrorism, or wars. Moreover, a five-year deferment period is given to the installation of "specific safety facilities (SSFs)" (see 4.6); and

5. There was no review of NSC's "Regulatory Guide for Reviewing Classification of Importance of Safety Function of Light Water Nuclear Power Reactor Facilities" (August 1990).

### 4.3 Issues related to earthquake-resistance in regulatory requirements

Despite the dire need for strengthening reactor siting requirements, the New Regulatory Standards removed the Governmental Guidelines on Reactor Site Evaluation, which is of utmost importance and therefore used to precede any other evaluation for nuclear power projects.

The New Regulatory Standards no longer mention "residual risks", which recognise severe accidents caused by earthquake ground motions beyond the design basis. They replaced this with "Severe Accident Countermeasures". Changing the regulation for the worse, by shifting the policy from taking into account the "possibility of accidents" to "managing when accidents happen", is unacceptable.

The New Regulatory Standards indicate that inspection should not be conducted while reactors are operating; instead, the reactors should be switched off for inspection. It is also mentioned that a back-fitting system – authorising enforcement of the latest regulatory requirements on already licensed facilities – will be introduced. This must be executed.

Safety evaluation of nuclear power plants must consider residual risks and siting guidelines, and local communities must be able to exercise the right of veto regarding the decision to resume operation of nuclear power stations.

### 4.4 The consequences of not applying site evaluation

The drafters of the New Regulatory Standards decided not to apply "site evaluation" which examines whether the site would "cause radiation injury to the general public living in the vicinity in the case of a large-scale accident" and requires that "In case of a hypothetical accident, the site should not cause radiation disaster." Giving up an evaluation that was formerly applied is an obvious change for the worse.

Instead, it is mentioned that "the discharge of Cesium-137 (Cs-137) will be controlled to be below 100 Terra-Becquerels by installing a filtered venting system." However, this implies that exposure to all other types of radioactive materials (e.g., inert gases, iodine) that are released to the air via the filtered venting system will not be regulated. Site evaluation examining all nuclear substances should be carried out.

### 4.5 The need to reform the 'design basis'

It still has not been fully determined what exactly triggered the Fukushima accident. After ascertaining the cause of the accident, the design basis should be revised accordingly.

The current design basis assumes the most common design basis event to be a loss of coolant accident (LOCA), and requires the introduction of the Emergency Core Cooling System (ECCS), which can only cope with accidents induced by a "breakdown of a single machine". To allow for effective management of cases where accidents are caused by the simultaneous failure of multiple machines or by an accumulation of human errors, suitability of the ECCS requirement should be fundamentally re-evaluated.

Fundamental re-designing of reactor vessels and reactor containers is necessary.

### 4.6 The 'countermeasures against severe accidents' of the New Regulatory Standards will not stabilise the accident

The cause of any severe accident is unknown. Moreover, since what would happen in nuclear disasters caused by catastrophic accidents cannot be ascertained, it is not possible to decide on practical thresholds or methods to be applied to counter such calamities. As such, there is no guarantee that the new safety standards would successfully stabilise the reactors and contain radioactivity.

At the Fukushima Daiichi Nuclear Power Plant, core meltdowns of all three reactors could not be prevented. Once in core meltdown, it becomes extremely difficult to know the situation inside the nuclear reactors and containment vessel, and preventing further development of the accident becomes very challenging.

The standards do not set any requirements to counter Beyond Design Basis Accidents (B-DBA), caused by beyond design basis earthquakes or tsunamis. Much more thorough countermeasures should be devised so that damage caused by large earthquakes and tsunamis can be minimised.

It is wrong to rely on filtered venting systems in reactor buildings to suppress radioactive discharge.

Appropriate measures are required for potential aircraft crashes and subversive activities.

Setting a five-year deferment period for specific safety facilities (SSFs) and filtered venting system for pressurised nuclear reactors goes against the safety principle. They should be installed immediately.

### 4.7 The unreliability of technologies related to nuclear power plant operations

Gauges that can resist the environmental conditions of severe accidents are indispensable. The types of gauges that are most pressingly needed include Reactor Vessel Level Indication System (RVLS) and thermometers inside and outside of reactor pressure vessels – all of these became dysfunctional during the Fukushima Accident.

To enhance reliability of power supply systems, it is recommended that either external power sources with the highest seismic resistance be prepared, or emergency power source systems be diversified so that at least one is always operational.

### 4.8 Problems with contingency planning and the range of local governments that should be involved in siting and restart decisions

All local municipalities within the UPZ of 30km radius should be consulted on matters such as power plant siting and operation of nuclear reactors; and decisions should not be made without their consensus.

Nuclear Disaster Control Guidelines should be fundamentally reviewed, placing at their core the reduction of radiation exposure among residents in disaster situations. The possibility of a seismic-nuclear disaster – nuclear accidents induced by large natural disasters like earthquakes and tsunamis – must be incorporated in the Guidelines and relevant municipalities should objectively and realistically re-evaluate the feasibility and effectiveness of the contingency plans.

### 4.9 Ageing reactors and the controversy over life extensions

Under the revised "Nuclear Reactor Regulation Law", the operation life-time of nuclear reactors is limited to 40 years. However, the law is such that the reactors can be given a one-time legal permission to extend their operation for another 20 years when the Nuclear Regulation Authority (NRA) standards are applied. This is a *de facto* watering down of the law. We recommend that nuclear reactors be decommissioned after 40 years of operation with no extension and without exception.

"Special inspections" to be implemented in applying for the abovementioned extension are designed so that existing reactors would be positively assessed. In other words, the standards are biased towards electric power companies. Life extension of reactors must not be based on such partial "special inspections".

### 4.10 Nuclear regulation and judicial review

Nuclear regulation and judicial review should be based on the shared understanding that severe accidents like the Fukushima Nuclear Accident must never be repeated. Any decision taken must also recognise that there is ample room for improvement in regard to the issues raised above (4.3 to 4.7).

Nuclear facilities are high risk facilities and the potential damage resulting from severe accidents is

vast. Further, our knowledge on security precautions is far from impeccable. Therefore, due consideration should be given to minority viewpoints. When risk cannot be eliminated, instalment or operation of nuclear facilities should not be allowed.

As for the safety of nuclear power plants, the ultimate burden of proof must be borne by the government and electric power companies.

### Conclusion of Chapter 4

Piecing together the arguments presented in this chapter, it is clear that resuming the operation of nuclear reactors under the current nuclear regulation is out of the question. Moreover, considering the risk associated with nuclear technology, we believe that there is only one path to choose – the path towards immediate nuclear phaseout. "Safety" precedes everything.

## Coda

We hope that this Interim Report will serve as a catalyst for generating opinions and comments from people from various fields, thereby giving us the basis on which to finalise the report *Policy Outlines for a Nuclear Phaseout* by March 2014. To that end, in the months to come, we will be extending our activities to hosting discussions and briefing sessions, enhancing our data archive, and fostering cross-border dissemination and exchange of information.

## Acronyms

| | |
|---|---|
| B-DBA | beyond-design-basis accident |
| Cs-137 | cesium-137 |
| CSO | civil society organisation |
| DB | design basis |
| DBA | design basis accident |
| ECCS | emergency core cooling system |
| FBR | fast breeder-reactor |
| HLW | high-level radioactive waste |
| JNFL | Japan Nuclear Fuel Ltd. |
| LLW | low-level radioactive waste |
| LOCA | loss of coolant accident |
| LWR | light water rector |
| MOX | mixed oxide (i.e., mixture of plutonium oxide and uranium oxide) |
| MSR | molten salt reactor |
| NSC | Nuclear Safety Commission (of Japan), predecessor of NRA |
| NRA | Nuclear Regulation Authority (of Japan) |
| NUMO | Nuclear Waste Management Organization of Japan |
| PMO | project management office |
| RVLS | reactor vessel level indication system |
| SDF | Japan Self-Defense Forces |
| SSF | specific safety facilities |
| TEPCO | Tokyo Electric Power Co., Inc. |
| UPZ | urgent protective action planning zone |

# Table of Contents of the full report