Proposed Changes in Regulatory Framework in Japan

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Messages for One Year Later

- We would like to extend our deepest gratitude to kind support and warm heated messages to our people who have suffered from the large scale tsunami and earthquake.
  - A total of **16,140** people have died and **3,123** people are still missing, as of Feb. 14, 2012.

- We also sincerely appreciate continued support from the countries around the world for coping with the nuclear accident and also for the people still suffering from land contamination.

- Based on the lessons learned from the accident, we will construct a system pursuing **continuous improvement** of safety.
Contents

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- Brief Description of Fukushima-Daiichi Accident
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- Summary
Current Status

- On Dec. 16, 2011, the government declared the **accident condition had ceased** at Fukushima-Daiichi NPP.
  - Leaked and accumulated water from RPVs and CVs is being injected back to RPVs. Stable core cooling has been established.
  - All the temperatures measured at RPVs / CVs became well below 100°C.
- **Stress test** is in progress:
  - Only **2 units** are in operation, while the rest of 52 are in shutdown.
  - The stress test is a necessary condition for restarting.

- Reform of regulatory organizations:
  - On Aug. 15, 2011, the cabinet made decision to create a **new regulatory body in April 2012**.

Current Status: Land Contamination

### Current Status:

**Cs134 and Cs137 deposition on the ground surface**

- **Evacuation Area (March 12-15):**
  - Fukushima Dai-ichi
  - Fukushima Dai-ii
  - Iidate

- **Evacuation Prepared Area (in case of Emergency):**
  - Area Number of people
    - Evacuation area: About 78,000
    - Deliberate evacuation area: About 10,000

Source: IAEA Ministerial Conference on Nuclear Safety, June 2011, Vienna

Source: MEXT [http://radioactivity.mext.go.jp/ja/]
Taken place at 14:46 on March 11, 2011
- Magnitude: 9.0 Mw
- Epicenter: 38° 10’N and 142° 86’E, 23.7km in depth
- Reverse fault type: Several faults moved jointly near the Japan Trench

Observed max. acceleration of seismic ground motion at Fukushima-Daiichi exceeded that of the design basis earthquake by 25% at highest.

http://www.kantei.go.jp/foreign/kan/topics/201106/iaea_houkokusho_e.html
Damages Caused by Earthquake and Tsunami

- The earthquake caused **loss of offsite power**. All units shut down normally and all EDGs started normally.
- App. 40-50 minutes later, the tsunami struck.
  - Design basis tsunami height: 5.7m ASL
  - Site ground level: 10m ASL
  - Run-up height: ~15 m ASL
- In units 1 to 4, it brought about **SBO** concurrently with **loss of station batteries** and **LUHS**.

Seawater pumps for residual heat removal became inoperable.

**Loss of Ultimate Heat Sink (LUHS)**

http://www.kantei.go.jp/foreign/kan/topics/201106/iaea_houkokusho_e.html
Damages of Reactor Buildings

Source: Digital Globe

Source: ISIS Online

Source: TEPCO
Design Basis Tsunami (DB-Ts):
- DB-Ts was re-evaluated in 2002, but was seriously underestimated.
- New information such as Jyogan Tsunami (869) was not thoroughly considered.
  ➡️ Continuous efforts to reduce uncertainty of tsunami hazard were needed.

Beyond DB-Ts:
- We should have been prepared for DB-Ts being exceeded. Such a risk exists even if the best efforts are made to determine DB-Ts. (preparation for “Low likelihood, high consequence” events)
  ➡️ Protection against dynamic force of tsunami, water tightness of doors, diversity in layout of equipment, etc., were needed to prevent common cause failures (CCFs).

Protection against Severe Accidents (SAs):
- Accident management (AM) measures implemented against SAs were not effective. No AM measures had been taken for spent fuel pools (SFPs)

Emergency Preparedness and Responses:
- Improvement of preparedness (communication, resources, etc.) assuming combination of large-scale natural disasters and prolonged nuclear accident.
- Enhancement of environmental monitoring for emergency
- Clarification of roles / responsibilities between central and local organizations
- many others

Strengthening of Safety Culture:
- We need to ask ourselves:
  ✓ Were we vigilant enough to the plant vulnerabilities?
  ✓ Were we careful enough for new technical findings?
- There’s no “continuous improvement of safety” without “safety culture”.

Source: Report of Japanese Government to the IAEA Ministerial Conference on Nuclear Safety
http://www.kantei.go.jp/foreign/kan/topics/201106/iaea_houkokusho_e.html
AM Measures not Effective

- The **AM measures** have been implemented since **1992** as a licensee’s voluntary activity for **prevention / mitigation** of SAs.
  - **Alternate water injection** by fire protection system, **CV vent** system, **power sharing** between units, etc.

- **PRA** has been applied to identify effective measures for risk reduction. However, **external events such as earthquake / tsunami, have not been considered**.
  - The measures implemented didn’t work due to loss of AC/DC power, etc.
  - **Deterioration of infrastructure** on/off site, **SAs at multiple units**, high radiation dose environment on site, etc. hindered the maneuvers.
  - No training assuming such severe conditions.

- The regulatory review of the AM measures has **not been strict enough** since they have been implemented as a licensee’s voluntary activity.

- It took more than 10 years but the measures implemented were essentially the same as those in the guide issued in 1992 and **had not been improved or upgraded since then**.

Source: Report of Japanese Government to the IAEA Ministerial Conference on Nuclear Safety
http://www.kantei.go.jp/foreign/kan/topics/201106/iaea_houkokusho_e.html
Proposed Changes in Regulatory Framework (1/4)

**Current status:** On Jan. 31, 2012, the cabinet made decision on the bills for new regulatory framework which are now under discussion in the Diet.

### New Organizational Structure

- **The Nuclear Regulatory Authority (NRA)** (name tentative) will be created in the Ministry of Environment (MOE).
  - Authority for decision making on regulation will be delegated to the **NRA Commissioner**.
    - Personnel: ~500
    - Budget: ~700M USD
  - The **Nuclear Safety Investigation Committee (NSIC)** will be created as an organization to oversee the “**regulatory independence**”.
    - Investigation / review of regulatory effectiveness, accident causes, etc.
    - Recommendations to MOE, NRA and other ministers.

Source: Reform of Japan’s Nuclear Safety Regulation, January, 2012
Current Framework

Proposed Changes in Regulatory Framework (2/4)

Cabinet (Prime Minister)

Cabinet office

Ministry of Finance

METI

ANRE

NISA*

NPPs, Wastes, etc.

* independent staffing

MEXT

Research

Reactors, Safeguard, RI, etc.

MOE

Responsible for environment protection

Proposed Framework

Cabinet (Prime Minister)

Cabinet office

Ministry of Finance

METI

ANRE

Safeguard, RI

NISA*

NPPs, Wastes, etc.

* independent staffing

AEC: Atomic Energy Commission, NSC: Nuclear Safety Commission
MOE: Ministry of the Environment
ANRE: Agency for Natural Resources and Energy
NISA: Nuclear and Industrial Safety Agency
METI: Ministry of Economy, Trade and Industry
MEXT: Ministry of Education, Culture, Sports, Science and Technology

Source: Reform of Japan’s Nuclear Safety Regulation, January, 2012
Major proposed amendments to relevant laws:

**<Atomic Energy Basic Law>**

- **Clarification of the objective of nuclear safety:** basically the same statement as “fundamental safety objective” in IAEA SF-1 Fundamental Safety Principles will be stipulated:
  - To protect **people and the environment** from harmful effects of ionizing radiation

**<Nuclear Regulation Law>**

1. New regulation that covers Beyond-DBAs to strengthen protection against SAs (4th layer of defense-in-depth)
   - Implementation of AM measures will be **mandatory by law**.
   - Licensees will be required to conduct “**comprehensive safety assessment for safety enhancement**” periodically, and to report the results to the government and make them open to the public.

Source: Reform of Japan’s Nuclear Safety Regulation, January, 2012
<Nuclear Regulation Law>

2. New regulation based on the state-of-the-art science / technology
   ■ “Backfitting”: The regulatory standards that consider the latest scientific / technical knowledge will be applied to existing facilities.
   ■ “Comprehensive safety assessment” as mentioned
   ■ Specified modifications that obviously make a facility safer will solely need reporting instead of acquiring permissions / approvals

3. Clarification of the licensees’ responsibility to safety
   ■ Licensee’s responsibility to take necessary measures for safety enhancement taking into account latest scientific / technical knowledge will be stipulated.

4. Introduction of “limit of operation” of 40 years
   ■ As an exception, a certain period of operation (<20 years) will be approved just once.

Source: Reform of Japan’s Nuclear Safety Regulation, January, 2012
An Example of Proposed Change: Aging Management

Current legislation

- There is not limit for plant life.
- Requirements:
  - Regulatory annual inspection every 13 to 24 months
  - Comprehensive aging management evaluation before 30 years and every 10 years afterwards

Proposed legislation

- “Limit of operation” of 40 years will be introduced.
- As an exception, one shot extension of a certain period (<20 years) will be approved, only when compliance with the regulatory standards is confirmed.

Source: Reform of Japan’s Nuclear Safety Regulation, January, 2012
In Feb. 2012, NISA released an interim report on “Technical Findings on Fukushima-Daiichi Accident.”

- A total of 30 measures to be addressed to safety regulation (see Appendix A) are identified based on the fact-finding activities.
- These are expected to be the bases for further discussion on technical standards on SAs under new regulatory framework.

Points to be addressed:

- Lessons learned as a regulatory body
  - Lack of system perusing safety enhancement
  - Needs for feedback of latest / overseas knowledge and findings, etc.

- Points to be addressed relevant to regulatory framework
  - Enhancement of defense-in-depth
  - Diversity, flexibility and operability of measures against SAs
  - Enhancement of consistency with international standards and practices

Summary

- New regulatory framework is expected to start in April 2012. The **Nuclear Regulatory Authority** (name tentative) will be created in the **Ministry of Environment**, aiming at “independence of regulatory decision making.”

- One of the focal points is **enhancement of measures against severe accidents**, considering the **external events**. Their implementation will be **mandatory by law**. Discussions have already been started for clarification of **regulatory requirements**.

- One of the most important lessons learned is “**lack of continuous improvement**.” The changes being proposed include basic framework for “**backfitting**” and “**comprehensive safety assessment for safety enhancement**.”

- New framework should work as intended. We need to be open to the world and learn more in order to avoid “**complacency**.”
# Measures that Should Be Addressed to Regulation Identified in NISA Report in February 2012

## Appendix A

### Offsite power supply
1. Enhancement of reliability of offsite power supply
2. Improvement of seismic resistance of substation
3. Improvement of seismic resistance of switchyard
4. Prompt recovery of offsite power supply

### Onsite power supply
5. Diversification in layout of onsite electric systems
6. Strengthening of water tightness
7. Strengthening of redundancy and diversity of emergency AC power supply
8. Strengthening of emergency DC power supply
9. Installation of dedicated power source to specific facility
10. Making ease of electric supply from outside
11. Stockpile of spare parts of electric systems

### Cooling capability and water supply
12. Enhancement of decision making capability in case of accident
13. Water tightness and diversity in layout of cooling systems
14. Strengthening of ultimate heat sink after accident
15. Improvement of reliability / operation of isolation valves & SRVs
16. Strengthening of alternate water injection capability
17. Improvement of reliability of cooling / water supply function of spent fuel pool

### Measures against containment failure and hydrogen explosion
18. Diversification of heat removal function of containment
19. Measures against over-temperature failure of containment top head flange
20. Reliable transition to alternate low-pressure water injection
21. Improvement of reliability / operability of PCV vent
22. Reduction in influence on ambient environment by PCV vent
23. Ensuring independence of PCV vent line
24. Prevention of hydrogen explosion

### Management and I&C
25. Reservation / Implementation of command post in case of accident
26. Ensuring communication function in case of accident
27. Ensuring reliability of instrumentation in case of accident
28. Strengthening of monitoring function of plant status
29. Strengthening of onsite environmental monitoring in case of accident
30. Establishment of emergency response system and implementation of its training

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<td>(15) Implementation of centralized control of equipment for emergency and rescue team</td>
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<td>Fostering safety culture</td>
<td>(28) Strong initiative to foster safety culture</td>
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Source: Report of Japanese Government to the IAEA Ministerial Conference on Nuclear Safety

http://www.kantei.go.jp/foreign/kan/topics/201106/iaea_houkokusho_e.html
In 1992, the NSC made decision to recommend the industries to implement AM measures as their voluntary activities.

After the Fukushima accident, in Oct. 2011, the NSC canceled the decision statement and showed the basic policy on measures against SAs:

- Strengthening of protection in the 4th layer of defense-in-depth
- Needs to assume the case where the design basis is exceeded.
- Clarification of legal requirements to be implemented
- Safety analysis on SAs: Attention should be paid to low frequency, high consequence events.
- Needs for continuous improvement

CV Venting

- CV vent (non-filtered) has been implemented as an AM measure.
- In Fukushima-Diichi accident, **CV venting** was delayed mainly because AOVs became inoperable due to loss of DC power and compressed air.
  - This caused CV overpressure,
  - → hydrogen leakage from CV to R/B
  - → detonation in R/B in units 1 and 3.

- Proposal from industry: implementation of **filtered vent system** with enhanced operability of valves, etc.

Proposed Changes in Organizational Structure (1/2)

Current Organizations:
- Cabinet Office
- Atomic Energy Commission (Nuclear Security)
- Nuclear Safety Commission
- METI
- ANRE
- NISA

Recommendations to other ministers

New Organization:
- Ministry of the Environment (Minister for Environment)
- Delegation of regulatory decision making to NSSA Commissioner

(NSSIC) Nuclear Safety Investigation Committee (tentative name)
- Separating regulation body from promotion functions
- Unifying relevant functions
- Strengthening of crisis management

(NSSA) Nuclear Safety and Security Agency (tentative name) (Independent budget and staffing)
- Objective, scientific regulation

Review of the NSSA's effectiveness
- Investigation of nuclear accidents

* Ensuring the independence of the regulation by NSSA

Source: http://www.cas.go.jp/jp/genpatsujiko/info/kokusaiws/documentslist.html
Number of staff in Regulatory Authority and TSO

**Regulatory Authority**

- **BMU**
  - About 500
  - Including environmental regulation
  - Land authorities (e.g. Byern)
    - about 50

- **ASN**
  - About 400

- **US NRC**
  - About 4000
    - NRR
    - NRO
    - RES
    - Enforcement
    - Security
    - Region offices etc.

**TSO**

- **GRS**
  - About 450

- **IRSN**
  - About 1700
    - Including tasks other than support to ASN

- **NSSC**
  - About 90

- **NISA**
  - About 380

- **KINS**
  - About 420

- **JNES**
  - About 420

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Appendix F

[Japan Nuclear Energy Safety Organization]