

**Topic 1. International standards and national regulations  
of each Member State**

**Discussion Points**

1. IAEA safety standards are not legally binding for Member States, but Member States incorporate them into national regulations at their discretion.
2. Even if a member state does not adopt all the IAEA safety standards as they are and makes its own standards by selecting requirements to be incorporated according to scientific and technical judgment with each State's concerns, it may not be considered inappropriate.
3. The areas of interest/priorities in regulations differ among Member States, depending on their inherent situations, e.g. the level of concerns on natural hazards, prepared measures of radiation protection, and the situation with neighboring countries which share borders. Therefore, certain contents of the international standards may not be considered applicable or prioritized for some cases.

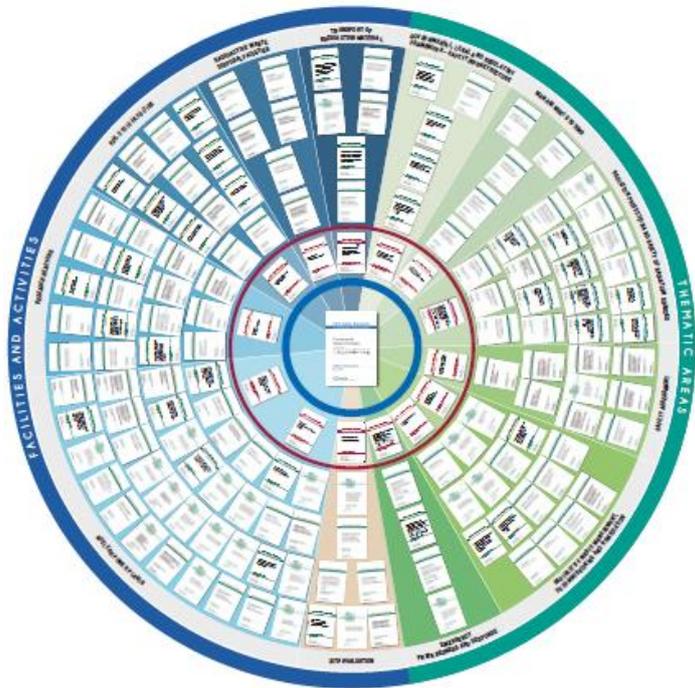
In light of the points above, to what extent should each Member State make their national standards consistent with the IAEA safety standards?

Reference 1

**GSR Part1(Rev.1) Foreword**

The IAEA’s Statute authorizes the Agency to “establish or adopt... standards of safety for protection of health and minimization of danger to life and property” — standards that the IAEA must use in its own operations, and which States can apply by means of their regulatory provisions for nuclear and radiation.

**IAEA Safety Standards**  
 protecting people and the environment



**Safety Fundamentals**  
**Fundamental Safety Principles**



**Collection of Safety Guides**

Source: IAEA website <https://www.iaea.org/resources/safety-standards>

# Topic 1: International Standards and National Regulations

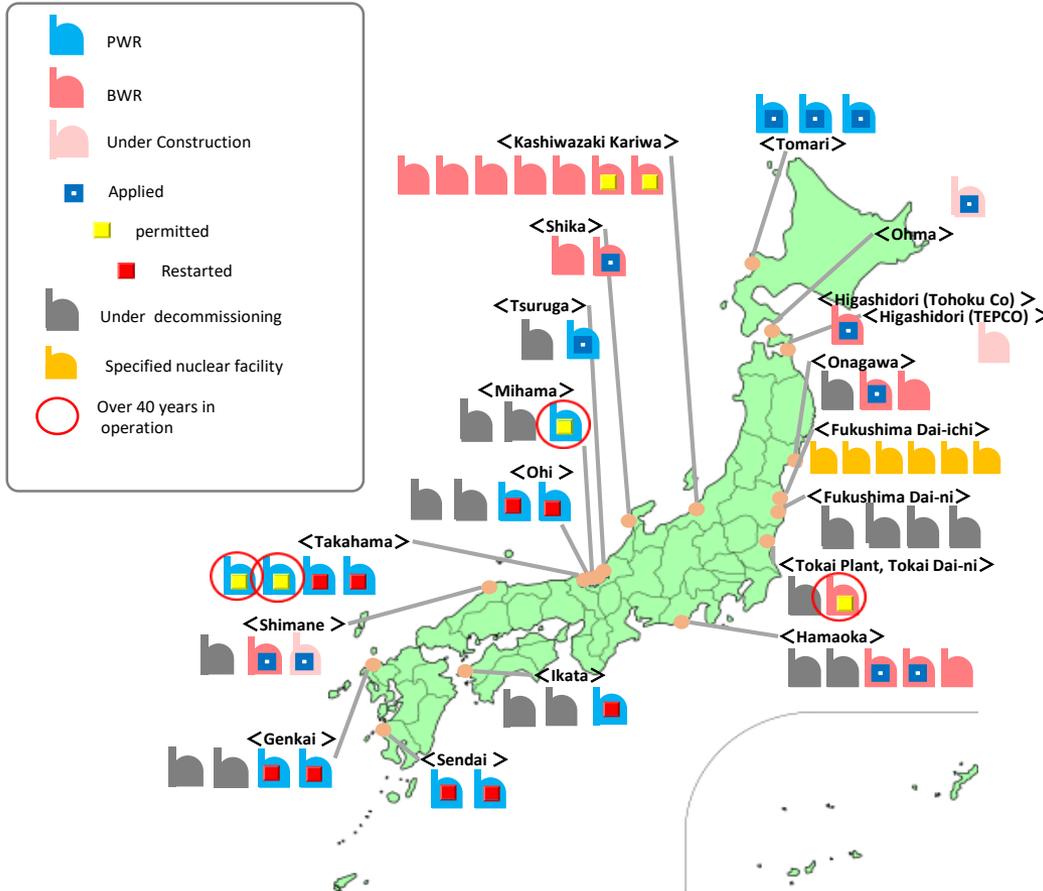
External Advisors Meeting  
November 5, 2019

Shinsuke Yamanaka, Commissioner  
Nuclear Regulation Authority



# Conformity Review (1)

## ◆ Nuclear Power Plants



As of October 2019

Total	60	
Applied	27	PWR 16 BWR 11
Permitted	15	PWR 12 BWR 3
<i>Restarted</i>	<i>9</i>	<i>PWR 9</i> <i>BWR 0</i>
Under decommissioning*	24	PWR 8 BWR 15 GCR 1
Others	9	BWR 9

\* Including Fukushima Daiichi NPPs and other NPPs declared for decommissioning.

◆ Fuel Processing Facilities : Four facilities(MNF, GNF-J, NFI (2)) were permitted.

◆ Rokkasho facilities (JNFL) : Enrichment facility was permitted.

Reprocessing & MOX processing are under review.

# Conformity Review (2)



## ◆ Recent Status of Conformity Review to the New Regulatory Requirements

Facility	Date of Application	Review Status
Tohoku Onagawa 2	27 Dec 2013	<ul style="list-style-type: none"><li>• Geology, Ground Motion, Tsunami, Volcanic Hazards</li><li>• <b>Ground/Slope Stability</b></li><li>• Measures for Design Basis and Severe Accident</li></ul>
Chugoku Shimane 2	25 Dec 2013	<ul style="list-style-type: none"><li>• Geology, Ground Motion, Tsunami</li><li>• <b>Volcanic Hazards, Ground/Slope Stability</b></li><li>• <b>Measures for Design Basis and Severe Accident</b></li></ul>
JNFL Reprocessing	7 Jan 2014	<ul style="list-style-type: none"><li>• <b>Fault Capability, Volcanic Hazards</b></li><li>• <b>Measures for Design Basis and Severe Accident</b></li></ul>
Recyclable Fuel Storage	22 Mar 2016	<ul style="list-style-type: none"><li>• <b>Tsunami</b></li><li>• <b>Shielding</b></li><li>• <b>External Event Impact on Metal Cask</b></li></ul>
Hokkaido Tomari 3	8 July 2013	<ul style="list-style-type: none"><li>• <b>Geology, Ground Motion, Tsunami, Volcanic Hazards</b></li><li>• <b>Principles for Seismic Design and Design against Tsunami</b></li><li>• Measures for Design Basis and Severe Accident</li></ul>

# Conformity Review (3)



## ◆ Recent Status of Other Facilities

Facility	Status
Dry Cask (Dual Purpose Cask for Transport and Storage)	<ul style="list-style-type: none"><li>• Under review of application for installation permit</li><li>• Kyushu: Genkai 3, 4</li><li>• Shikoku: Ikata 3</li></ul>
Monju (FBR)	<ul style="list-style-type: none"><li>• Under decommissioning</li><li>• Removal of fuel assemblies (100 fuel assemblies have been removed from the core as planned for 2019FY.)</li></ul>

# Back-fitting



## Additional Regulatory Requirements and Deadline for Implementation

Items	Date of Enforcement	Deadline for Implementation
Measures against open phase conditions (OPCs) in three phases of electrical power systems	2014 July 9 for Power Reactors 2014 October 29 for Reprocessing	Before restart of operation (No grace period for reactors in operation)
Measures against toxic chemical release	2017.5.1	2 years after enforcement, and before the end of the first Periodic Facility Inspection or before restart operation
Measures against High Energy Arching Fault (HEAF)	2017.8.8	<ul style="list-style-type: none"> <li>- 2 years after enforcement, and before the end of the first Periodic Facility Inspection (except the board connected to EDG).</li> <li>- 4 years after enforcement, and before the end of the first Periodic Facility Inspection (boards connected to EDG).</li> <li>- Before operation start (newly built facilities)</li> </ul>
Measures against the design basis seismic ground motion on the fuel cladding confinement function	2017.9.11	By 2019 Sep 30
Seismic response analysis method for rotating components during and after earthquake	2017.11.15	By 2018 Nov 30
Measures against tephra/ash fall	2017.12.14	By 2018 Dec 31
Measures to prevent over-pressure failure of reactor containment vessel (Containment Vessel Alternate Circulation Cooling Systems in BWR)	2017.12.14	By the end of the first Periodic Facility Inspection, after 2019 January 1, for facilities which have already obtained approval of construction plan before enforcement of this requirement.
Measures to leakage of liquid containing radioactive materials caused by internal flooding	2018.2.20	By 2019 Feb 19
Clarification of requirements for configuration of fire sensors	2019.2.13	5 years after enforcement, and before the end of the first Periodic Facility Inspection or before start operation



**Recent Cases  
in Application of Back-fitting Rules  
-Natural Hazards-**

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**NRA Commissioner  
Akira Ishiwatari**

**External Advisors Meeting  
November 5, 2019**

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# 1 . Basic concepts of back-fitting

## Aiming at “continuous improvements”

- Incorporating the lessons learned from the TEPCO Fukushima Daiichi NPS accident, the Reactor Regulation Act was revised in 2012 and the back-fitting rule was introduced.
- The back-fitting rule is to require existing facilities to adopt the latest knowledge even after obtaining permit and authorization. It contributes to **continuous improvement of safety**.
- Basic mechanism is to incorporate new knowledge into existing regulatory requirements (ordinances and their guides) and require licensees to meet these revised requirements.

## 2. Application of back-fitting rules (1)

- The NRA Commission decides whether a particular newly-identified knowledge should be incorporated into regulatory requirements or not. Also, the deadline of implementation is decided by the NRA, considering points indicated at hearings from licensees and public comments.
- When the regulatory requirements are revised, licensees are required to go through the procedures such as application for reactor installation permit amendment, and refurbishment of facilities as required.
- This process can be described as **back-fitting application of “Rule-change type”**, which were the cases so far.

## 2. Application of back-fitting rules (2)

- The recent cases: when new information or knowledge is identified and found different from the one confirmed during the conformity review, it may be necessary in some cases for licensees to submit application for amendment of Permit even though the requirements are not revised.
- In these cases, unless licensees voluntarily submit application for amendment of Permit, the NRA may order them to take back-fitting measures. Those cases can be called as **“New-knowledge type” (no rule changes)**.
- In **“New-knowledge type”**, the back-fitting implementation is secured with legal authorization of issuing an order of back-fitting

## Case 1: Re-evaluation of the thickness of Daisen-Namadake Tephra

- In light of new findings, the possible volume of Daisen-Namadake Tephra (DNP: “P” stands for “Pumice”\*) was reevaluated and calculated to be approximately 11km<sup>3</sup> (despite 5km<sup>3</sup> at the time of “Permit of installation” granted). The NRA recognized that this DNP volume should be assumed as a possible natural hazard and be used for re-evaluation of volcanic effects on Takahama, Ohi, and Mihama NPPs of Kansai Electric Power Company (KEPCO), the licensee.
- The NRA requested KEPCO to submit an application for reactor installation permit amendment, but KEPCO did not respond to the request. Therefore, the NRA issued an order of back-fitting to KEPCO in June 2019.

\*Daisen Volcano is at about 200 km distance to the west from the three nuclear power stations of KEPCO. DNP eruption took place about 80 thousand years ago.

## Case 2: Tsunami without tsunami warning

- In December 2018, a huge tsunami caused by the volcanic eruption and associated landslide of Krakatau Volcano hit the coast of the Sunda Strait in Indonesia without any tsunami warning.
- The NRA decided that Takahama NPPs, which are placed on the ground only 3 m above the average sea level, must take measures against “tsunami without tsunami warning”, because Takahama NPPs has taken measures in which tide prevention gates will be closed by a tsunami warning so far.
- The NRA confirmed licensee’s intention in writing to submit an application for reactor installation permit amendment, therefore there was no need to issue a back-fitting order.

## Case 3: Measures against tephra (ash fall)

Measures against tephra (ash fall)	Relevant regulatory requirements
<p><b>Background:</b> In response to the comment provided by public for the conformity review documents for Mihama unit 3 regarding the possible influence to intake filter of Emergency Diesel Generator (EDG) by the same density of ash fall as the eruption of St. Helens, NRA requested licensees to conduct evaluation and report its result.</p> <p>Furthermore, based on the report of the Central Research Institute of Electronic Power Industry (CRIEPI), NRA requested licensees to report about the estimated level of density of ash fall in each site.</p> <p>Eventually, NRA set up an examination team to collect the latest knowledge to examine the impact of ash fall.</p>	<ul style="list-style-type: none"> <li>▪ NRA Ordinance for NPPs</li> <li>▪ Review guide of operational safety programs (Power reactor)</li> <li>▪ Review guide of operational safety programs for decommissioning measures (Power reactor)</li> <li>▪ Review guide of measures against ash fall</li> </ul>
<p><b>NRA's action:</b> In order to ensure capabilities to control reactors including shut-down and cooling operation in case of hazardous volcanic activities, NRA amended the requirements stipulating that following measures should be taken:</p> <ol style="list-style-type: none"> <li>1) to maintain function of EDG</li> <li>2) to maintain function of equipment such as alternative power, necessary to cooling reactor</li> <li>3) to set-up organizational function necessary to prevent core damage when Station Black Out (SBO) occurs</li> </ol>	Date of enforcement
	14 Dec 2017
	Deadline of implementation
	By 31 Dec 2018

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# References

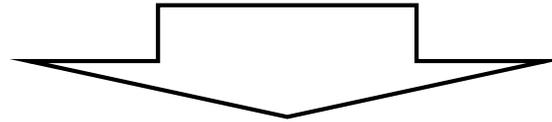
# Case 1: Re-evaluation of the thickness of Daisen-Namadake Tephra (1)

## Legal Framework

The Ordinance on Standards for the Location, Structures, and Equipment of Commercial Power Reactor

(Prevention of damage due to external hazards)

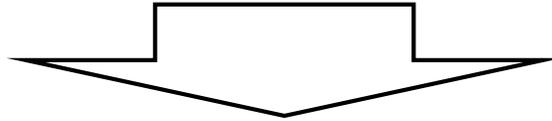
Article 6 Safety systems shall be such that their safety functions will not be compromised in the event of postulated natural phenomena.



The Regulatory Guide of the NRA Ordinance on Standards for the Location, Structure, and Equipment of Commercial Power Reactors

Article 6 Prevention of damage due to external hazards

(2) "Postulated natural phenomena" mentioned in paragraph (1) means flood, wind (typhoons), tornadoes, freezing, precipitation, snow accumulation, lightning strikes, landslides, effect of volcanic activity, biological events, forest fire, etc. expected based on the natural environment of the site.



Application for Amendment to Reactor Installation Permit of Takahama NPS (Unit 1) (excerpt)

(v) The location, structure and equipment of the power reactors and auxiliary facilities

Safety facilities shall be designed not to impair safety functions at NPPs during operation, by having a sufficient safety margin for static load on the structures that are directly affected by volcanic ejecta with maximum thickness of 10cm which is set as a possible volcanic event that are likely to damage safety functions.

# Case 1: Re-evaluation of the thickness of Daisen-Namadake Tephra (2)

## Time Sequence (1/2)

2017

June 14

### 15th NRA Commission Meeting in 2017

Due to the results of safety research by the NRA, a different possibility arose regarding the estimated amount of volcanic ejecta from Mt. Daisen (Daisen-Namadake Tephra), and the NRA ordered Kansai Electric Company to collect information on the extent of DNP.

2018

March 28

### 75th NRA Commission Meeting in 2017FY

NRA Commissioners and Secretariat discussed the results of collected information by Kansai Electric Company, and determined that the maximum thickness of DNP at Koshihata point in Kyoto would be 26cm.

November 21

### 42nd NRA Commission Meeting in 2018

The NRA Commission confirmed that:

- The maximum thickness of DNP at Koshihata in Kyoto is estimated approx. 25cm
- The total volume of DNP is considered more than 10km<sup>3</sup> which exceeds the previous assumption at the time of Reactor Installation Permit amendment.

December 12

### 47th NRA Commission Meeting in 2018

The NRA issued an order of mandatory report on the following items that Kansai Electric Company was to submit by March 31, 2019.

- (1) The possible eruption scale based on volcanic ejecta (DNP) and its thickness at seven inspection points including Koshihata.
- (2) Based on (1), the maximum thickness of volcanic ejecta (DNP) at Takahama, Ohi, and Mihama NPPs based on DNP simulation.

# Case 1: Re-evaluation of the thickness of Daisen-Namadake Tephra (3)

## Time Sequence (2/2)

2019

March 29

### Received a report from KEPCO

Kansai Electric Company reported that DNP and DKP are a series of huge volcanic eruptions and the possibility of future eruption such as DNP is considerably low.

April 17

### 4th NRA Commission Meeting in 2019

The NRA commissioners discussed KEPCO's report and judged that the basic design policy on volcanic activities regarding safety functions of NPPs may be affected by the fact that the maximum thickness of tephra was changed from 10cm (already-approved thickness) to 20cm.

May 29

### 10th NRA Commission Meeting in 2019

The assumed conditions for basic design was clearly insufficient not to impair safety functions in terms of natural event judging from the extent of DNP. However, Mt. Daisen is not an active volcano and its situation is not urgent regarding the possibility of eruption, and the possibility of impact on the facility caused by DNP is not catastrophic. Therefore, the NRA decided that there was no need for immediate suspension of the reactor operation.

The NRA ordered KEPCO to change the basic design policy of the facility and to submit an application for Reactor Installation Permit amendment again. The NRA provided KEPCO with a chance to explain.

June 11

KEPCO replied that they would not give an exculpatory statement.

June 19

### 13th NRA Commission Meeting in 2019

The NRA issued the back-fitting order. Regarding the other reviews and inspections for the facility under back-fitting order:

(1)The conformity to the regulatory requirements are judged based on the conventional assumption on volcanic phenomena until permit for amendment regarding DNP is given.

(2)In granting permit for amendment regarding DNP, a grace period will be established and how to treat other reviews and inspections will be decided.

September 26

KEPCO submitted the applications for Reactor Installation Permit amendment to the NRA.

October 15

Conformity Review meeting

# Case 2: Tsunami without tsunami warning (1)

## Legal Framework

### The Ordinance on Standards for the Location, Structures, and Equipment of Commercial Power Reactor

(Prevention of damage due to tsunami)

Article 5 SSCs for DB(without dry casks for storage and transportation and peripheral facility) shall be such that their safety functions will not be compromised by tsunami which might give large impacts on them in service (hereinafter referred to as "design basis tsunami")

### The Regulatory Guide of the NRA Ordinance on Standards for the Location, Structure, and Equipment of Commercial Power Reactors

(Appendix 3)

Article 5 (Prevention of damage due to tsunami)

1. To determine design basis tsunami specified in Article 5 paragraph (1), choose an appropriate type of tsunami from a seismological perspective on submarine topography, geological structure and seismic activities from the tsunami source area to the vicinity of the facility site based on the latest scientific and technical knowledge.(The rest is omitted.)

2. Determine design basis tsunami in 1 above according to the following guidelines:

(i) Consider the factors shown below that cause tsunami and choose multiple factors that are likely to have a large impact on the facility site. (The rest is omitted.)

- Interplate earthquakes
- Intra oceanic plate earthquakes
- Intralab earthquakes due to active oceanic faults
- Landslides and slope failures on land and on the ocean floor
- Volcanic phenomena (eruptions, sector collapse, caldera collapse, etc.)

### Application for Amendment to Reactor Installation Permit of Takahama NPS (Unit 3) (excerpt)

"Attached document No.6" Selection of design basis tsunamis

As a result of evaluation of tsunami water levels using integrated calculation, the "Combination of the fault near the Wakasa sea hill and the Oki Trough submarine landslide" was selected as design basis tsunami No.1, and the "Combination of the FO-A to FO-B to Kumakawa fault and land landslide" was selected as design basis tsunami No.2., because these combinations are likely to impact massively on the NPP.

# Case 2: Tsunami without tsunami warning (2)

## Time Sequence

2018

December 12

### Tsunami in the Sunda Strait in Indonesia

This tsunami is considered to be caused by volcanic activities (seaward landslide), which reached the coast of the Sunda Strait without any tsunami warning.

2019

January 16

### 53rd NRA Commission Meeting in 2018FY

Takahama NPS implements an operation for closing the intake-channel gate for preventing seawater inflow into the site when a tsunami warning is issued.

Considering this operation, the NRA confirmed to investigate the possible impact of “Oki-Trough submarine landslide” tsunami, as a possible ‘tsunami without tsunami warning’ on the Takahama NPS.

July 3

### 16th NRA Commission Meeting in 2019

NRA commissioners recognized that the above-mentioned tsunami is to be designated as design basis tsunami, and instructed the NRA Secretariat to confirm Kansai Electric Company’s plan. The NRA sorted out its possible impacts on the Takahama NPS as follows:

- When Takahama Units 1 and 2 are not in operation, additional tsunami measures are not necessary (even when Units 3 and 4 are in operation).
- When Takahama Units 1 through 4 are in operation, tsunami measures should be taken.

July 16

### Hearing from the licensee

Kansai Electric Company confirmed as follows:

- (1) To submit the application for Amendment to Reactor Installation Permit of Takahama NPS by September 30, 2019.
- (2) Not to simultaneously operate Units 1 through 4 until the necessary measures are taken after completion of the safety review.

July 31

### 20th NRA Commission Meeting in 2019

The NRA decided how to manage the other reviews and inspections as follows:

- (1) Before approval of this case, the other conformity reviews/inspections to regulatory requirements would be conducted according to the existing knowledge/assumptions.
- (2) In approving this case, a grace period shall be established for completion of reflecting the new knowledge, and the NRA would determine how to treat the other reviews and inspections.

September 26

KEPCO submitted applications for Reactor Installation Permit amendment to the NRA.

October 15

Conformity Review meeting