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Nuclear Regulation Authority

Application of back-fitting rules

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Shinsuke Yamanaka, Ph.D.
Commissioner
Nuclear Regulation Authority

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Basic concept of the application of the back-fitting rules

- NRA is responsible for setting regulatory requirements for prevention of accidents in the use of nuclear energy under the Act on the Regulation on Nuclear Source Material, Nuclear Fuel Material and Reactors (the Nuclear Regulation Act).

- In the Nuclear Regulation Act, new regulatory requirements are to be applied to existing nuclear facilities (so-called "back-fitting").

- For back-fitting, basically, the date of enforcement (deadline of implementation) is set on a day certain time after enforcement of the new regulatory requirements; or moratorium period is placed for transition after enforcement.

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The deadline of implementation for back-fitting (1)

- The following two factors are to be considered for determining the deadline of implementation:
  (1) Safety importance (the risk of moratorium of implementation)
  (2) The time period required for licensees to implement necessary measures

  Then, this deadline of implementation is decided on a case-by-case basis by NRA commissioners when new regulatory requirement is decided.

- In setting the deadline, (1) is the most important and (2) is the secondary factor.

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The deadline of implementation for back-fitting (2)

- Setting certain deadline of implementation, thus setting certain moratorium period, is recognized as an indispensable factor:

  a) to avoid “rigid” discussions such as "introduction of new regulatory requirements" directly leads to "stopping the operation of nuclear facilities until the completion of responsive actions“

  and

  b) to apply the back-fitting system in a reasonable and smooth manner.

  In principle, once the deadline is set, it is to be unchanged regardless of individual circumstances of licensees.

- If implementation is not completed at the time when the deadline has passed, the nuclear facility would fall into the status of “non-conformity with the requirements”. In this case, NRA could order necessary operational safety measures under the Nuclear Regulation Act, which include the suspension of the operation.

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Application of the back-fitting rules after Fukushima Daiichi NPP Accident

- Based on the lessons learned from the TEPCO's Fukushima Daiichi NPP accident, a set of new regulatory requirements entered into force in July 2013. It was the first application of the back-fitting rules under the NRA.

- The new regulatory requirements strengthen measures against large scale natural disasters such as earthquakes, tsunamis, volcanic eruptions, tornadoes, and also set new measures against severe accidents.

- NRA examines conformity of existing plants to the new regulatory requirements upon the submission of applications. If a plant do not meet the requirements, NRA judges that it does not satisfy the preconditions for restarting operation.

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Additional requirements and deadline for implementation

- Even after the new regulatory requirements were introduced, NRA continues to collect the latest knowledge and incorporate findings into the requirements.

- Additional requirements are to be applied to existing nuclear facilities (back-fitting) and the implementation deadlines are decided for each requirement.

Additional requirements and deadline for implementation

Item	Date of Enforcement	Deadline of Implementation
Measures against open phase condition (OPC)	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 gas 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	- 2 years after enforcement, and before the end of the first Periodic Facility Inspection (except the board connected to EDG). - 4 years after enforcement, and before the end of the first Periodic Facility Inspection (boards connected to EDG). - Before operation start (newly built facilities)
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 active 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	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 prevent overflow of radioactive liquid to the uncontrolled area	2018.2.20	By 2019.Feb.19
Measures to fulfill the requirements for fire sensor stipulated in Fire Service Act.	2019.2.13	5 years after enforcement, and before the end of the first Periodic Facility Inspection or before start operation

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The requirements for SSF

- Based on the lessons learned from the TEPCO's Fukushima Daiichi NPS accident, the NRA formulated the new regulatory requirements including SA measures, which came into force in July 2013.

- Under these requirements, it is required to install the Specialized Safety Facility (SSF), in addition to measures using mobile equipment. SSF is a backup measure for further improvement of reliability against serious severe accidents such as the ones caused by deliberate large-scale aircraft collision against nuclear power reactor building.

The deadline for the installation of SSF

- The deadline is set as 5 years from the approval date of construction plan for main facilities while considering that SSF is a backup facility for improving reliability, and that certain time period is necessary for its safety reviews and construction.

- Initially, the deadline was set as 5 years from the enforcement date of the new regulatory requirements for SSF, which was July 2013.

- However, it had been changed because the specifics of SSF needs to be reviewed after the specifics of main facilities are fixed. Since necessary licensing procedures take a long time, the deadline of implementation of SSF is modified to five years from the approval date of construction plan for main facilities.

- The above-mentioned change was formulated after the discussions at the NRA Commission meetings and the public comment process.

Present status of installation of Specialized Safety Facility (SSF)

- As of the end of March 2019, 13 reactors have obtained the approval of construction plan for main facilities. Among them, 12 reactors have applied for the permission of SSF, and among these 12 reactors, 7 reactors' SSF have been approved. In other words, 1 reactor has not yet applied for the permission of SSF (The Japan Atomic Power Company's Tokai-Daini).

- The earliest deadline of SSF is for Kyushu Electric Power's Sendai Unit 1 (March 2020), followed by Sendai Unit 2 (May 2020), Kansai Electric Power's Takahama Units 3 (August 2020) and 4 (October 2020).

- At this point there are no NPPs where the installation of SSF is completed.

- If implementation is not completed at the time when the deadline has passed, the nuclear facility would fall into the status of "non-conformity with the requirements". In this case, NRA could order necessary operational safety measures under the Nuclear Regulation Act, which include the suspension of the operation.

Present status of installation of Specialized Safety Facility (SSF)

As of the end of March 2019

NPPs	Approval date of construction plan for main facility	Permission of SSF		Deadline of SSF
		Application date	Permission date	
Sendai #1 and #2	2015.3.18 (#1) 2015.5.22 (#2)	2015.12.17	2017.4.5	2020.3.17 (#1) 2020.5.21 (#2)
Takahama #3 and #4	2015.8.4 (#3) 2015.10.9 (#4)	2014.12.25	2016.9.21	2020.8.3 (#3) 2020.10.8 (#4)
Ikata #3	2016.3.23	2016.1.14	2017.10.4	2021.3.22
Takahama #1 and #2	2016.6.10	2016.12.22	2018.3.7	2021.6.9
Mihama #3	2016.10.26	2018.4.20	Under review	2021.10.25
Ohi #3 and #4	2017.8.25	2019.3.8	Under review	2022.8.24
Genkai #3 and #4	2017.8.25 (#3) 2017.9.14 (#4)	2017.12.20	Under review	2022.8.24 (#3) 2022.9.13 (#4)
Tokai Daini	2018.10.18	Not yet applied	—	2023.10.17

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reference

Additional Requirements and Deadline of Implementation

Measures against open phase condition (OPC)	Relevant regulatory requirements
Background: On Jan. 30, 2012, Unit 2 at the Byron Nuclear Power Station (NPS) shut down safely after an "open phase" event. The shutdown was caused by unbalanced electrical voltage coming into the plant from the regional electric grid. The plant was not designed, however, to automatically turn off circuits to isolate that offsite power source and switch to emergency backup power. The plant could not detect and also the other 97 US nuclear plants could not have detected the “open phase” condition (OPC). **NRA’s action:** Because the condition could happen in Japan, NRA amended the regulatory guide to stipulate that measures should be taken to detect an OPC on the transformers directly connected from the grid and to isolate the fault circuit or switch the power supply of the emergency bus automatically or manually.	▪Regulatory guide for NRA ordinance on standards (Power reactors, research reactors and Reprocessing facilities) ▪Regulatory guide for NRA ordinance on technical standards (Power reactors, research reactors) **Date of enforcement** ▪2014-Jul-09 for power reactors, research reactors ▪2014-Oct-29 for reprocessing facilities **Deadline of Implementation** Before restart of operation (No grace period for reactors in operation)

Additional Requirements and Deadline of Implementation

Measures against toxic gas release	Relevant regulatory requirements
Background: In 2012, USNRC issued an Information Notice in response to the occurrence of toxic gas leakage within the nuclear power plant which activated the alarm system. In Japan, the former Nuclear and Industrial Safety Agency (NISA) was examining the toxic gas leakage, but the examination was suspended due to the Great East Japan Earthquake in 2011. The requirements of the protection against the toxic gas were not clear even in the new requirements established in 2013. **NRA's action:** NRA amended the requirements to stipulate that equipment should be installed to keep the level of toxic gas in the air within the level of the toxic gas standard, so that operators at main control room (MCR), emergency control room (ECR) and emergency responding center (ERC) can keep ability to operate facilities even when toxic gas is generated.	▪ NRA ordinance on standards (Power reactor and Reprocessing) ▪ NRA ordinance on technical standards (Power reactor and Reprocessing) ▪ Regulatory guide for NRA ordinance on standards (Power reactor and Reprocessing) ▪ Regulatory guide for NRA ordinance on the technical standard (Power reactor) ▪ Review guide of SA (Power reactor and Reprocessing) ▪ Review guide of operational safety programs (Power reactor and Reprocessing) ▪ Review guide of measures against toxic gas release (Power reactor)
	Date of enforcement
	2017-May-01
	Deadline of implementation
	2 years after enforcement, and before the end of the first Periodic Facility Inspection or before restart of operation

Additional Requirements and Deadline of Implementation

Measures against High Energy Arching Fault (HEAF)	Relevant regulatory requirements
Background: USNRC has conducted a case analysis on HEAF events since the early 2000s. In addition, the OECD/NEA set up a working group on HEAF in 2009. The HEAF has been drawing attention around the world as there is a need to develop a method for evaluating the impact of HEAF from the view point of nuclear safety regulators. In Japan, the HEAF occurred too and was accompanied by a fire. There was a possibility that the fire could have spread more damages to the equipment. Therefore, NRA conducted safety research related to HEAF, and the knowledge on prevention of arching fire was obtained. **NRA's action:** NRA amended the requirements to stipulate that measures should be taken to mitigate the consequence of explosion by HEAF, and to prevent the occurrence of arching fire on electrical power boards by applying high-speed circuit breakers that can cut-off arc energy fast enough.	▪NRA ordinance on technical standard (Power reactor and Reprocessing) ▪Regulatory guide for the NRA ordinance on technical standard (Power reactor) ▪Review guide of HEAF **Date of enforcement** 2017-Aug-08 **Deadline of implementation** •2 years after enforcement for non-safety bus in the operating plants •4 years after enforcement for safety bus with EDGs in the operating plants •Before 1st operation for plants under construction

Additional Requirements and Deadline of Implementation

Measures against the design basis seismic ground motion on the fuel cladding confinement function	Relevant regulatory requirements
Background: Before the new regulatory requirements were introduced, 'maintaining their geometric configuration for removal of decay heat was required for a fuel cladding against earthquake'. It became necessary to evaluate confinement function of fuel cladding against earthquake, because the standard seismic motion (hereafter, the standard seismic motion Ss) under the new regulatory requirements has become larger than the past. **NRA's action:** NRA amended the requirements to stipulate that measures should be taken to ensure that the confinement function of the fuel cladding can be maintained even when an earthquake with the standard seismic motion Ss occurs during the normal operation or the anticipated operational occurrences.	▪NRA ordinance on standards (Power and research reactor) ▪NRA ordinance on technical standard (Power reactor) ▪Regulatory guide for NRA ordinance on standards (Power and research reactor) ▪Regulatory guide for NRA ordinance on technical standard (Power reactor)
	Date of enforcement
	2017-Sep-11
	Deadline of implementation
	By 2019-Sep-30

Additional Requirements and Deadline of Implementation

Seismic response analysis method for active components during and after earthquake	Relevant regulatory requirements
Background: During the conformity review, in order to prove that the functional requirements of active components during and after earthquake are fulfilled, the seismic response analysis results need to meet the standard specified in Japan Nuclear Power Plant Seismic Design Technical Guide (JEAG4601). However, during the review for Ohi units 3 & 4 construction plan, it was found out that specific evaluation methods used by the licensee were not presented in JEAG4601 for some active components. **NRA's action:** NRA amended the requirements to stipulate that, in such cases like above, the active components' response to earthquake should be proved not to exceed the standard by implementing an abnormality factor analysis with reference to existing studies.	▪Regulatory guide for NRA ordinance on technical standard (Power reactor) ▪Review guide for seismic design (Power reactor) **Date of enforcement** 2017-Nov-15 **Deadline of implementation** By 2018-Nov-30

Additional Requirements and Deadline of Implementation

Measures against tephra (ash fall)	Relevant regulatory requirements
Background: 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 EDG by the same density of ash falls as the eruption of St. Helens, NRA requested licensees to conduct evaluation and report its result. Furthermore, based on the CRIEPI report, NRA requested licensees to report about the estimated level of density of ash falls in each site. Eventually, NRA set up an examination team to collect the latest knowledge to examine the impact of ash fall. **NRA's action:** In order to ensure capabilities to control reactors including shut-down and cooling operation in case of volcanic activities, NRA amended the requirements to stipulate that following measures should be taken: 1) to maintain the function of EDG 2) to maintain the function of equipment such as alternative power, necessary to cooling reactor 3) to set-up organizational function necessary to prevent core damage when Station Black Out (SBO) occurs	▪ NRA Ordinance for NPPs ▪ Review guide of operational safety programs (Power reactor) ▪ Review guide of operational safety programs for decommissioning measures (Power reactor) ▪ Review guide of measures against ash fall **Date of enforcement** 2017-Dec-14 **Deadline of implementation** By 2018-Dec-31

Additional Requirements and Deadline of Implementation

Measures to prevent over-pressure failure of CV **(Lessons learned from Kashiwazaki-Kariwa (KK) units 6&7 conformity review)**	**Relevant regulatory requirements**
Background: NRA decided that the technical lessons learned from TEPCO KK units 6&7 conformity review should be incorporated to the requirements. **NRA's action:** NRA amended the requirements to stipulate that the licensees should provide following measures: • to install an alternative circulation core cooling system which can reduce pressure and temperature of reactor containment vessel while keeping the confinement function of CV, in order to prevent any damage of CV caused by over pressure in sever accident • to prevent negative effects caused by water vapor which is generated from spent fuel pool • to install blowout panel which can close from the Main Control Room in order to protect operators from radiation appropriately in case of emergency.	▪ NRA ordinance on standards (Power and research reactor) ▪ NRA ordinance on technical standard (Power reactor) ▪ Regulatory guide for the NRA ordinance on standards (Power and research reactor) ▪ Regulatory guide for the NRA ordinance on technical standard (Power reactor) ▪ Review guide of SA（Power reactor） ▪ Review guide of effective evaluation（Power reactor)
	Date of enforcement
	2017-Dec-14
	Deadline of implementation
	By the end of the first Periodic Facility Inspection after 2019-Jan-01

Additional Requirements and Deadline of Implementation

Measures to prevent overflow of radioactive liquid to the uncontrolled area	Relevant regulatory requirements
Background: In the spent fuel pool of Fukushima Daini Nuclear Power Plant No.1 to No.4 in November 2016, internal flooding was caused by sloshing phenomena induced by earthquake and liquid containing radioactive materials flew over water-stop installation into uncontrolled area. **NRA's action:** NRA amended the requirements to stipulate that measures should be taken to prevent leakage of liquid containing radioactive materials into uncontrolled area from tanks, pipes and spent fuel pools.	▪ NRA ordinance on standards (Power and research reactor) ▪ NRA ordinance on technical standard (Power and research reactor) ▪ NRA ordinance on technical standard of construction works (Research reactor) ▪ Regulatory guide for NRA ordinance on standards (Power and research reactor) ▪ Regulatory guide for NRA ordinanceon technical standard (Power reactor)
	Date of enforcement
	2018-Feb-20
	Deadline of implementation
	By 2019-Feb-19

Additional Requirements and Deadline of Implementation

Measures to fulfill the requirements for fire sensor stipulated in Fire Service Act.	Relevant regulatory requirements
Experience: During the inspection of the operational safety program, it was found out that, among different-spec fire sensors installed in the fire area/zone, heat sensors did not fulfill the requirements stipulated in Fire Service Act. **NRA's action:** NRA amended the requirement to stipulate that measures should be taken for all the different-spec sensors to fulfill the requirements for fire sensor stipulated in Fire Service Act.	▪Regulatory guide for NRA ordinance of fire protection **Date of Enforcement** 2019-Feb-13 **Deadline of implementation** 5 years after enforcement, and before the end of the first Periodic Facility Inspection or before start operation

Specialized Safety Facility