原子力規制委員会
Nuclear Regulation Authority

Risk-Informed Nuclear Regulation
Toward Effective and Efficient Regulatory Activities

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Agenda

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01 Third Medium-Term Objectives

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○The Nuclear Regulation Authority establishes five-year regulatory objectives and implements them systematically through its management system.

○Currently, the Third Medium-Term Objectives, adopted in March 2025, are in effect.

Ⅱ. Rigorous and Appropriate Implementation of Nuclear Regulation and Enhancement of Technical Infrastructure

（2）Review of Inspection and Review Experience, Safety Research Results, and the Latest Domestic and International Knowledge

（Policy Objective）

・Advance consideration and preparation regarding methods for utilizing risk information in regulatory reviews and inspections, and promote the use of risk information in applicable areas.

（3）Improve regulatory frameworks and operations to enable effective and efficient regulatory activities commensurate with safety significance through the use of risk information and other relevant insights.

（Policy Objective）

・Promote continuous improvement of regulatory frameworks and activities through proactive application of graded approaches utilizing risk information and insights gained through regulatory implementation, thereby achieving more effective and efficient regulatory activities commensurate with safety significance.

02 Use of Risk Information in Regulatory Activities to Date

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○ Risk information has been referenced in regulatory reviews following the establishment of the new regulatory requirements and in the introduction of the U.S.-style Reactor Oversight Process (ROP).

○ In regulatory reviews, dominant accident sequences are identified based on Probabilistic Risk Assessment (PRA), and severe accident measures are developed and their effectiveness evaluated against those sequences. At some plants, additional sequences have been introduced, including those related to tsunami countermeasures (e.g., Tokai Daini).

○ In inspection activities, PRA results are referenced in determining the significance of findings, similar to the U.S. Reactor Oversight Process.

○ Under the Safety Improvement Evaluation Reporting System, utilities report updated plant information reflecting continuous improvements. Reported risk evaluations include Seismic PRA, Tsunami PRA, Internal Events PRA, and Level 2 PRA results.

Application of PRA in Nuclear Regulation

New Regulatory Requirements and Safety Reviews	Safety Improvement Evaluation	Reactor Oversight Process
【Requirements for Licensees】 ・Conduct plant-specific PRA covering internal and external hazards*1 ・Identify accident sequences and containment failure modes used to evaluate the effectiveness of severe accident countermeasures	【Requirements for Licensees】 ・Conduct plant-specific PRA covering internal and external hazards ・Identify plant vulnerabilities and examine countermeasures	【Licensee Use of PRA】 ・Consider applications of Risk-Informed Decision Making (RIDM) using risk information
【NRA Review】 ・Review the appropriateness of the process used to identify accident sequences and containment failure modes based on PRA	【NRA Confirmation】 ・Confirm PRA methodologies used by licensees and the technical basis supporting them	【NRA Use of PRA】 ・Determine the safety significance of inspection findings using licensee PRA models (Significance Determination Process: SDP) ・Understand plant risk profiles and prioritize inspection activities using component importance information derived from PRA (Risk Information Handbook)

*1 PRA that does not consider severe accident countermeasures

03 Establishment of the Forum on Risk-Informed Regulation

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○Four meetings were held during the past year to exchange views on future discussion topics.

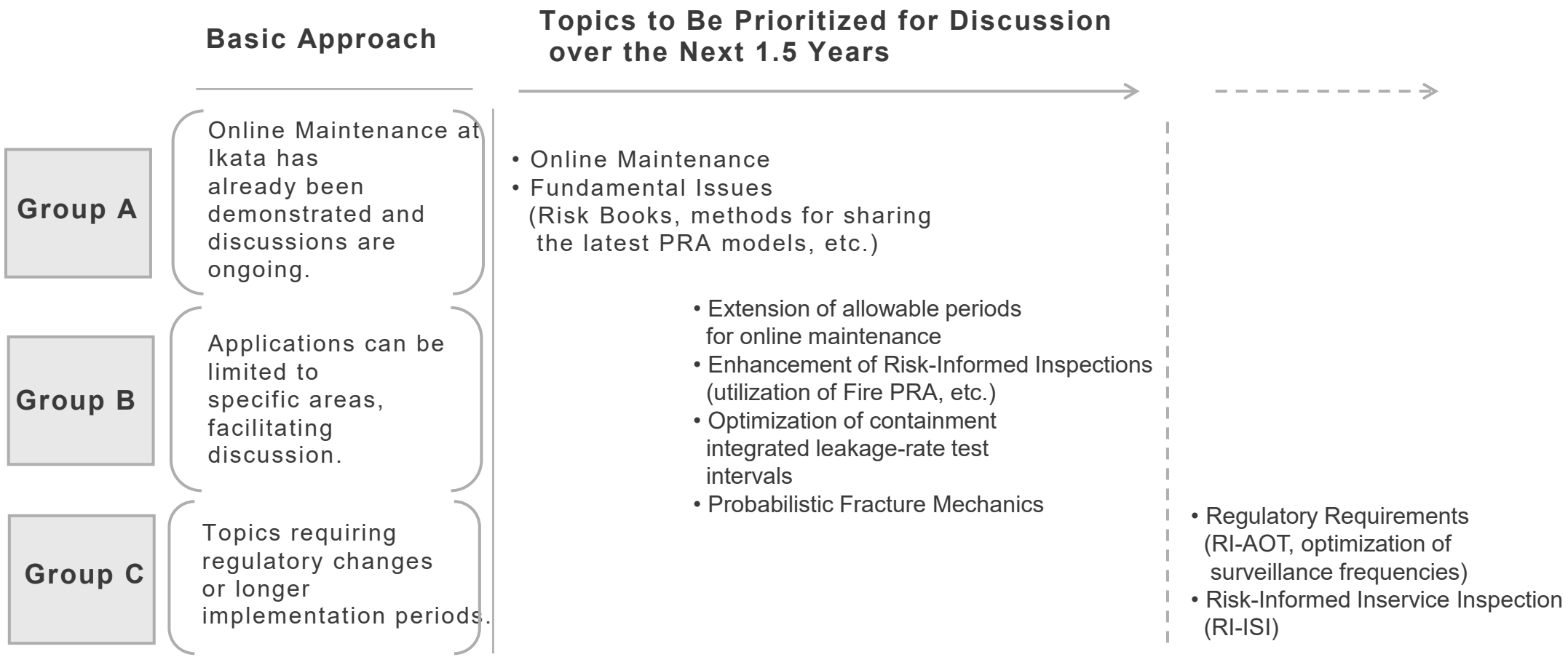
○Although online maintenance had already been under consideration prior to establishment of the forum, it is regarded as one of the expected outputs of the forum.

○Current discussion topics include:
- Probabilistic Fracture Mechanics (PFM)
- Application of Fire PRA
- Development of a common Risk Book to be used by both regulators and operators

○As the adoption of risk-informed approaches has been relatively slow in Japan compared with other countries, priority is placed on accumulating practical experience based on operational needs.

○Meanwhile, discussions between regulators and operators on research-related topics are conducted through technical exchanges on safety research and development, including technical issues associated with PRA.

Topics Proposed by Industry



[Source : ATENA Materials for the Third Forum on Risk-Informed Regulation]

04 Implementation of Online Maintenance

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○ Discussions were initiated in response to proposals from industry in parallel with establishment of the Discussion Forum on the Use of Risk Information.※1

○ Since discussions on paper alone had limitations, pilot demonstrations of online maintenance were conducted with the approval of the Nuclear Regulation Authority.Ikata: two demonstrations (EDG and High-Pressure Injection System)Ohi: one demonstration (CCW Pump)※2

○ Analysis of these demonstrations confirmed that online maintenance can be conducted within the current Allowed Outage Time (AOT) framework. Revision of the review criteria was therefore initiated to clarify the position of maintenance activities during operation.

○ On September 2, 2026, the proposed amendment to the review criteria was approved, and a public comment process is currently underway.※3

*1 Material 2, 57th NRA Commission Meeting, January 29, 20252 3
*2 Material 4, 66th NRA Commission Meeting, March 18, 20264 5
*3 Material 2, 30th NRA Commission Meeting, September 2, 2026

04 Implementation of Online Maintenance

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	On-line Maintenance Guideline (CRIEPI)	1st Campaign	2nd Campaign	3rd Campaign
NPP		Shikoku EPCO, Ikata NPP Unit 3	Shikoku EPCO, Ikata NPP Unit 3	Kansai EPCO, Ohi NPP Unit 3
Target Equipment		Emergency Diesel Generator (EDG) 3B	Load-side Circuit Breaker of High Pressure Injection Pump 3B	3C Reactor Auxiliary Cooling Water Pump
Work Activities		Insulation Resistance Measurement of Auxiliary Equipment Mock-up Cleaning of Air Cooler Interior	Detailed Inspection and Open/Close Test of Circuit Breaker	Lubricating Oil Replacement and Trial Operation
Pre-job Review Meeting	Work Selection Process	Ikata NPP Safety Management Committee	Ikata NPP Safety Management Committee	Risk Review Meeting (1st)
	Work Planning Process	Ikata NPP Screening Meeting		
	Work Preparation Process	Ikata NPP Risk Management Measures Review Meeting	Ikata NPP Risk Management Measures Review Meeting	Risk Review Meeting (2nd)
Risk Management Measures	Work Execution Process	[Protective Measures (Access Restrictions / Work Restrictions)] • Emergency Diesel Generator (EDG) 3A • Emergency Gas Turbine Generator (EGTG) • Air-cooled Emergency Power Supply Equipment, etc. [Measures Required by Operational Safety Program] • Standby Train Startup Test (once every 24 hours) [Others] • Verification of Availability of Redundant Equipment with the Same Function • Emergency Gas Turbine Generator • Air-cooled Emergency Power Supply Equipment • Special Emergency Power Supply Equipment	[Protective Measures (Access Restrictions / Work Restrictions)] • High Pressure Injection Pump 3A • Motor-driven Auxiliary Feedwater Pump 3A • Diesel Generator 3A, etc. [Measures Required by Operational Safety Program] • Standby Train Startup Test (once every 8 hours) [Others] • Functional Recovery Using a Spare Circuit Breaker	[Protective Measures (Access Restrictions / Work Restrictions)] • A, B, and D Reactor Auxiliary Cooling Water Pumps • Large Capacity Pump [Measures Required by Operational Safety Program] • Verification of Operability of Pumps in Other Trains (once every 8 hours) [Others] • Verification of Accessibility Route for the Large Capacity Pump

[Source: Materials of the 66th NRA Commission Meeting, March 18, 2026]

05 Expansion toward Full-Scope PRA

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○ Discussions regarding risk assessments conducted in planning online maintenance referred to the Online Maintenance Guideline developed by CRIEPI.

○ Key features of Japan's post-Fukushima regulatory framework include enhanced protection against natural hazards and strengthened defense-in-depth. From this perspective, reliance solely on Internal Events PRA is not sufficient for understanding overall plant risk.

○ Japanese operators already report the results of Internal Events PRA, Seismic PRA, and Tsunami PRA through Safety Improvement Evaluations.

○ Meanwhile, the NRA possesses pilot models for Fire PRA and Internal Flooding PRA.

○ Regulators and operators should combine their expertise and conduct pilot applications of plant-specific Full-Scope PRA.

○ Knowledge from U.S. NRC Regulatory Guide 1.174 should also be utilized to facilitate a clearer understanding and visualization of risk changes associated with online maintenance.

※NRA, Overview of the New Regulatory Requirements for Commercial Nuclear Power Reactors
NRA, Concepts Behind the New Regulatory Requirements for Commercial Nuclear Power Reactors

05 Expansion toward Full-Scope PRA

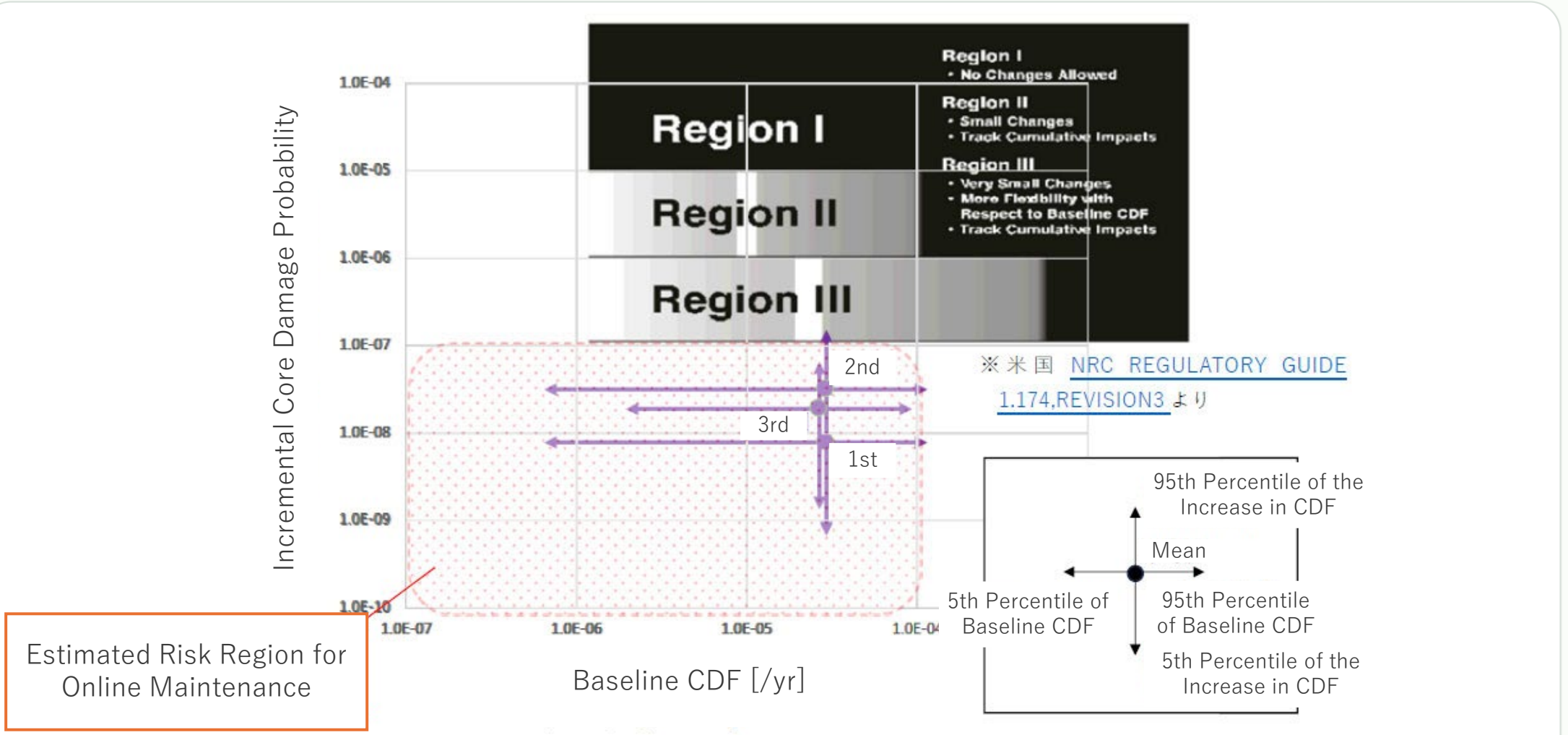


Figure 1. Comparison of Total Full-Scope PRA Results for the 1st through 3rd Demonstration Campaigns

[Source: Materials of the 66th NRA Commission Meeting, March 18, 2026]

○ Confirm the appropriateness of Level 1 PRA methodologies for external hazards such as earthquakes and tsunamis and organize the knowledge necessary for determining the significance of inspection findings.
○ Examine methods for confirming the appropriateness of failure rates established by operators and analytical methods that reduce unnecessary conservatism in PRA.

Regulatory Science Research on Probabilistic Risk Assessment

○ （Short-Term Issues）
- Confirm the appropriateness of Level 1 PRA methodologies for external hazards such as earthquakes and tsunamis and organize the knowledge necessary for determining the significance of inspection findings.
- Examine methods for confirming the appropriateness of failure rates established by operators and analytical methods that reduce unnecessary conservatism in PRA.

○ （Mid- and Long-Term Issues）
- Assess capabilities for integrated risk assessments from Level 1 PRA through Level 3 PRA and examine approaches for resolving challenges related to the use of risk information.
- Investigate international applications of risk information and consider risk metrics suitable for risk-informed regulatory activities.

○Continued Focus on Discussions in the Forum on Risk-Informed Regulation

- Discussions on Probabilistic Fracture Mechanics
- Expansion to Fire PRA and Internal Flooding PRA
- Sharing common Risk Books between inspectors and operators

○Expectations for Full-Scope PRA

- The foundation of Japan's regulatory framework is enhanced protection against natural hazards and strengthened defense-in-depth.
- Full-Scope PRA is essential for obtaining a comprehensive understanding of plant risk.

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Thank you for your attention.