

NEA Nuclear Energy Agency OECD

NEA regulatory guidance report on Defense-in-Depth

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NRC Regulatory Information Conference 2015

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concept used for many years to secure high levels of safety - 5 independent barriers

Level of defence in depth	Plant Status	Objective	Essential Means
Level 1	Normal Operation	Prevention of abnormal operation and failures by design	Conservative design, construction, maintenance and operation in accordance with appropriate safety margins, engineering practices and quality levels
Level 2	Operational Occurrences	Control of abnormal operation and detection of failures	Control, limiting and protection systems and other surveillance features
Level 3	Accidents	Control of accidents within the design basis	Engineered safety features and accident procedures
Level 4	Beyond Design Base Accidents e.g. core melt accident	Control of severe plant conditions in which the design basis may be exceeded, including the prevention of fault progression and mitigation of the consequences of severe accidents	Additional measures and procedures to prevent or mitigate fault progression and for on-site emergency management
Level 5	Significant off site release of radioactivity	Mitigation of radiological consequences of significant releases of radioactive materials	Emergency management and on-site and off-site emergency response



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Fukushima Daiichi Nuclear Accident

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Impact of the Fukushima Daiichi accident

- Raised questions about DiD and its implementation
 - ✓ Implementation to be done more consistently
 - ✓ Importance of independence when implementing DiD at different levels
 - ✓ Rare external site specific hazards should be addressed at all DiD levels
- Concept remains valid, although there are some discussions on the end safety goals
 - ✓ Initiatives are being considered to look at the overall end safety goals considering minimising social impacts

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New outline (September 2014)

1. Introduction
2. Background
3. Structure and Independence of Levels
4. External Hazards and Other Common Cause/Mode Failures
5. Practical Elimination of Significant Early Release
6. Emergency Arrangements and Post-Accident Management Off-site
7. Implementation – Regulatory Use (incl. survey results)
8. Wider Uses of DiD to Secure Nuclear Safety
9. Conclusions

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Survey: Use of DiD by the Nuclear Regulator for Reactors, with particular attention to changes post Fukushima Daiichi Accident

REGULATORY ACTIVITY	(a) DiD USED EXPLICITLY IN THIS ACTIVITY?	(b) RELEVANT DOCUMENTATION	(c) CHANGES IN USE POST FUKUSHIMA (including requirement and implementation)	COMMENTS (including where implicit use of DiD for this activity)
Regulations (with definitive reference to a DiD requirement)				
Guidance, Code of Practice, Principles				
Training of Regulatory Staff and other Agency Staff				
Assessment of Design/Safety Case/Events/etc				
Inspections				
Enforcement /Regulatory decisions				

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STG meeting in February 2015

- ✓ DiD as a complementary tool for design and safety decision making
- ✓ Adequate balance between prevention and mitigation
- ✓ DiD common mode failures: Human and Organizational factors, Fire , Digital I&C
- ✓ Challenges for the use of the “practical elimination” concept
- ✓ DiD level 5: Emergency arrangements
- ✓ DiD use: Existing vs. new reactors
- ✓ DiD use by regulatory bodies: Survey
- ✓ Consistency with IAEA and WENRA efforts

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Way forward

- Green Booklet to be completed in May-June 2015
- Main focus on policy issues
 - ✓ DiD concept and end safety goals
 - ✓ Balance between prevention and mitigation
 - ✓ Adequate attention to site aspects
 - ✓ Convergence on DiD implementation
 - ✓ Closer harmonisation of the application and implementation of DiD : Practical elimination
- Ensure input and consistency with other initiatives (IAEA, INSAG, WENRA, ...)

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Thank you for your attention

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