

International Conference on Topical Issues in Nuclear Installation Safety

21 – 24 October 2013

**Defence in Depth: Advances and Challenges for
Nuclear Installation Safety**

Topical Session 4 Report



IAEA

International Atomic Energy Agency

Topical Session Number 4

List of Presentations

1. Czech Republic, J. Misak, *Defence in Depth: Assessment of Comprehensiveness and Further Strengthening of the Concept*

2. NEA, N. Blundell, *NEA's Plans for Strengthening International Implementation of the Application of Defence in Depth Philosophies in Nuclear Power Countries*

3. China, G. Shi, W. Zhan, Q. Mei, D. Sun, *Technical Insight of the High Level Safety Goal for NPPs Built in China's Thirteenth Five-Year Period (2016-2020)*

4. France, B. de L'Épinois, F. Bouteille, N. Nicaise, *Some Lessons Learnt From the Fukushima Daiichi Accident, as Regards Defence in Depth and its Implementation in New or Existing Designs – an Industry Example*

5. WENRA, L. Reiman, T. Routamo, F. Féron, *Western European Nuclear Regulators' Association (WENRA) Views on Defence in Depth for New Reactors*



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List of Presentations (continued)

6. UK, M W Weightman, *DiD - Applied to the Nuclear System*
7. WANO, J Regaldo, *WANO actions to reinforce the operators safety culture worldwide*
8. IAEA, A Nacic, *IAEA Assistance in helping Member States develop effectively independent and robust regulators for nuclear installations*
9. Indonesia, H Hardiyanti, B Herutomo, G K Suryaman, *Safety culture as a pillar of DiD implementation at the EFEI at Batan*
10. IAEA, P Kenny, J Chaput, *IAEA Response and Assistance Network and the new installation assessment and advice functional area*

Topical Issues

1. Independence in Defence in Depth
2. Concept of Practical Elimination
3. Strengthening Defence in Depth
4. Particular and Practical Issues for Defence in Depth

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Need for additional understanding and implementation concerning of the meaning of independence:

- Amongst and Within Layers
- Effective Independence
- Independence of provisions to secure safety function for a particular hazard/initiating event rather than independence of safety function protection amongst layers
- Difficulties of high level safety objective compared to practical provision

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Need for additional understanding and implementation concerning of the meaning of Practical Elimination

- On one level taken as **Physically Impossible** but how demonstrate (e.g. passive safety)
- Otherwise range of interpretations for the level of protection required and how demonstrate
 - 1 in 1M or 10m years or lower – single event or sum of all events
 - Different views as to whether it means “Regardless of Cost “ compared to reasonably achievable/practical for which cost/time/trouble taken into account for optimisation of degree of protection to reduce risk
- Need simple explanation for stakeholders and consistent understanding and application
- How do we ensure consistent application – range of examples to help
- Is it simply a matter of judgement at the end of the day ?

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Suggestions for Strengthening Defence in Depth

- Subdivide layers – concern that this reduces the universal understanding
- Greater attention to levels 4 & 5
- Balance more towards mitigation
- Greater attention to the independent robust protection of essential safety function capability (e.g. Hardened safety function core concept)
- Greater understanding of the role of safety culture as a key component in DiD
- Greater international cooperation including wider use of international peer reviews and safety review services
- Examples of application

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Particular and Practical Issues

- Greater attention to common mode defeat of several layers
 - Siting
 - DBE
 - Define carefully
 - Include adequate margins
 - Update as knowledge advances
 - Institutional and Cultural Factors – great work of WANO
- Digital I&C
- Dealing with External Events
- Maintenance of Design Defence in Depth throughout life
- Use of Functional Protective Systems in several Defence in Depth layers

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Particular and Practical Issues (continued)

- Taking account of human factors in the emergency response under extreme external event circumstances
- Need for additional safety research to address particular aspects of DiD – hydrogen explosion, loss of coolant, thermal hydraulics
- Enhancing regulatory oversight of the implementation of DiD
- The application of DiD concepts and principles to the Nuclear Safety Institutional system in a member state and its assurance by an additional but joint IAEA/WANO review service and its reporting into CNS review meetings