International Experts Meeting on

Decommissioning and Remediation After a Nuclear Accident

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Session V-B
Fuel Retrieval and Management of Fuel Element Debris
Summary of Findings and Recommendations

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Session Theme

- More that 20 core melt-down accidents have occurred around the world in the last 60 years
- The major among them are TMI, Chernobyl and Fukushima
- Considerable experience of fuel debris retrieval and management is available
- Sharing and documenting this experience and the lessons learned will be useful in dealing with any such situation if it were to happen in future
- This would also be useful for Fukushima, where such activities are planned.

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Papers presented in the session

- Five papers were presented in the session. Three papers dealt with retrieval of fuel debris and the other two with management of the debris after its removal
- Some of the authors were personally involved in these activities and spoke from personal experience and covered the subject in great detail.
- One hour discussion on specific issues followed the presentation

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Key observations and issues.. 1/2

- Irradiated fuel is extremely radioactive and chemically complex. Cooling, shielding and maintaining sub-criticality is essential. Any intervention has the potential risk of re-criticality. The fuel debris also contains large amounts of radio-nuclides, some of them very long-lived. Hence even after a long time, radiation levels are extremely high.
- Each core melt-down accident is different and consequently the resulting debris is different. This is due to differences in fuel composition and quantity involved, structural materials in the core, the extent to which the accident has progressed, the materials added during mitigation, etc.

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Key observations and issues.. 2/2

- In overall scenario of recovery from an accident fuel retrieval and management has little impact. However, successful retrieval of fuel debris and storage or disposal at a safe place away from the NPP site will have a very positive impact on the affected community
- When to take up retrieval of fuel after an accident depends on several issues that are specific to the situation. However from safety angle following factors should be considered
  - Safety of molten core i.e. possibility of criticality, radiological conditions etc.
  - Stability of structures supporting or containing the core
  - Other factors such as accelerated corrosion or self disintegration of the lava as observed in some cases

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Considerations for IEM report Issues identified and lessons learned.. 1/2

- Characterization of core debris is essential before planning any intervention
- Hostile conditions require remote handing technologies and tooling
- Tools should be simple, reliable and adaptable to provide flexibility for surprises. They should also be easy to decontaminate
- Robotic machines should be carefully assessed before deployment
- Adequate shielding, ventilation and lighting is needed for worker safety and comfort
- Full scale mock-ups are needed for testing of tools, validation of processes and training of workers

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Considerations for IEM report
Issues identified and lessons learned.. 2/2

- Appropriate containers are needed for transfer, storage and shipping in case it is planned
- Options for management of retrieved debris include, onsite or off-site storage, or processing for long term storage/disposal
- In-situ storage or entombment could also be an option in some cases

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Other Points to address

Observations pertaining to application of standards and criteria.

- There are no specific standards in this area. Given that each case is unique, such standards may not be needed.

Recommendations for strengthening international cooperation

- Considerable experience is now available in the area of retrieval and management of fuel debris after an accident. Collecting and documenting it is important for knowledge preservation

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Thank you for your attention