

IEM 7 Chairman's Summary

It is now just over three years since the Fukushima Daiichi accident and significant efforts and actions have been undertaken by Member States and other relevant organizations with the common goal of improving nuclear safety and ensuring protection of the people and the environment. The results of these efforts and actions are visible through, for example, the 'stress tests' that have been performed by Member States and discussed in fora such as these international experts' meetings (IEMs) and conferences. Although there appear to be differences in approach taken to these assessments and the priorities for implementation of the results, the work performed by Member States appears to have converged to similar conclusions.

One aspect that has been raised in numerous fora is the need not only to strengthen the efforts to prevent nuclear accidents but also to enhance the mitigation capabilities for events that may lead to a severe accident. One of the lessons identified in the first in this series of IEM on reactor and spent fuel safety was the need to strengthen severe accident management practices, guidelines and regulations to be used by the operating organizations and regulatory bodies. Accordingly, this IEM has been convened to exchange views and ideas on strengthening mitigation capabilities to deal with severe accidents and to consider the lessons learned and further actions to be taken to strengthen severe accident management arrangements.

This meeting was the seventh in the series of IEMs that have been organised by the IAEA in the framework of the Action Plan on Nuclear Safety in response to the action dealing with communication and information dissemination. This action requests that the IAEA organize IEMs to analyse all relevant technical aspects and learn the lessons from the Fukushima Daiichi accident. The previous IEMs were held on the topics of reactor and spent fuel safety, communication, severe natural hazards, decommissioning and remediation, human factors and radiation protection.

The objectives of this meeting were to:

- Share improvements made to severe accident management programmes following the Fukushima Daiichi accident;
- Discuss the appropriate regulatory treatment of severe accident management;
- Discuss how to effectively train and equip operators to effectively implement severe accident management guidelines (SAMGs);
- Identify any knowledge gaps related to the implementation of SAMGs and the ways to fill these gaps;
- Discuss linkages between on-site and off-site response plans during a severe nuclear accident; and
- Identify potential priority areas for research and development.

Approximately 170 experts from around 40 Member States and international organisations gathered during IEM 7 to discuss their views regarding enhancements to severe accident response that are either planned or implemented in Member States. The meeting consisted of 13 keynote presentations, 31 invited presentations, and 22 posters which provided the framework for the constructive deliberations that took place during the 6 panel discussions.

The programme for the meeting contained five technical sessions dealing with the topics of:

- Improvements to Severe Accident Management Guides (SAMGs);
- Equipment and Training Needs for Severe Accident Response;
- Appropriate Regulatory Treatment of Severe Accident Management Measures;
- The link between On-Site and Off-Site Response; and

- Challenges in Severe Accidents and Link with SAMGs.

All the presentations delivered at the meeting are available on the IAEA web site and a report will be published in due course. This summary will form part of that report.

Meeting Summary

- Training

The need for training arose during the discussions in all of the sessions of this meeting. One of the insights from these deliberations is that every organization involved in severe accident management including operators, decision makers, regulators, and offsite responders need to have robust training programs in place. These training programs should take a practical, learn by doing, approach using realistic training aids and allow for an evaluation of their effectiveness. Several specific examples that were highlighted during the week were: (1) the need to train operators and decision makers on the clear understanding of the phenomena involved in severe accidents; (2) the need to train decision makers to evaluate both event and knowledge based situations; (3) the need to ensure that onsite personnel are trained on the use of response equipment; (4) the need to conduct exercises and drills, under varying extreme conditions; and (5) should take into account human and organizational factors.

- Flexibility and resourcefulness in accident management strategies

It was noted that accident management procedures should be designed in such a way that operators are able to respond to the symptoms of a severe accident without the need to diagnose the exact scenario that led to these symptoms. Given how these procedures are designed the guidance needs to enable responders to successfully implement a knowledge based response strategy when needed.

- Strengthening regulatory capabilities

The participants in the meeting made it clear that currently operating NPPs have taken the necessary actions to continue safe operations while regulatory changes for severe accident management are being considered. In this context, regulatory actions that have been taken or that are under consideration include requirements related to command and control, minimum staffing needs, communication capabilities, equipment qualification and staff training. From these discussions it is clear that there should be regulatory requirements related to severe accident management and that regulatory authorities should review licensee developed severe accident management programs and strengthen inspection and oversight activities of severe accident mitigation measures.

- Instrumentation and Control

Two issues associated with accident monitoring instrumentation discussed were, how many variables need to be monitored by this instrumentation during the course of a severe accident, and what environmental qualification requirements should be applied to this instrumentation to ensure that necessary and credible information is available to the operators. From the presentations and discussions during the meeting there appears to be good agreement as to the minimum number of variables that need to be monitored to effectively respond to a severe accident. However there was some discussion around whether it is best to monitor these variables using the normal complement

of plant instrumentation or to install special purpose instrumentation intended for use only under severe accidents conditions. The decision on the approach is also strongly influenced by environmental qualification considerations. There was general agreement that environmental qualification of severe accident mitigation instruments is essential and that this qualification should consider such factors as elevated temperatures and pressures and the high radiation conditions under which these instruments may need to function. It was also emphasized that operators should be trained to evaluate information from multiple indications rather than relying solely on one measurement because of the inherent uncertainty in measurements under the extreme environmental conditions of a severe accident. It is recommended that the availability of information on essential safety parameters is sufficiently redundant so that the information can be accessed at different locations to ensure the effective management of severe accidents, taking into account the extreme environmental and radiological conditions that may prevail.

- Response equipment

While it seems that most Member States have adopted response strategies using a combination of onsite and offsite equipment, there was considerable discussion surrounding how best to ensure that this equipment is available when called upon. Several important points were noted including the previously mentioned need to ensure that onsite operators are trained in the use of response equipment, the need to test the deployment of onsite and offsite equipment during extreme weather conditions and the need to ensure that for multi-unit stations there is sufficient response equipment for each unit. Guidance needs to be developed to establish the best approaches to the management and deployment of this equipment.

- Common operational picture

The need for effective communication between the many diverse organizations involved in a response to a severe accident is essential and some of the communications challenges presented during the response to the Fukushima Daiichi accident were discussed. It was clear from these discussions that emergency planning needs to allow for all organizations likely to be involved to effectively communicate with each other. This will ensure that a common operational picture emerges in which every organization has a good understanding of the accident progression. Severe accident management guides and emergency plans need to ensure that all response teams including operators, technical support centres and emergency responders have a common situational awareness in order to respond effectively.

- Expanded response to a severe accident

In an extreme accident situation many organizations may be called upon to respond that are not necessarily involved in the detailed emergency plans (for example, defence forces). Member states should ensure that all such organizations are identified and have basic guidance on how to respond in such situations. Member states should also ensure that they have provisions to be able to, if required, extend the response arrangements.

- Emergency management organization

Many presentations identified the risk associated with the potential loss of key personnel. Emergency plans and severe accident management strategies should explicitly recognize this risk and make provisions to ensure the resilience of the response teams. This could be achieved in part through cross training and the need for key actions to be confirmed by more than one position.

Concluding Remarks

Throughout the many discussions this week I was reassured by the commitment from the experts to the need for the ability to effectively mitigate severe accidents. This IEM brought together the onsite and offsite response experts who took good advantage of this opportunity to share ideas on how best to further strengthen their ability to provide a coordinated response during a severe accident. It was noted that the IAEA plays a crucial role in assisting Member States to prepare their capability to respond to a severe accident and several suggestions for future IAEA activities were noted as follow:

- IAEA should work with Member States to continue to improve Severe Accident Management provisions by further developing guidance and continuing to encourage the use of the IAEA services;
- IAEA to sponsor benchmarking activities on severe accident management and emergency response;
- IAEA should consider developing guidance for damage control management at NPPs;
- IAEA should assist Member States to better coordinate severe accident management strategies with emergency response.

In conclusion, I am very pleased with the outcome of this week's meeting. The expert's openly shared their views and experience on these very important issues and I am confident with the recommendations developed such as the need for robust training and the need to allow for flexibility in the response strategies. It was also reassuring to see that there was strong support for the need to strengthen the linkages between the onsite and the offsite response communities. I felt that the information that was shared will allow Member States to enhance the robustness of their plans for severe accident mitigation so that we can learn the lessons from the accident at the Fukushima Daiichi nuclear power plant to further improve the safety of NPPs and increase public confidence in the safe use of nuclear energy for the common betterment.