CONCLUDING STATEMENT

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1. INTRODUCTION

The title of the Symposium, "Upgrading The Fire Safety of Operating Nuclear Power Plants" reflects the delegates desire and commitment to continually improve the safety of their Nuclear Power Plants.

Public acceptance of nuclear power is based on the perception that the radiological risks presented by Nuclear Power Plants is small and well managed. However even minor fires with no nuclear safety significance affect this perception and could ultimately threaten the existence of nuclear power programs. Whilst the Symposium has concentrated on the upgrading of Nuclear Power Plants to mitigate the consequences of fires, everyone has recognised the importance of fire prevention.

The papers presented at the Symposium have covered a broad range of topics relating to fire protection and its role in maintaining nuclear safety and have provided a comprehensive view of world-wide developments and practices in analysing fire safety on Nuclear Power Plants, and a simple summary of individual sessions would be insufficient to highlight some of the significant issues which arose.

In concluding the Symposium I have attempted to identify those issues which, from the presentations and discussions, have appeared to be important to the overall achievement of maintaining, and most importantly, improving nuclear safety. Therefore I have concentrated on four topics; Data, Fire PSA, Fire Safety Reviews and the proposed introduction of Performance Based Regulation.

2. DATA

It was recognised that accurate and reliable data provides the basis of both deterministic or probabilistic analyses. A number of data collection initiatives have been described. The motivation behind these initiatives is the need to support the expanding use of Fire PSA and to develop the use of risk-informed, performance based regulation.
Many requirements were discussed, but two have featured prominently, these were the fire initiation frequency and data relating to the reliability and unavailability of both active and passive fire protection systems. The value of data in both areas suffered from the generic problems of inconsistent reporting, incomplete information and the use of different reporting standards.

Several database and data collection initiatives have been highlighted including those from WANO, IPSN, India and the NEIL initiative. Whilst these initiatives had the

common goal of identifying and recording fire incidents, it was recognised that each was different, adopting different reporting criteria and recording different types of fire information. This is not a criticism of the databases as each was set up for a specific purpose, but it has made any comparison or unification of the data difficult.

It has been proposed that fire frequency deficiencies can be overcome by expanding the plant data to include generic data from other countries such as the United States, but it is recognised that the origins of the data needed to be understood and compared against the plant specific conditions before its use. However, this approach may not be appropriate for the data relating to the reliability and unavailability of fire protection systems, where differences in manufacturing, testing, inspection and maintenance standards are significant. It was concluded that this problem could be addressed if each Nuclear Power Plant were to compile its own plant specific data. The development of the IAEA's TEC-DOC on the "Use of Operating Experience in Fire Safety Assessment of Nuclear Power Plants" should prove useful in this task.

No matter which source of data is used in analysis, its use is conditional on maintaining the operational practices and standards applicable to the source of data or at least adopting practices that are judged to achieve an equivalent standard. Failure to do this may invalidate its use.

There would appear to be a need for international collaboration to improve the data available for fire hazard analysis and this was reflected in delegates request for an internationally accepted fire classification, incorporated into either the IAEA's INES or IRS.

3. FIRE PSA

The considerable interest in Fire PSA is reflected in the number of papers presented. Significant advances have been made over the years in the application of probabilistic assessment to fires, and many of these advances have recently been recorded in the IAEA's Safety Report on Fire PSA.

It was reported that Fire PSA has been used to supplement the deterministic fire hazards analysis and that it is recognised as a tool that has the potential to provide valuable insights with respect to weaknesses in the plant design and operation. It allows the identification of dominant risk contributors, the comparison of options for risk reduction and provides a basis for cost benefit analysis.

Ideally the results of the Fire PSA should enable the fire safety engineer to focus on upgrading those aspects of fire safety which contribute to the greatest risk reduction. The results of the Fire PSA may also indicate where it is not reasonably practicable to improve safety further.

However, some delegates drew attention to current limitations on the use of Fire PSA. These included, incompleteness of data, inadequately conceived modelling or mistakes in the screening out of low frequency events. These could produce fictitious results which may obscure the true fire risks, and create a false sense of security. Therefore the application of the method needed care and detailed knowledge of the fire phenomena and

its potential impact on nuclear safety systems. Moreover the scarcity of appropriate data introduces further uncertainty into the results. A number of initiatives are now taking place throughout the world to address these limitations and uncertainties and it is expected that these will feature prominently in the IAEA list of technical issues.

The message appeared to be that the Fire PSA methodology should provide valuable insights into risk contributors but should be used with caution. Because the results of Fire PSA are not testable and are dependent on the analysts knowledge, they should be regarded as input to a decision making process, and judgements on the adequacy of safety levels should also be dependent on compliance with engineering and deterministic safety standards.

In the future, as the utopia of a Fire PSA with no uncertainties is approached, it was anticipated that the technique could be used to refine the deterministic rules to reduce unnecessary levels of conservatism. In the meantime, the use of Fire PSA should not undermine the defence-in-depth strategy or the deterministic engineering approaches that are presently the foundation of regulatory decisions. It should be used in combination with the deterministic methods in a constructive way to identify further cost effective improvements.

4. FIRE SAFETY REVIEWS

The radiological effects of major accidents at nuclear power plants do not respect international borders, and operators of Nuclear Power Plant wherever they are in the world recognise that the risks associated with their Nuclear Power Plants must be adequately managed. It was recognised that it is important to ensure that the management systems and hardware systems, put in place to achieve an adequate level of nuclear safety, are themselves adequately maintained throughout the plants operation.

One of the most effective means of achieving this objective is through periodic fire safety reviews. Some licensing regimes, recognising its importance, require periodic safety reviews and plant and equipment upgrades as technology and knowledge advances and so continually drive risks down. Several examples of the advantages and benefits of independent peer reviews have been presented. Independent peer reviews have been carried out by organisations such as WANO and the IAEA. The Hartlepool Nuclear Power Plant in the UK is currently being peered reviewed by WANO.

A major benefit of such reviews was the bringing together of experts to share knowledge and experience of best international practice with the operating plant personnel and with each other. It was agreed that the scope of the review should be broadened to include an assessment of the management and organisational structure and should not simply concentrate on fire hardware such as fire detection and suppression, as managerial deficiencies have been identified from previous reviews as a significant contributor to the degradation of fire safety.

Self assessment is also possible, and the three IAEA Safety Practices covering different types of fire review should prove useful in this task.

5. PERFORMANCE BASED REGULATION

There was a lengthy debate on the recent USNRC proposal to introduce the principles of risk-informed, performance based regulation of fire protection. The objective of the initiative is to reduce the regulatory burden on licensees by introducing flexibility in fire safety provision in areas where compliance with the prescriptive rules appear to have a marginal affect on nuclear safety. There was general agreement that this approach could be useful.

It was noted that the use of a performance based methodology may allow more cost effective solutions to be developed to the management of fire risk. Consequently, it was agreed that this approach would be more flexible, would allow a quicker response and allow advances in knowledge and technology to be readily adopted. However, it would place a greater reliance on the use of judgement and discretion in the identification of fire safety goals and the development of performance criteria for hardware. A performance based approach also requires validated analytical tools for studies of fire and smoke development and spread.

This approach was not new to many of the delegates as a performance based concept has been applied in considering exceptions to current prescriptive rules.

Most countries, particularly those in the European Community are now adopting a watching brief on the US initiative and are not currently considering any amendments to their current licensing regulations.

6. CONCLUSION

The papers presented at the Symposium covered many and varied topics. They have provided a valuable source of information on safety issues relating to the upgrading of fire safety on operating Nuclear Power Plants, and have described the many upgrading initiatives taking place throughout the world. While this concluding statement has aimed to highlight some of the more significant safety issues, the substance and value of the Symposium is recorded in the detailed papers and in the records of the discussion panels, and these should prove useful to the IAEA in developing it's future programme.

There was obviously a need to address many topics in the advancement of fire safety of Nuclear Power Plants, and many of these issues were identified during the Symposium. Some of them may only be resolved through international collaborations, and the delegates looked to the IAEA to help co-ordinate these.