

## PANEL SESSION: MAINTAINING COMPETENCE

### Panel Chairperson's Summary

#### Current Status

The nurturing of an effective safety culture needs *competent* staff throughout an organization: that is staff who have the necessary *education, knowledge* and *dedication* and who care about safety.

The nuclear industry is facing a situation in which many of the most experienced and knowledgeable individuals have retired or are approaching retirement, while the number of young people embarking on careers in the industry is declining. If the industry is to continue to operate safely, and even grow in the future, it needs not only to replace the lost staff, but also to find ways of retaining the wealth of knowledge and experience accumulated by those staff during their careers, so that it is available to their replacements.

There is a widespread general decline in interest in careers in the physical sciences and engineering. Furthermore, the stagnation or decline of nuclear power in many countries and the often highly negative image of the nuclear industry have together made nuclear science and engineering even less attractive. As a result, educational opportunities available in these fields are declining: fewer universities are offering relevant specialized courses because they cannot attract enough students. In addition to the loss of courses, many of the research reactors associated with these universities are also being shut down.

It was also pointed out that simple question and answer sessions have shown that many present-day operators lack an in-depth understanding of reactor physics and the principles of reactor operation. Without such an understanding there can be no effective safety culture. This emphasises the need for better education.

Although a particular problem has been identified in relation to university education, the need to maintain — and indeed enhance — competence is much more general. True competence requires the fundamental understanding, specialized skills and real world knowledge that come from a proper combination of education, training and experience. Furthermore, competence is needed not only at the level of the professional nuclear engineer, but throughout the whole workforce.

Some countries have historically 'imported' expertise, and many nuclear safety professionals educated and trained in one country have made their careers in another. Given the general trend towards globalization, and the different prospects for nuclear power in different countries, this mobility of nuclear professionals might be expected to increase, and could make a significant contribution to the solution of the problem of maintaining competence by providing an external source of expertise. The prospect of an 'international' career might even attract people to the industry who might not otherwise consider the nuclear field. However, if this international mobility were predominantly in one direction (e.g. from developing countries to developed countries), it could exacerbate the problem of maintaining competence in the countries of origin.

Following the recommendations of an international Advisory Group, the IAEA is modifying the focus of its education and training programmes in nuclear safety. While continuing to only provide a wide range of courses, in parallel they are placing more emphasis on helping countries to build the infrastructure for their own sustainable national education and training programmes and on providing materials to allow countries to organize their own courses in accordance with the IAEA's safety standards.

## **Findings and Conclusions**

The nuclear safety field must find ways to attract more talented young people. To some extent, this may only be achievable by improving the overall perception of the nuclear industry. However, the challenges and opportunities of nuclear safety also need to be presented in a more attractive and exciting way. International networking or exchanges between students and young professionals can help to build enthusiasm.

Measures need to be taken to preserve the 'knowledge base' held by long-serving staff who have recently retired or are approaching retirement, and to transfer it to the next generation. Various methods are available, such as 'mentoring' of young staff by those approaching retirement, or 'archiving' information on various media, but these need to be applied more widely and systematically before it is too late. This must be done at the local level, but the IAEA could help to disseminate information on the different methods used and experience gained. The IAEA could also help to provide guidelines on appropriate methodologies that could be used to capture and organise this information.

Operating organizations and regulators need to systematically identify the core competencies that will be needed to ensure the safety of nuclear installations in the future, and make plans to provide for them. Although operators have the primary responsibility for safety, governments have a role to play in ensuring that the basic infrastructure is available to allow competence to be maintained. The IAEA could help to foster the exchange of national experiences to assist countries in performing this task.

Examples of how this is being achieved include the collaboration between the United States Department of Energy and the power utilities that has resulted, thus far, in eight distinct programmes designed to support departments of nuclear engineering. These programmes will also be expanded internationally. Some initiatives have also been undertaken in the United Kingdom to support the programme at the University of Birmingham.

There is evidence that the decline in numbers of students entering the nuclear field can be stopped and possibly even reversed if operators, regulators and governments co-operate with universities in identifying which courses are needed, in assisting with these courses and in providing some positive encouragement (e.g. bursaries) for potential students..

Research reactors are valuable resources for training and for obtaining practical experience, but many are being lost because of under-utilization. The IAEA could extend the idea of regional centres for education and training by supporting the use of research reactors as 'regional centres'.

Regional centres for postgraduate education in radiation protection are proving to be very valuable and it the IAEA could consider extending this concept to cover education in nuclear and waste safety.

The IAEA's initiatives to promote sustainable national and regional infrastructure for education and training in nuclear safety are welcomed. The quality of educational and training courses is also essential. The IAEA's emphasis on developing 'model' courses that are consistent with its safety standards is a positive development in this regard and should be continued. This approach might also be extended to provide some form of international accreditation system for national educational and training programmes.

## **Main Points**

The following important points emerged from this panel discussion.

- To operate safely, and particularly to have an effective safety culture, it is vital to maintain a high level of *competence* throughout an organisation.
- Education, training and the husbanding of accumulated experience all play an important role in this process.
- For a variety of reasons the recruitment of competent young people to the industry has fallen to a very low level and in some countries this may be reaching the proportions of a crisis.
- It is clear that in the interests of safety, Governments and utilities must play an active role in reversing this trend. This is already happening in some countries such as the United States and to some extent in the United Kingdom in the form of co-operation between utilities, government and universities.
- For nuclear energy installations to continue to operate safely and perhaps even to grow in the future it is essential that these initiatives, as well as other initiatives being undertaken *inter alia* in Japan, Ukraine, Slovenia and South Africa should all be pursued vigorously.
- The IAEA has an important role to play in encouraging and facilitating this process.
- It can assist with the establishment of model curricula, for example for postgraduate education at institutions for higher education. It could play a role in facilitating a process of international accreditation.
- It can assist in the establishment of regional centres both for education and for the effective utilization of research reactors in education and training.
- The IAEA can investigate and disseminate methodologies (possibly "expert systems") for the retention of practical knowledge and experience.
- Finally this is an international problem and the role of the international mobility of experts can play an important role in maintaining competence in the nuclear industry.