

Operational Radiological Protection And Aspects of Optimisation

Ted Lazo, OECD Nuclear Energy Agency, France
Carl-Göran Lindvall, Barsebäck Kraft AB, Sweden

Abstract

Since 1992, the Nuclear Energy Agency (NEA), along with the International Atomic Energy Agency (IAEA), has sponsored the Information System on Occupational Exposure (ISOE). ISOE collects and analyses occupational exposure data and experience from over 400 nuclear power plants around the world and is a forum for radiological protection experts from both nuclear power plants and regulatory authorities to share lessons learned and best practices in the management of worker radiation exposures.. In connection to the ongoing work of the International Commission on Radiological Protection (ICRP) to develop new recommendations, the ISOE programme has been interested in how the new recommendations would affect operational radiological protection application at nuclear power plants. Bearing in mind that the ICRP is developing, in addition to new general recommendations, a new recommendation specifically on optimisation, the ISOE programme created a Working Group to study the operational aspects of optimisation, and to identify the key factors in optimisation that could usefully be reflected in ICRP recommendations. In addition, the Group identified areas where further ICRP clarification and guidance would be of assistance to practitioners, both at the plant and the regulatory authority.

The specific objective of this ISOE work was to provide operational radiological protection input, based on practical experience, to the development of new ICRP recommendations, particularly in the area of optimisation. This will help assure that new recommendations will best serve the needs of those implementing radiation protection standards, for the public and for workers, at both national and international levels.

This paper will provide the practitioner's perspective for the implementation of an effective program of optimisation of worker radiation exposures.

Operational Radiological Protection And Aspects of Optimisation

Ted Lazo, OECD Nuclear Energy Agency, France
Carl-Göran Lindvall, Barsebäck Kraft AB, Sweden

Operational radiological protection focuses very strongly on assuring that exposures to workers and the public are maintained As Low As Reasonably Achievable, or ALARA. While this concept is central to the day-to-day management of exposures, the complex nature of exposures and exposure situations mandates a flexible approach to the implementation of radiological protection actions. The increasing participation of various stakeholder groups in decision-making processes further suggests the need for flexibility to assure the appropriate incorporation of these views. Although philosophy, policy, regulations and guides are necessary as a framework for operational applications, these guiding tools should remain rather non-prescriptive to allow the radiological protection practitioner to appropriately find the optimum option for radiological protection on a case-by-case basis.

In this context, radiological protection professionals are very interested in the current development of new recommendations from the International Commission on Radiological Protection, ICRP. To assist in this development, the NEA / IAEA Information System on Occupational Exposure (ISOE) developed, through its Working Group on Operational Radiological Protection (WGOR) this report. The objective of this work is to remind the international radiological protection community, and the ICRP, of the practical aspects of radiological protection that should be reinforced by any new ICRP recommendations, and to identify areas where further practical guidance would be useful. Several key messages, that are elaborated in the body of the report and supported by practical examples in the report's annexes, have been developed.

In the area of public exposures, it is clear that the objective of radiological protection professionals is to use a process of optimisation to protect members of the public, workers and the environment. Minimisation of dose is not the objective. The ALARA philosophy and the use of Best Available Technology (BAT) are both used in optimising exposures. Within the process of optimisation, it should be remembered that protection options that decrease public exposure at the expense of significant worker exposures are not seen to be ALARA. Collective dose is an effective planning tool for comparing options, but, particularly with respect to public exposures, is not used to assess public detriment.

Worker exposures are also managed using a process of optimisation. Workers themselves contribute significantly to work planning, using their operational experience to improve work efficiency. Worker collective dose is an extremely useful tool for worker exposure management. To effectively manage doses, flexibility is needed for controlling collective dose and for assuring that individuals are equally protected. As such, having an individual dose limit/constraint of 20 mSv/a can be restrictive and can actually lead to increases in collective dose. A key aspect to worker exposure management is the effective empowerment of the workforce. This can result in several positive effects that are closely linked together, including; lower doses, higher safety, higher efficiency, lower costs, and more efficient use of resources. While it should be remembered that national and plant-specific approaches to the implementation of work management practices may differ significantly (responsibility, distribution of tasks, etc.), the objectives of work management can be achieved by many approaches. Work management will include the consideration of many aspects of worker health and safety than simply radiological protection.

The optimisation process, as applied to both public and worker exposures, is inherently judgmental and case-by-case, using quantitative and qualitative approaches. As such, flexibility in guidance for the application of optimisation is needed. Optimisation of dose, below a given dose constraint, focuses on the process, not on the results. As such, the site-specific philosophy for the implementation of optimisation and

ALARA may be equivalent while yielding different results. It would be very useful to have guidance on the types of criteria that should be considered when judging the effectiveness of an ALARA / optimisation programme.

These things being said, however, the application of a generic level, on the order of a few 10s of $\mu\text{Sv/a}$, below which the need for regulatory control, if any, would be reduced, would be welcomed by the nuclear industry. It should be noted, however, that, particularly as these levels would be applied in decommissioning operations, any levels that are eventually chosen for clearance levels, and regulatory requirements for release measurements for verification of compliance with these criteria should not result in excessive worker exposures. Worker exposures should be key elements that are considered when national decommissioning policy is developed.

Finally, the nature of international recommendations implies a certain level of agreement on common approaches. To assure that common approaches leave sufficient national and local flexibility, the level of common approaches and understanding needed to effectively optimise public and worker doses needs to be discussed. One area where the need for guidance is clear is the national and international management of itinerant worker exposures. Here, it is understood that the responsibility for the management and optimisation of worker doses lies at all levels:

- The management and optimisation of worker doses is the responsibility of the worker's employer, however
- The facility causing worker exposure is responsible for optimising all doses received at that facility.
- National regulatory authorities are responsible for monitoring worker doses and their compliance with dose limits.

This being said, expanding the use of practical tools, such as “dose passports”, should be explored nationally and internationally.

In any case, the ISOE programme encourages the open dialogue of the broad radiological protection community on the development of new international recommendations. Because of the broad impact that such recommendations could have on national radiological protection regulations and implementation, it is suggested that any new ICRP recommendations should be reviewed from the legal standpoint, which will probably be necessary at the country level, and for their practical implications BEFORE they are finalised.