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For ISOE Participants

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ISOE Programme Meetings:

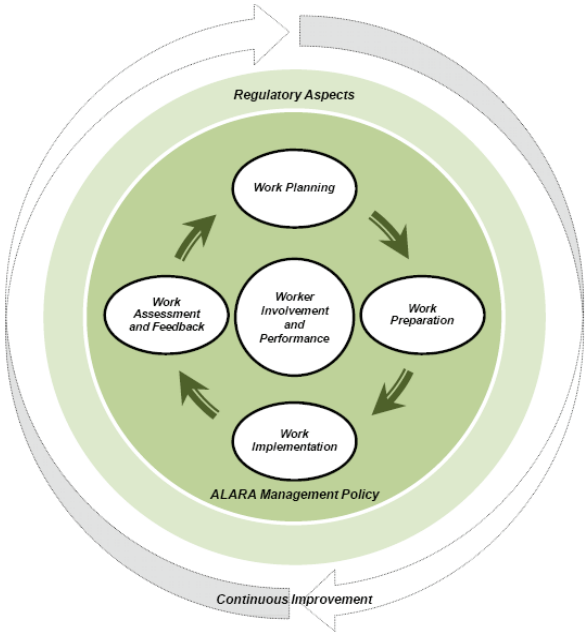
The 2009 mid-year meetings of the ISOE Bureau and Working Group on Data Analysis (WGDA) took place in May 2009 in Paris, France. In addition to reviewing the ISOE programme of work, the Bureau has placed high priority on the renewal of all eligible participants under the current ISOE Terms and Conditions, including promoting the value of ISOE participation directly to nuclear power utilities.

The mid-year meeting of the ISOE WGDA focussed on improving the completeness of the ISOE occupational exposure data, evolution of the ISOE database to better address user needs, including occupational exposure aspects of reactors undergoing decommissioning, finalising the development of web-enabled data entry software, enhancements to the ISOE Network website, and specialised technical analyses from the ISOE technical centres in the areas of occupational radiation protection.

The 2009 ISOE Management Board meeting will take place 18-20 November 2009 at the OECD Conference Centre in Paris, France.

New ISOE Report:
Work Management to Optimise Occupational RP in the Nuclear Power Industry

A new report on "Work Management to Optimise Occupational RP in the Nuclear Power Industry" has been prepared by the ISOE Expert Group on Work Management. This report is a significant update to a previous 1997 ISOE work management report, and reflects the current state of knowledge, technology and experience in occupational radiation protection of workers at nuclear power plants.



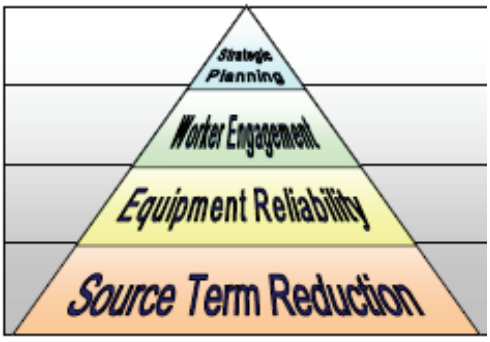
This new report provides practical guidance on the application of work management principles within the context of optimisation of occupational radiation protection. This recognises that while work management is no longer a new concept in nuclear power plant operations, continued efforts are needed to ensure that good performance, outcomes and trends are maintained in the face of current and future challenges.

The report presents the key aspects of work management that should be considered by management and workers to save time, dose and money. This is supported by updated practical examples from within the ISOE community in order to bring practical value to the reader and encourage continuous improvement of performance.

The report will be available both in print form and as a e-book for download through the ISOE Network website. In advance of this, a few examples from the report are presented below.

An example of Work Management (Organisational ALARA) at Quad Cities NPP

Quad Cities-1 NPP (USA) successfully reduced collective radiation exposure through an integrated approach focusing on the components of work management (or Organisational ALARA). Concerted efforts addressing source term reduction, equipment reliability, worker engagement and strategic planning have decreased collective dose to 1.9 person-Sv for the 2007 refuelling outage from a high of 8.6 person-Sv for the 2002 refuelling outage resulting from challenges created by chemistry transients affecting primary and secondary piping dose rates and by equipment challenges associated with the up-rating of the units.



Organisational ALARA Concepts

Quad Cities-1 RPM proposed this pyramid of ALARA concepts for successful implementation of its Organisational ALARA policy, including from top to bottom:

- Strategic Planning
- Worker Engagement
- Equipment Reliability
- Source Term Reduction

Successful ALARA management actions at Quad Cities-1 include:

Source term reduction: Chemical decontaminations of recirculation piping and moisture separators; replacement of turbine blades containing Stellite-based erosion shields; use of a site exposure reduction charter with site vice-president signature approval/accountability: such as integration of chemistry parameters into site management vocabulary and daily discussion.

Equipment reliability: Power up-rate recovery to treat plant vibrations through diagnosis and treatment of underlying causes: steam dryer replacement increased capacity in concert with the uprated power; development of technical human performance philosophy and principles governing engineering activities that include exposure concerns; including dose as a required value in plant health committee discussions of modification prioritisation; and integration of dose into equipment reliability priory lists.

Worker engagement: Individual dose accountability established, including individual daily dose goals; radiation work permit trip tickets implemented, forcing determination and accounting of dose individually by entry.

Strategic planning: Fleet dose now monitored accounting for aggregate over/under performance; corporate ALARA Committee established with site ownership for dose at the plant manager level accountable to the senior vice president of operations; and long-term planning includes dose impacts of future jobs (out 5 years) as part of the decision-making process.

An example of management of shielding practices

Optimisation of lead shielding during outages

At Beznau plant (Switzerland), biological shielding was originally only installed in maintenance and monitoring areas, and the quantity of lead used was very small. At the start of the 1990s, it was shown that the dose received by the person installing the lead shielding was very low compared to the dose saved by installing this shielding for other operators. The quantity of biological shielding installed for the outage has thus considerably increased to about 120 tonnes in 1999 for replacement of the steam generator in Unit 2. Until the start of the 2000s, 80 tonnes of lead were used on average for each outage. A new policy was then developed: installation of biological shielding only in areas where work is carried out during the outage. This policy has led to a reduction in the quantity of lead used to about 40 tonnes per outage without increasing the collective dose of the maintenance works.

Cost-benefit analyses of shielding installation

In some Asian nuclear power stations, cost-benefit analyses of shielding installation must be completed first as an engineering support for dose reductions. Lead blankets, mobile lead walls, lead bricks, tungsten sheets and water boxes are often used based on specific needs of systems, components and work environments.

Fixed biological shielding

At the Almaraz and Confrentes NPPs (Spain), fixed biological shielding is installed around piping and valves that contribute significantly to the ambient dose rate. Some of this shielding is equipped with access hatches to enable opening or checking of valves. As a consequence, minimal biological shielding (around 6 tonnes) is installed during unit outages.

New shielding materials

At Pickering B NGS (Canada), the application of new shielding materials is driven by the need for lighter, more effective radiation attenuating materials to augment traditional PVC lead bags. Latest attenuating materials include a homogenous mixture of 50 – 200 micron tungsten particles distributed in an elastic silicon matrix, enabling the production of mouldable sections that provide flexibility in shielding radiation on irregular shapes.

CANDU reactor face shielding

Also at Pickering B NGS, a ReactorShield cap was developed as a shielding device (square in shape) which is made of lead alloy sandwiched between 2 pieces of plastic. This configuration minimises the gaps between adjacent pieces once installed. ReactorShield caps have been demonstrated to provide excellent and consistent reduction of general radiation fields and streaming radiation emanating from the face. This shielding has been used with success during previous pressure tube replacement campaigns.

Shielding installation during outages

At Doel NPP (Belgium), the personnel assigned to install biological shielding are extremely well qualified and trained. The company to which they belong has prepared, over a number of years, a standard programme for installing biological shielding at the start of a unit outage. Its operatives are also radiation protection workers.

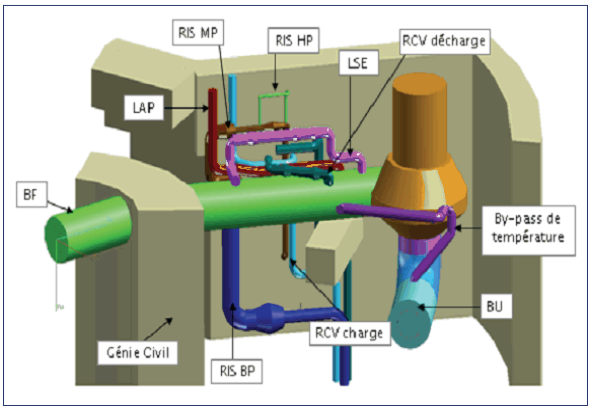
Shielding for reactor vessel internals replacement

At Ikata NPP (Japan), a reactor vessel (RV) internals replacement was accomplished in a PWR for the first time in the world in 2004. A special temporary shielding was developed for this procedure, as well as for the RV shroud replacement at Fukushima Daiichi BWR Unit 3.

Example of ALARA Shielding Studies

EDF (France) has developed a methodology based on its PANTHERE dose rates modelling software to define the optimal scenario for shielding installation on primary loop circuits. This methodology has been applied on several 900 MWe plants. A dose saving of about 30% can be obtained on the works performed in these areas.

In the past years, ALARA studies performed were quite simple and empirical, mostly based on feedback experience and common sense. These solutions are efficient for simple cases when the exposure situations are not complex. EDF now uses its national corporate engineering as a support for its NPPs to perform modelling studies and to provide an optimised scenario.



Using the PANTHERE-RP 3D radioprotection software, a geometric model based on installation design maps and isometric drawings is prepared by CAD specialists. Radiation sources and their activities are fed into the model. A generic radiological spectrum is used to define the activity of each source, which is updated annually through in-site measurement campaigns. Measurements are also carried out on sources of interest at contact and at 0.5 m distance. The software inputs take into account, for each planned outage activity, ambient dose rate, access areas, etc, as “reception points”.

The programme calculates a generic dose rate matrix (no water, no shielding, no thermal insulation) to assess dose rates coming from each source for each reception point. The on-site measurements and data related to the real environment are fed into the software to calculate an updated on-site dose rate matrix. Each possible RP option (water level management, system flushing, biological shielding, equipment removal, etc) is characterised. The number of persons, time of exposure, and best planning time -period are also stated.

Some steps need to be validated and implemented on-site. This methodology and tool is still theoretical and the goal is to achieve an industrial ALARA approach. Using this tool, it may be possible to calculate the dose rate reduction coefficient for each RP option with respect to each source and workstation related to maintenance and shielding. The results are also displayed in a matrix for each option.

This approach and the software tool, which will help NPPs to analyse the optimal shielding protection, will be used in the 2010 outage of Tricastin NPP.

ISOE Network Website (www.isoe-network.net): Migration of the ISOE 1 Questionnaire input module to the ISOE Network

The ISOE 1 data input module and ISOEDAT database have been migrated from the CD-based system (under Microsoft ACCESS) to the ISOE Network website. Currently, ISOE participants can use the ISOE data analysis module, MADRAS, on-line through the ISOE Network. By the end of 2009, it will also be possible for ISOE participants to enter their data for the ISOE 1 Questionnaire into the global database simply by using a web browser.

What is new?

Data entry: Authorised ISOE participants will be able to submit their annual ISOE 1 data through a web-based interface accessible through the ISOE Network website. Authorisation to submit data through the web data entry system is based on the nomination of authorised persons in each country for data entry and validation.

Data validation: As with the current system, all submitted data will be validated prior to being made available to the global ISOE community. Under the new application, validation will occur via the web interface. Validation of entered data can be performed at different levels according to the direction of each participating utility: plant, utility, country, Technical Centre, ETC (administrator). The level for data entry and validation is the choice of each participating user. However, there is a minimum validation process: plant or utility / Technical Centre / ETC.

Once the data receives final validation by the ETC, it becomes accessible on the ISOE Network website to all registered users for viewing and benchmark analyses (MADRAS Analyses), subject to their data permissions as participating utility or authority.

Time schedule

The ISOE Working Group on Data Analysis is currently undertaking final testing of the new application. The final application will go "live" on the ISOE Network by the end of 2009. At that time, the ISOE utility participants will be invited to use the web for the 2009 ISOE data collection. However the current CD-based system will be maintained according to the direction of the ISOE Management Board. ISOE Participating Utilities will be requested in the coming months to identify individuals responsible for their data entry and/or data validation.

More information on the new ISOE 1 data entry module will be distributed to ISOE participants prior to its formal launch on the ISOE Network.

The NEA Committee on Radiation Protection and Public Health (CRPPH): Expert Group on Occupational Exposure

The ad-hoc Expert Group on Occupational Exposure (EGOE) was formed by CRPPH at its March 2006 meeting to broadly scope out issues in occupational radiation protection that could have policy and regulatory implications. Recognising the important operational experience residing within the ISOE programme, ISOE members and Technical Centres have been participating in this activity.

The EGOE has recently completed a case study addressing occupational radiation protection criteria for designing new nuclear power plants. This report, which will be published in 2009, addresses the following areas:

- Occupational radiation protection principles at the design stage of nuclear power plants
- Lessons learned, knowledge management, education and training
- Integrating occupational radiation protection criteria during the design phase
- Evaluation and integration of occupational radiation protection cost in design process

With the finalisation of this report, the EGOE is now turning its attention to occupational exposure issues in relation to the implementation of the new general recommendations of the International Commission on Radiological Protection (ICRP), focusing on the use of dose constraints in the occupational setting.

Announcements

2009 ISOE International ALARA Symposium

The 2009 ISOE International ALARA Symposium will be hosted for the first time by the IAEA Technical Centre at IAEA Headquarters in Vienna, Austria, from 13-15 October 2009. The deadline for registration for the symposium has been extended to 20 July 2009. The second announcement and registration form can be downloaded from the ISOE Network.

2009 ISOE Asian Regional ALARA Symposium

The 2009 ISOE Asian Regional ALARA Symposium, organised by ATC, will be held 8-9 September 2009 in Aomori, Japan. This will be followed by technical tours to the Higashidori NPP and the Muroran Plant of the Japan Steel Works. More information, including the first announcement and call for papers, can be found on the ISOE Network

More information on all ISOE Symposia, including papers and presentations from previous symposia, can be found on the ISOE Network.

Schedule of ISOE Meetings for 2009

- 8-9 September 2009: ISOE Asian Regional ALARA Symposium (Aomori, Japan)
- 13-15 October 2009: ISOE International ALARA Symposium (IAEA, Vienna, Austria)
- 16-17 November 2009: ISOE Working Group on Data Analysis (OECD/NEA, Paris, France)
- 18-20 November 2009: ISOE Management Board Meeting (OECD/NEA. Paris, France