APPLICATION OF 'ALARA' AT TIHANGE NPP

Philippe Petit
Deputy Head of SRP department
ELECTRABEL – Tihange Nuclear Power Plant
Avenue de l'Industrie 1, 4500 Tihange, Belgium
philippe.petit@electrabel.com

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1. Introduction

The ALARA principle is a precautionary principle which encourages reducing the collective dose to the greatest extent possible. For every activity where exposure to the radiological risk is justified, the various players involved must determine optimum prevention and protection measures.

2 procedures deal with the 'ALARA' process at Tihange Nuclear Power Plant more specifically:

- General procedure: defines the optimisation method and the role of the players concerned.
- Application procedure: describes the ALARA process for worksites outside and during outages.

Comment: controlling the radiological risk only makes sense in the context of controlling all of the risks.

Article 20.1 of the Royal Decree of 20/07/2001 deals with limiting doses.

The ALARA procedures covered in this presentation deal with controlling high risks of exposure.

The high nature of the risk of exposure makes it necessary to:

- identify the risk;
- evaluate it;
- compare it relative to the results already obtained and compared with the goals set.

2. Principles

The goal is to reduce the collective dose as much as possible by acting on:

- the ambient dose rate (DR);
- the intervention length.

DR x Length of Exposure = Individual Dose
Individual Dose x Number of Persons = Collective Dose

It is possible to minimise the dose rate by acting on one or more of the following parameters:

- Primary chemistry
- Choice of materials
- Shielding
- Decontamination
- Distance

It is possible to optimise the intervention time by acting on one or more of the following parameters:

- Choice of the method
- Choice of the contractor
- Training
- Preparation
- Ergonomics

An efficient ALARA process starts with the initiation of an activity and includes the following stages:

- Identification of the risk of a high level of radiological exposure.
- Quantitative evaluation of the identified risk.
- Analysis and determination of prevention and protection measures.
- Supervision of the implementation conditions.
- Adaptation of prevention and protection measures.
- Evaluation and recording.
- Re-evaluation on the basis of the organisation's development, qualifications, feedback from experience, recording results, individual and collective dosimetric data, etc.

3. Resources available

High radiological risks are identified with the help of:

- Results from the supervision programme (worksite reports, feedback from experience, databases, etc);
- Description of the projects (studies file, Prevention, Health, Safety and Environment Plan, etc);
- Programme and description of the activities and interventions (state of circuits, etc);
- Initiation meeting and/or worksite opening meeting.

A database of dose rates per item of equipment and per room is made available to all staff (see annex 1).

As data allowing an advance estimate of the collective dose is not available systematically, a criterion of a dose rate to be verified at the opening of the worksite is also given.

4. Supervision of the implementation conditions

Supervising the implementation conditions for a worksite implies:

- Ensuring the instructions are applied (role of the responsible for the worksite and the SRP agents)
- Intervening if the ALARA conditions are not met or if the risks are insufficiently controlled.

This is why the CARE SRP department implements the following supervisory programmes:

- Supervision of working conditions;
- Supervision of measurement conditions;
- Supervision of exposure:
    - Electronic dosimetry with alarms
    - Systematic examination of individual exposure;
    - Systematic examination of collective exposure;
    - Comparison with the forecasts.

5. Responsibilities

The responsibilities of the different intervening parties are defined precisely in the general procedure for each of the following stages:

- Identify and communicate the projects with a high risk of exposure (to the SRP department manager);
- Evaluate and use the possibilities to optimise the implementation conditions (method, equipment, state of the circuit, number of intervening parties, duration, screens, etc);
- Establish the lists of projects and activities concerned, check and verify the information transmitted;
- Identify the constraints, define the possible stop points and resources for monitoring the collective dose;
- Submit modifications of the installation for the approval of the Head of Physical Inspection;

- Examine and set the different means of action to reduce exposure;
- Examine the interference with the other worksites (radio protection but also safety, environment, fire, etc);
- Prepare the implementation of the practical actions that have been agreed;
- Transmit, classify and manage the information;
- Undertake preliminary and verification steps;
- Examine the real intervention conditions (efficiency of the measures taken) and adapt these if necessary;
- Record the doses of the intervening persons, supervise the collective dose and report if the first agreed threshold is reached;
- Evaluate the collective mastery of risk and performance, and consolidate future estimates.

Those managers who have one or more quite specific roles to play in this framework are as follows:

- Project manager;
- Site manager;
- Worksite manager;
- ALARA coordinator;
- ALARA committee;
- Head of Physical Inspection;
- OPERATIONS department;
- CARE department;
- SRP department;
- MAINTENANCE department;
- Worksite coordinator;
- etc.

6. Method

The ALARA process is essentially an anticipatory process.
In practice, the different stages of implementation are:

- Calculating the raw collective dose;
- Determining the resources needed to reduce the dose;
- Calculating the net collective dose;
- Supervising the conditions for implementation;
- Modifying the protective measures;
- Recording the ALARA file.

6.1. Calculating the raw collective dose

- Estimate of the length of exposure and the number of intervening people.
- Measurement of the ambient Dose Rate (DR).

RAW COLLECTIVE DOSE (D):
D (Man.mSv) = DR (mSv/h) x duration (h) x Number of operators

- If D is lower than:

    - 0.1 Man.mSv, outside outage;
    - 0.5 Man.mSv, during outage;

The worksite then starts.
Otherwise, the worksite is classified as ‘ALARA’.

6.2. Determining the resources needed to reduce the dose

- If the raw dose is lower than 5 Man.mSv:

    - Simple shielding
    - 3 zones (work, assistance, withdrawal)
    - Ergonomics of the workplace (working height, accessibility, lighting, etc.)

- If the raw dose is over 5 Man.mSv:

    -Additional shielding
    - Rinsing or decontamination of the equipment
    - Preparation of the work on a model
    - Use of preparation forms for the item

6.3. Calculating the net collective dose

A new estimate is performed after the resources for reducing the dose are determined.
The result is the net dose that will be used as the basis for dosimetry monitoring.

6.4. Dosimetry monitoring

A distinction is drawn between 3 types of site:

- ALARA 1: net collective dose of between 0.1 and 0.5 Man.mSv;

- ALARA 2: net collective dose of between 0.5 and 5 Man.mSv;

- ALARA 3: net collective dose of over 5 Man.mSv.

- ALARA 1:

    - Authorised work
    - Normal supervision
    - Dosimetry monitoring completed by the operators and checked by SRP.

- ALARA 2:

    - Same as ALARA 1
    - Preparation forms and inspections carried out by SRP at least once per item.

- ALARA 3:

    - The worksite cannot be started + info to the worksite manager;
    - Work submitted for approval to the ALARA Committee;
    - Mandatory use of specific preparation forms;
    - Dosimetry monitoring on the special ‘ALARA site’ form;
    - Stop point at 75% of the estimated collective dose.

6.5. Modifying the protective measures

The ALARA Coordinator or SRP agent is contacted at over 75% of the estimated collective dose.

Overstepping is ‘tolerated’ up to 125% of the initial estimate. Beyond this, the worksite is shut down and the ALARA Committee must be consulted.

6.6. Recording of the ALARA file

At the end of the worksite, the ALARA file is closed by the head of works and the ALARA coordinator.

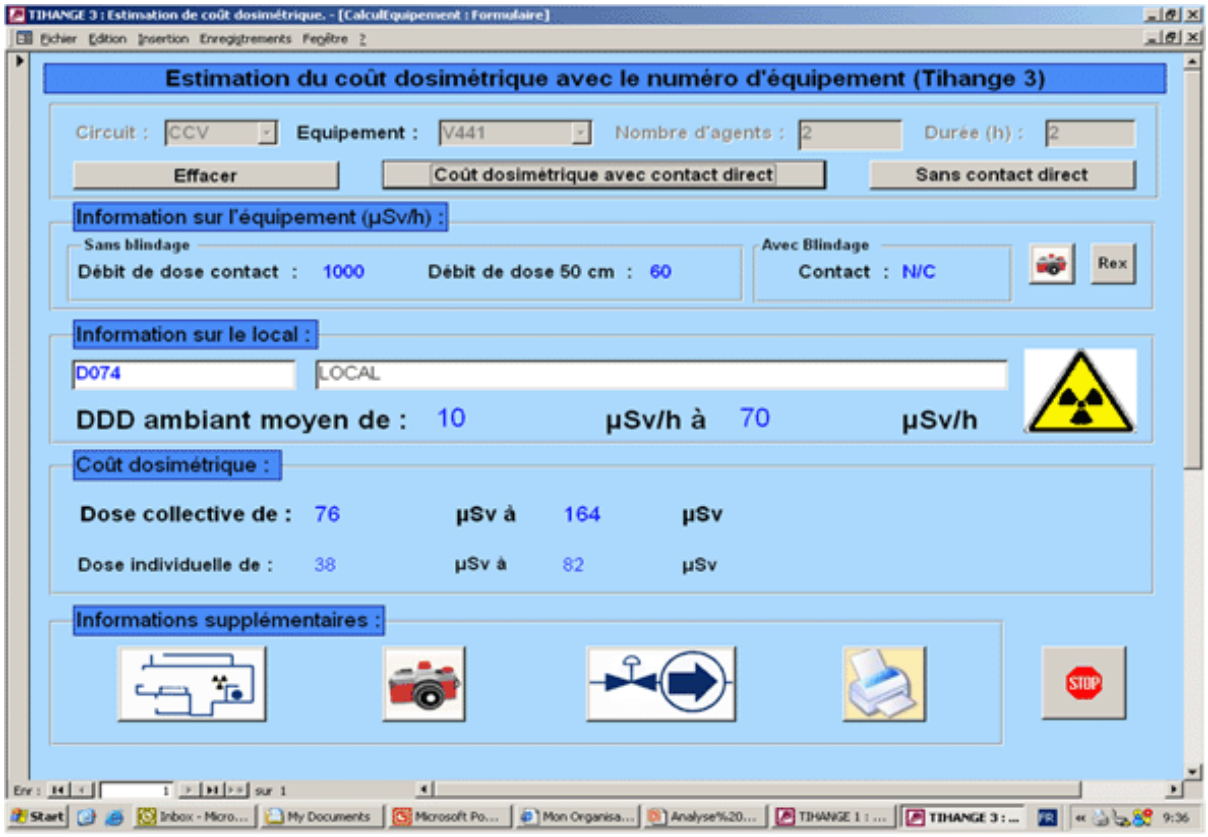
If the net collective dose is exceeded by over 25% compared with the estimated dose: an analysis of the reasons for the overstepping must be given.

The ALARA file for any site recording a collective dose > 5 Man.mSv is sent to the ALARA Committee.

7. References

- RP/ALARA/002: ‘ALARA’ – rev 0 of 06/07/06.
- RP/ALARA/012: ‘Application of the ALARA process’ – rev 1 of 20/03/07.

Annex 1: Dose rates database


TIHANGE 3 : Estimation de coût dosimétrique. - [CalculEquipement : Formulaire]
Fichier Edition Insertion Enregistrements Fenêtre ?
Estimation du coût dosimétrique avec le numéro d'équipement (Tihange 3)
Circuit : CCV
Equipement : V441
Nombre d'agents : 2
Durée (h) : 2
Effacer
Coût dosimétrique avec contact direct
Sans contact direct
Information sur l'équipement (µSv/h) :
Sans blindage
Débit de dose contact : 1000
Débit de dose 50 cm : 60
Avec Blindage
Contact : N/C
Rex
Information sur le local :
D074
LOCAL
DDD ambiant moyen de : 10 µSv/h à 70 µSv/h
Coût dosimétrique :
Dose collective de : 76 µSv à 164 µSv
Dose individuelle de : 38 µSv à 82 µSv
Informations supplémentaires :
STOP
Enr : 1 sur 1
Start
Inbox - Micro...
My Documents
Microsoft Po...
Mon Organisa...
Analyse%20...
TIHANGE 1 : ...
TIHANGE 3 : ...
9:36