

ALARA ORGANIZATION IN NUCLEAR POWER STATIONS

R. DOLLO - RADIATION PROTECTION - ELECTRICITE DE FRANCE - PARIS

THE INITIAL CONTEXT

EDF's nuclear power stations were built with provisions being made, as from the design stage, to limit radiation sources and the results observed over the first ten years (annual collective dose and dose per unit of less than 2 man.Sv) were considered to be very good. However, these results began to deteriorate from 1988 onwards. At the same time, considerable progress was being made by other generators of electricity, who were achieving results which were better than those archived by our later units. Furthermore, radiological protection standards are being revised and personal dose limits will soon be lowered.

A DETERMINED POLICY

A policy aimed at reducing doses has therefore been implemented for the benefit of all EDF personnel and external contractors with the objective of reducing personal dose dispersion -the even-handed aim of ICRP recommendation 60- and collective doses in order to achieve the following :

- providing all workers with the same level of dosimetric protection, whatever their employer,
- achieving collective dose results similar to those of the best operators throughout the world in the operation of nuclear reactors.

This has led to the establishment of dose targets and decision making criteria (value of the collective dose unit to be avoided). It is not a question of reducing doses at any price, but rather in carrying out a cost/benefit analysis of the possible solutions.

ENCOURAGING RESULTS

The decision to adopt this ALARA approach at national level has been extended to all nuclear installations over the last few years.

Working groups for specific areas and led by various local and national committees, have been able to reverse the trend noted after 1988 and the results for the years 1992 to 1996 prove this.

TODAY

In order to return the Nuclear Operating Division of Electricit' de France to the ranks of the world's best operators in terms of collective and personal dosimetry, a national "ALARA" project was set up to co-ordinate a certain number of actions, which are aimed at achieving the following objectives :

1. To define a common language, methods and tools for all nuclear installations in order to achieve a level of standardisation in this field.
2. To make the main levels of management aware of their responsibilities for what is at stake in terms of dosimetry and to encourage them to establish objectives in order to move from a resource driven approach to a result driven approach.
3. To bring external contractors into this overall process.
4. To improve the most costly maintenance sites in terms of doses.
5. To reduce specific sources of exposure.
6. To reinforce the organisation and exploitation of experience feedback in this field and to modify the existing information processing system accordingly.



1) Defining a common language, methods and tools

The implementation of a policy of optimisation, in accordance with the ALARA concept, requires a priori management of exposure levels. In other words, we have to be capable of anticipating and forecasting where, when and how given tasks will be subject to exposure.

Therefore, the first objective of the ALARA Project is to define the common language, methods and tools which are required to operate the ALARA optimisation loop at nuclear installation level and involving all Operational Units.

The main areas of activity concern the following :

- defining the structure for the gathering and detailed analysis of dose data in order to be able to combine them with specific operations and levels of responsibility,
- standardising the establishment of gamma environment mapping in order to transpose the reference doses and to render the results objective, thus facilitating comparison and analysis,
- to establish a dosimetric reference for the main maintenance or retrofit sites, according to type of unit shutdown and according to type,
- to adopt common or compatible methods and tools.

2) Responsibilities

The establishment of objectives is an effective management tool. This is one of the key aspects of the ALARA concept. The initial actions set out above, will greatly facilitate the following, be it at national or local level :

- the commitment of various levels of management (client and prime contractor) to their responsibility for making dosimetry forecasts. Complying with, such commitments necessarily result from the desired actions : consideration, analysis, preparation.
- the examination of results, the analysis of discrepancies and finally the implementation of the necessary corrective actions,
- the gradual introduction of performance evaluation techniques in this field.

3) Bringing external contractors into the overall approach

Approximately 80 % of doses received in nuclear installations directly concern the personnel of external contractors and a strategy must be developed to bring such contractors into the EDF collective and personal dose reduction and control project.

For this, various improvements to partnership relationships are being considered and are subject to actions at both national and local level. They are intended to define : the requirements set out in agreements, the possible use of contracts in this field, the dosimetry targets specified in orders, training activities, the involvement of contractors in the experience feedback process and evaluation criteria.

In addition, European regulations are being revised to include ICRP recommendation 60 which, in addition to the annual dose limit of 50 mSv, sets of 5-year dose limit of 100 mSv (or an average of 20 mSv per year).

Without waiting for this, and without endangering the jobs of those concerned, the contractors most concerned will be consulted from now and 1998, in order to achieve the objective of nobody receiving more than 20 mSv in any 12 months.

4) Optimisation of the most costly sites in terms of doses

At the same time as the structural actions taken and as a sine qua non, some twelve maintenance sites or fields of activity will receive special attention. They alone represent 70 % of the dose received in all nuclear installations and the optimisation of these sites should achieve a reduction of such dose of 15 to 20 % in the medium term.

In this case, it is a question of implementation or continuation of such optimisation, to establish an initial dosimetry reference (reference doses, mapping, operating conditions, good practices) and to pass on the benefits to all nuclear installations.

Included among these operations, we should mention maintenance works on steam generators, operations concerned with the opening and sealing of reactor vessels, maintenance on valves and fittings, non-destructive testing, decontamination and cleaning operations as well as operations concerned with auxiliary systems.

5) Reducing specific sources

Certain components in contact with the primary coolant tend to encourage the appearance of oxides or particles which, when they are active, are deposited evenly on the walls of pipeworks and vessels where "hot spots" may be created.

These components include stellites, materials which are used in valves and fittings for example, and they are responsible for a significant share of the doses. A specific aspect of the Project is concerned with the replacement of the worst components (3 mSv/year for all installations) and to forbid their use in future installations.

In addition, some ten nuclear units are affected, to greater or lesser extent by "hot spots". Their impact on dosimetry justifies the taking of curative actions to clean these units, not forgetting monitoring and preventive operations in unaffected units.

6) Improving the organisation and exploitation of experience feedback data...

The feedback of experience gained on work sites is essential. There can be no significant progress made without ordered communication and the exchange of information concerning good and bad practices.

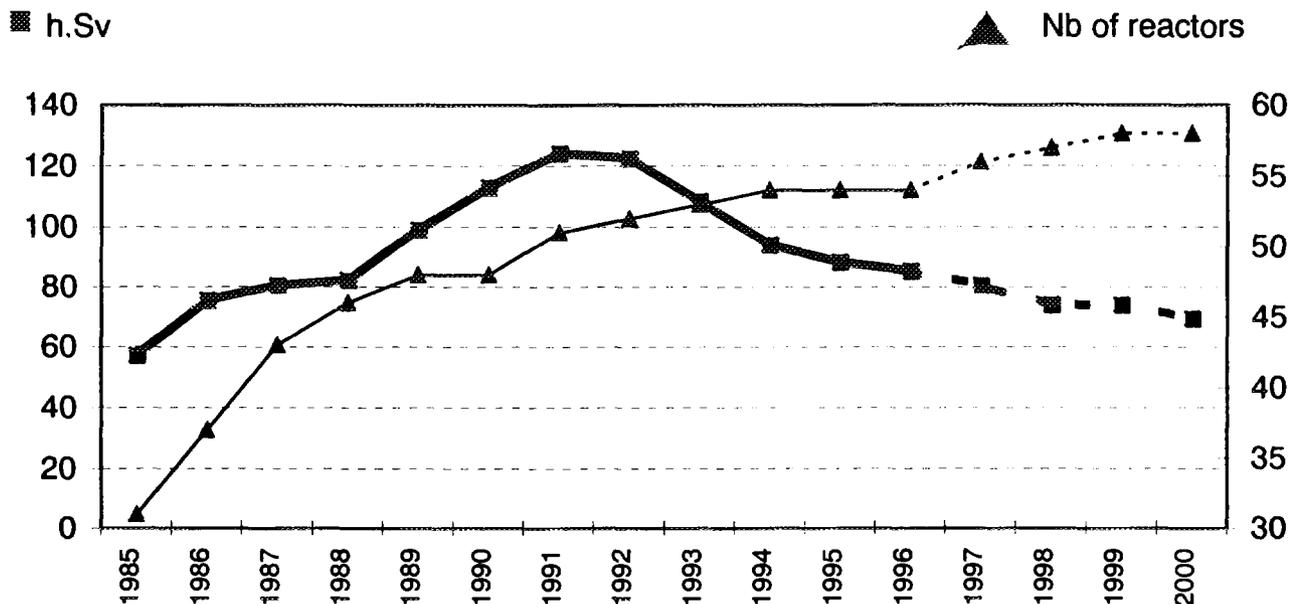
Accordingly, the existing information and experience feedback system will be improved through the Project by establishing compendiums and data bases and by setting up networks of opposite numbers and colleagues.

In addition, the activities of the Equipment Division during the design stages of future nuclear power stations (and the modification of power stations in service) should lead to an improvement in the choice of materials and of the environment and therefore working conditions during maintenance operations.

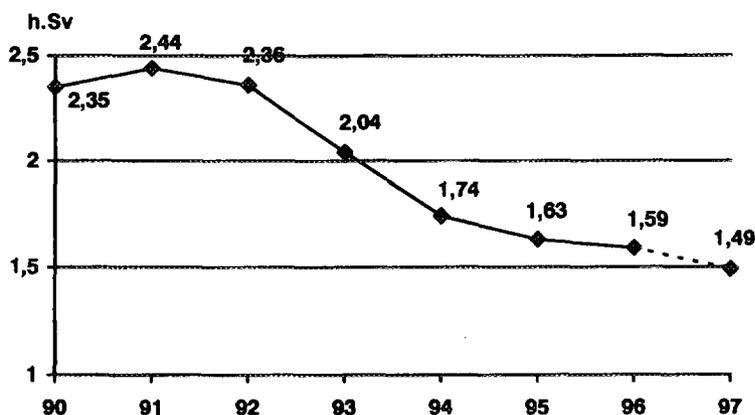
This requires EDF to make adequate operating feedback information available. The setting up of an efficient and durable organisation is a long term investment which should be made.

... and developing the information processing system

Finally, the requirements which emerge from the various aspects discussed above must be taken into account in order to develop the "site dosimetry" information processing system into more advanced system.



EDF PWR's annual collective dose and number of reactors



EDF PWR's annual collective dose per reactor