

OCCUPATIONAL EXPOSURE EVOLUTION IN SPANISH NPP'S

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INTRODUCTION

After extremes fluctuations in the early 1980's, the evolution in occupational collective dose in the operating nuclear power plants in Spain seems to be stabilising and lightly decreasing in the last years, within the same range of the average level of the OECD countries.

It is clear that only a well structured, systematic and practical approach to optimization of protection, as a strict selection process and as a "state of thinking", ensures that no important aspects are overlooked and the appropriate decisions are taken to perform the different tasks in conditions to achieve the optimum level of exposure. During the last decade we can affirm that a progressive development of ALARA culture is having a positive influence in Spanish PWR and BWR.

In this presentation the main indicators of the occupational dose trends to assess the present development level of this criterion, the collective dose per reactor, the task related collective dose, individual doses, etc. are reviewed and the key elements that have shown a clear effectiveness to improve the practical application of it, organizational modifications, increasing commitment, global strategies to reduce the source term, increasing presence of robots, etc. are discussed.

COLLECTIVE DOSE

Occupational collective dose per reactor evolution in the operating LWR's in Spain the scope showing in figure 1.

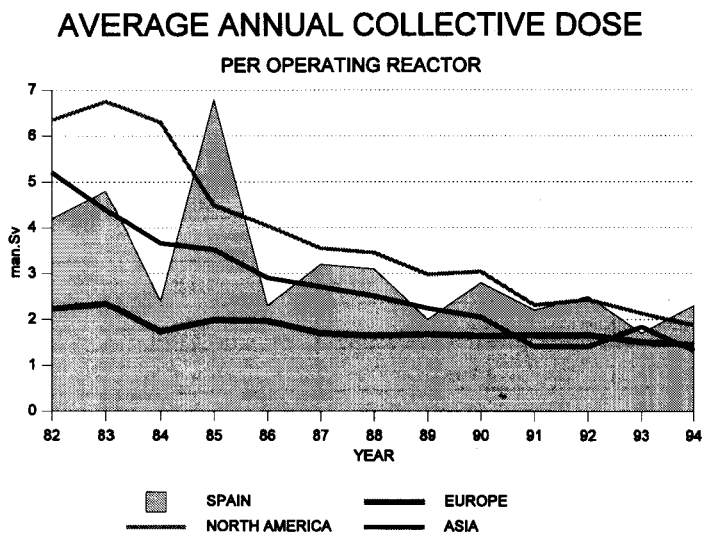


Figure 1.- Annual collective dose per reactor unit for LWRs plants at Spain and different regions.

After extremes fluctuations in the early 1980's, because major modifications to enhance the safety in CN JOSE CABRERA and the recirculation piping system replacement in CN ST^a M^a GAROÑA took place, the trend in occupational exposure seems to be stabilising last few years within the same range of the average level in the OECD member countries.

Surely, this tendency of the collective occupational dose for Spanish LWR's is however far to reach an ALARA plateau that it is not cost effective to reduce exposure with the current nuclear reactor design and technology.

Comparing the situation for PWR's within the international context, size and age tacking in account, we can see according with the data of the table 1 that while collective occupational exposure at last generation of Spanish PWR's is in a balanced level, otherwise is the behaviour at first generation.

Table 1. Average collective doses in 1993 as a function of reactor size and age for PWR's (man.mSv).

COUNTRY	OLD & SMALL PLANTS	INTERMEDIATE & MEDIUM	MODERN & MEDIUM
SPAIN	3* (01)	1.7 (04)	1 (02)
NORTH AMERICA	1.4 (7)	1.7 (9)	0.9 (7)
ASIA	1.6 (5)	0.7 (1)	0.5 (1)
EUROPE	1.7 (10)	2.3 (18)	-

* Three years average, because the 1993 data is not representative.

NOTE: The values in the parenthesis are the numbers of reactors. The regional data are taken from Ref. 4

Similar terms of comparison can be established for BWR's. Here, the relative situation on occupational exposure is nearly the same for the new plant than for the old one, as can be seen in Table 2.

Table 2. Average annual collective doses in 1993 as a function of reactor size and age for BWR's (man.mSv).

COUNTRY	OLD & SMALL PLANTS	INTERMEDIATE & MEDIUM
SPAIN	4* (1)	4.7 (1)
NORTH AMERICA	3.1 (7)	3.4 (2)
ASIA	2.5 (3)	1 (2)
EUROPE	2.7 (8)	4.7 (1)

* Date of 1994, because the 1993 date is not representative.

NOTE: The values in the parenthesis are the numbers of reactors. The regional data are taken from Ref. 4

TASK RELATED COLLECTIVE DOSE

Operational monitoring systems besides the regulatory individual dosimetry are established in all Spanish LWR's, most of them, except one, are digital and computerising system. This type of dosimetry allows a link to be made between the daily doses received by workers and a set of generic operations taking place during the operation and maintenance of the plants.

Following the recollected data up to date, some jobs involving higher average collective doses in PWR's are represented in figure 2.

AVERAGE COLLECTIVE DOSE PER TASK FOR ALL PWR's

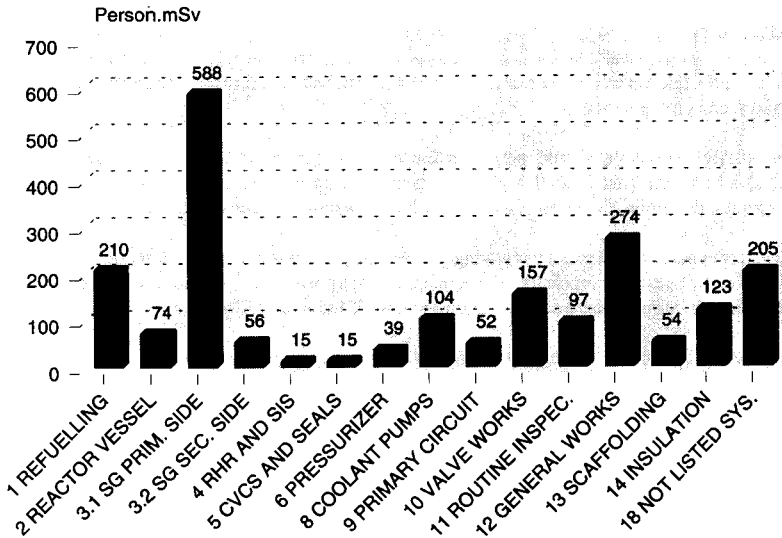


Fig. 2. Average collective dose per task for Spanish PWR's in the period 1988-92.

INDIVIDUAL DOSES

The average individual dose is also a global indicator that is often used to assess the performance of nuclear power plant operation in relation with radiological protection. Only slight variation between the reactor types exists, the international average being about 3 mSv per year. In Spain, this parameter is stabilising on the same order last five years, in 1994 the value was 2.27 mSv. Anyway one should be aware of when using this indicator, which different criteria are used in different countries to record and report doses and it is not a solid basis for firm conclusions concerning the general radiological situation.

In order to approach the previous situation in Spain to face in the early future the new dose limits recommended by the ICRP, more explicit results the evolution of the individual dose distribution, specially to define the size of the critical groups of workers, typically mechanical maintenance workers.

According with the 1994 data, 85% of workers have received less than 5 mSv, only 3% are over 15 mSv and 1.5 % workers exceeding 20 mSv/year, i.e. 140 workers over 9,053.

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