

PRACTICAL IMPLEMENTATION OF THE 96/29 EURATOM DIRECTIVE TO THE RADIATION PROTECTION PROGRAMS OF SPANISH NUCLEAR POWER PLANTS.

O. Guzmán, T. Labarta, J.J. Montesinos, M^a L. Rosales, M^a J. Muñoz, I. Amor.

Spanish Nuclear Safety Council (CSN), Justo Dorado, nº 11, 28040 Madrid (Spain)

INTRODUCTION

The Spanish legislation on Licensing of Nuclear and Radioactive Facilities (Royal Decree 1836/99, Art. 20) requires submission and approval of the so-called “Radiation Protection Manual (RPM)” in the licensing process of a Nuclear Power Plant (NPP). The RPM is a document reflecting the practical implementation of the licensee responsibility for radiation protection through the adoption of management structures, policies, plans, training, procedures and other measures developed and implemented to achieve continuing compliance with the legislation in force and to apply the ALARA principle.

In Spain, the Regulation on Sanitary Protection Against Ionising Radiations (Royal Decree 783/01) came into force on July 6th 2001 and:

- Implement the majority of the Basic Safety Standards Directive 96/29/Euratom (BSS Directive) in Spain.
- Replace Regulation on Sanitary Protection Against Ionising Radiations (Royal Decree 53/92) which was made in response to the 1980 BSS Directive 80/386/Euratom (as amended by 84/467/Euratom).

In the past, RPM complied with the replaced R.D 53/92, the structure and content fitting the Nuclear Safety Council Safety Guide 7.6 “Content of the Radiation Protection Manuals in radioactive and nuclear facilities of the fuel cycle”. The necessary revision of the RPM owing to the new RD 783/01 entailed a clear occasion to achieve a higher degree of homogeneity in the scope and content of some issues that could be subject to interpretation.

Seizing the opportunity, the CSN and the Spanish Association of Electricity Utilities (UNESA) set up an ad-hoc working group constituted by the NPP Radiological Protection Department Heads and the Regulatory Occupational Radiological Protection experts. The group began its activities in February 2000 and it concluded in December 2001.

The driving force of the group was to lay the foundations of a generic document based on homogeneous and coherent radiological criteria that could be used by the facilities as a guidance to produce their respective Radiation Protection Manuals. Each individual RPM should eventually be tailored to the particular features of the facility.

As a result of the work carried out a new framework was established, on the one hand new reference values related to the protection of both workers and the public were set up, on the other hand harmonised methods for ensuring compliance with R.D. 783/01 requirements were included, such as:

- Establishment of limiting values and reference levels for every one of the radiological areas in terms of dose rate, airborne contamination and surface contamination.
- Establishment of reference levels for internal and external dosimetry and surface contamination.
- Regulation of access and permanence conditions for visits in radiological areas.
- New values for ALIs (Annual Limits of Intake) and DAC (Derived Air Concentration) resulting from 20 mSv of annual dose and a working year of 2000 hours.
- Reuse criteria for clothing and protective equipment

In the next sections the most remarkable features either because of their novelty or because of the uniformity achieved among all facilities are presented:

1. CLASSIFICATION OF AREAS

The next table presents the accepted values in terms of Dose Rate (DR), Airborne Contamination (AC) and Surface contamination (SC):

	FREE ACCESS	SUPERVISED	CONTROLLED			
			FREE PERMANENCE	LIMITED PERMANENCE	RESTRICTED PERMANENCE	PROHIBITED ACCESS
DR	< 0.5 $\mu\text{Sv/h}$ (1)	< 3 $\mu\text{Sv/h}$	< 25 $\mu\text{Sv/h}$ and	< 1 mSv/h and	< 100 mSv/h and	>100 mSv/h or
AC		<0.4 Bq/cm ² β/γ < 0.04 Bq/cm ² α Averaged on 300 cm ²	< 4 Bq/cm ² β/γ < 0.4 Bq/cm ² α Averaged on 300 cm ² and	< 40 Bq/cm ² β/γ < 4 Bq/cm ² α Averaged on 300 cm ² and	< 400 Bq/cm ² β/γ < 40 Bq/cm ² α Averaged on 300 cm ² and	> 400 Bq/cm ² β/γ > 40 Bq/cm ² α Averaged on 300 cm ² or
SC			< 0.1 DAC	< 1 DAC	< 10 DAC	> 10 DAC

(1) Exceptionally, in those areas were restriction of access in not efficient higher dose rates can be allowed provided that the dose rate is always lower than 2.5 $\mu\text{Sv/h}$. Nevertheless, these areas will be subjected to an administrative radiological control.

2. REFERENCE LEVELS FOR THE RADIOLOGICAL SURVEILLANCE OF AREAS

The following reference levels are consistent with the established classification of areas:

RL: recording Level

IL/IL: Investigation/intervention Level

		CONTROLLED AREA	SUPERVISED AREA	FREE ACCESS AREA
DR	RL	3 μSv	0.5 μSv	0.5 μSv
	IL/IL	THE HIGHEST DOSE RATE VALUE WHICH DEFINES THE AREA		
SC	RL	4 Bq/cm ² β/γ and 0.4 Bq/cm ² α	0.4 Bq/cm ² β/γ and 0.04 Bq/cm ² α	0.4 Bq/cm ² β/γ and 0.04 Bq/cm ² α
	IL/IL	THE HIGHEST SURFACE CONTAMINATION VALUE WHICH DEFINES THE AREA		
AC	RL	< MDA (< 0.05 DAC for β/γ radiation)		
	IL/IL	THE HIGHEST AIRBORNE CONTAMINATION VALUE WHICH DEFINES THE AREA		

3. REFERENCE LEVELS FOR INTERNAL AND EXTERNAL DOSIMETRY AND SKIN CONTAMINATION.

	EXTERNAL DOSIMETRY		INTERNAL DOSIMETRY	SURFACE CONTAMINATION (1)
	$H_p(10)$,	$H_s(0.07)$		Skin dose due to skin contamination
RL	0.1 mSv/month	0.1 mSv/month (A) and 0.1 mSv/month (B)	1 mSv/year (2)	4 mSv/month averaged on 1 cm ²
Inv. L	10 mSv/year (A) & 3 mSv/year (B).	50 mSv/month (A) and 15 mSv/month (B)	1 mSv/year	50 mSv/month
Int. L	18 mSv/year & 90 mSv in a consecutive 5-y period (A) y 5 mSv/year (B).	450 mSv/year (A) and 135 mSv/year (B)	5 mSv/year	450 mSv/year

Individual dose equivalent, penetrating, $H_p(d)$,
Individual dose equivalent, superficial, $H_s(d)$

(1) The reference level set up for skin contamination averaged on 100 cm² is 4 Bq/cm² for β - γ emitters. In case α emitters have to be measured, the reference value would be 0.4 Bq/cm².

(2) For those radioisotopes that, by virtue of their physical-biological characteristics, this value it is not compatible with the Minimum Detectable Activity of the measurement technique, the approach established for the recording of dose will be followed whenever activities higher than the MDA are measured.

4. NON EXPOSED WORKERS

A new figure has been introduced, non exposed workers, not considered in the R.D. 783/01. This figure, included in the group "Members of the Public", covers those cases of certain not large groups of non exposed workers, who may enter low dose rate and contamination areas in the free permanence controlled areas (green).

For these workers dose is limited for every working period in the power station so as to guarantee that the incurred annual dose does not exceed 1 mSv. Thus a 40 μ Sv dose constraint is set for every working period at the NPP. If the dose constraint is exceed, then it must be justified.

Moreover, it has been required to keep a register of every visit or non exposed workers who enter the controlled area.

5. ALIs AND DACs

The RPMs of the Spanish NPP have included as an annex the new Annual Limits of Intake (ALIs) and Derived Air Concentration (DACs) values. The calculations have been carried out by the electrical sector using Directive 96/29 dose coefficients and are based on a committed effective dose of 20 mSv and a 2000-hours working year.

6. PROTECTIVE CLOTHING AND EQUIPMENT

For the performance of works with risk of contamination, access is not allowed to radiological areas wearing personal clothes, with the exception of underclothing.

Criteria concerning surface contamination levels acceptable for the reuse of personal clothing and protective equipment have been standardized. Such levels, averaged on 100 cm² are presented in the next table:

	CLOTHES IN CONTACT WITH THE SKIN		CLOTHES WORN ABOVE THE PREVIOUS ONES		REUSE OF RESPIRATORY EQUIPMENT	
	b-g and low toxicity a	Remainder a emitters	b-g and low toxicity a .	Remainder a emitters	b-g and low toxicity a	Remainder a emitters
FIXED CONTAMINATION	< 4 Bq/cm ²	< 0.4 Bq/cm ²	< 40 Bq/cm ²	< 4 Bq/cm ²	< 4 Bq/cm ²	< 0.4 Bq/cm ²

7. CALIBRATION, OPERATION TESTS AND MAINTENANCE OF SYSTEMS AND EQUIPMENT

A new section has been introduced where the general rule concerning calibration frequency for the different measurement systems and equipment is described. The rule allows modifications that can be justified based either on manufacturer recommendations or operational experience of the equipment itself. Calibration frequency will agree with the Spanish Norm UNE-EN-300012-which deals with metrological quality assurance.