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ISOE INFORMATION SHEET

THE INFLUENCE OF REACTOR AGE AND INSTALLED POWER ON COLLECTIVE DOSE: 1992 DATA

ISOE European Technical Center - CEPN Information Sheet No. 2

In the first ISOE report, an analysis concerning the influence of reactor age and installed power on the annual collective dose was performed.

This analysis was not included in the second ISOE Overview Report as more attention has been paid to the analysis of the influence of the lengths of full cycle, outage refueling and operation cycle on annual average collective dose.

However, some participants have asked for an updating of the previous analysis with the 1992 data. This ISOE information sheet addresses to this request.

Tables 1 to 7 present the influence of age and installed power on annual average collective dose by reactor type and by region for 1992 data.

By comparison with the 1991 analysis [1], it is again noticeable that the older the reactor the higher the dose, except in America for BWRs. For old PWRs, the annual average dose increases with the size of the reactor, whatever the region. Data for 1992 is still somewhat statistically irregular due to the small sample size.

As in 1991, for modern and intermediate age reactors, dose decreases with size. This may reflect design improvements often built into larger plants.

Figure 1 illustrates the influence of the age of the reactor on annual average collective doses by region and by type of reactor.

METHOD

The analyses performed do not concern the ISOE database as a whole. The reactors have been aggregated by age (from 1 to 5 years; from 6 to 10 years; more than 11 years) and by installed power (≤ 700 MWe; 701-1000 MWe; > 1000 MWe). For each site where the collective dose per reactor is not split up, data have been taken into account only when the reactors belong to the same age and same installed power category.

- PWR / 1992 -

Table 1. **Annual average collective dose as a function of reactor size and age in Europe**

PLANT AGE	AVERAGE COLLECTIVE DOSE (man.Sv) small plants (≤700 MWe)	medium plants (700-1000 MWe)	large plants (>1000 MWe)	**all plants**
Modern (1-5)	-	1.8 (1)	0.8 (13)	**0.9 (14)**
Interm. (6-10)	-	2.1 (20)	1.5 (16)	**1.8 (36)**
Old (≥11)	2.4 (10)	2.8 (25)	3.0 (4)	**2.7 (39)**
All ages	**2.4 (10)**	**2.5 (46)**	**1.4 (33)**	**2.1 (89)**

The number in ( ) indicates the number of reactors considered

Table 2. **Annual average collective dose as a function of reactor size and age in North America**

(excluding 18 reactors because only collective dose for the whole site is available and reactors are different ages)

PLANT AGE	AVERAGE COLLECTIVE DOSE (man.Sv) small plants (≤700 MWe)	medium plants (700-1000 MWe)	large plants (>1000 MWe)	**all plants**
Modern (1-5)	-	2.1 (1)	1.4 (8)	**1.5 (9)**
Interm. (6-10)	-	0.3 (1)	2.2 (7)	**1.9 (8)**
Old (≥11)	1.6 (9)	2.5 (23)	2.6 (9)	**2.3 (41)**
All ages	**1.6 (9)**	**2.4 (25)**	**2.1 (24)**	**2.2 (58)**

The number in ( ) indicates the number of reactors considered

Table 3. **Annual average collective dose* as a function of reactor size and age in Asia**

(excluding 5 reactors did not have refueling outage in 1992)

PLANT AGE	AVERAGE OUTAGE COLLECTIVE DOSE (man.Sv) small plants (≤700 MWe)	medium plants (700-1000 MWe)	large plants (>1000 MWe)	**all plants**
Modern (1-5)	0.5 (2)	-	-	**0.5 (2)**
Interm. (6-10)	-	0.8 (3)	-	**0.5 (3)**
Old (≥11)	1.4 (5)	2.8 (3)	5.3 (2)	**2.6 (10)**
All ages	**1.1 (7)**	**1.8 (6)**	**5.3 (2)**	**1.9 (15)**

The number in ( ) indicates the number of reactors considered

*: In this table, reference is made to outage collective dose, only because no information on annual collective dose per reactor was provided for Japan.

- BWR / 1992 -

Table 4. **Annual average collective dose as a function of reactor size and age in Europe**

PLANT AGE	AVERAGE COLLECTIVE DOSE (man.Sv) small plants (≤700 MWe)	medium plants (700-1000 MWe)	large plants (>1000 MWe)	**all plants**
Modern (1-5)	-	-	-	**-**
Interm. (6-10)	-	1.5 (1)	1.3 (6)	**1.4 (7)**
Old (≥11)	2.6 (8)	2.2 (6)	1.1 (2)	**2.3 (16)**
All ages	**2.6 (8)**	**2.1 (7)**	**1.3 (8)**	**2.0 (23)**

The number in ( ) indicates the number of reactors considered

Table 5. **Annual average collective dose as a function of reactor size and age in North America**

(excluding 4 reactors because only collective dose for the whole site is available and reactors are different ages)

PLANT AGE	AVERAGE COLLECTIVE DOSE (man.Sv) small plants (≤700 MWe)	medium plants (700-1000 MWe)	large plants (>1000 MWe)	**all plants**
Modern (1-5)	-	4.3 (1)	4.1 (2)	**4.2 (3)**
Interm. (6-10)	-	7.1 (1)	4.9 (7)	**5.2 (8)**
Old (≥11)	3.3 (7)	3.7 (10)	2.0 (5)	**3.2 (22)**
All ages	**3.3 (7)**	**4.0 (12)**	**3.8 (14)**	**3.8 (33)**

The number in ( ) indicates the number of reactors considered

Table 6. **Annual average collective dose[*] as a function of reactor size and age in Asia**

(excluding 9 reactors did not have refueling outage in 1992)

PLANT AGE	AVERAGE OUTAGE COLLECTIVE DOSE (man.Sv) small plants (≤700 MWe)	medium plants (700-1000 MWe)	large plants (>1000 MWe)	**all plants**
Modern (1-5)	-	0.4 (1)	0.6 (1)	**0.5 (2)**
Interm. (6-10)	-	-	1.1 (3)	**1.1 (3)**
Old (≥11)	2.6 (4)	2.2 (4)	2.4 (2)	**2.4 (10)**
All ages	**2.6 (4)**	**1.9 (5)**	**1.5 (6)**	**1.9 (15)**

The number in ( ) indicates the number of reactors considered

[*]: In this table, reference is made to outage collective dose, only because no information on annual collective dose per reactor was provided for Japan.

- CANDU / 1992 -

Table 7. **Annual average collective dose as a function of reactor size and age in North America**

PLANT AGE	AVERAGE COLLECTIVE DOSE (man.Sv) small plants (≤700 MWe)	medium plants (700-1000 MWe)	large plants (>1000 MWe)	**all plants**
Modern (1-5)	-	0.1 (2)	-	**0.1 (2)**
Interm. (6-10)	0.9 (6)	0.3 (4)	-	**0.7 (10)**
Old (≥11)	2.4 (4)	0.8 (4)	-	**1.6 (8)**
All ages	**1.5 (10)**	**0.5 (10)**	**-**	**1.0 (20)**

The number in ( ) indicates the number of reactors considered

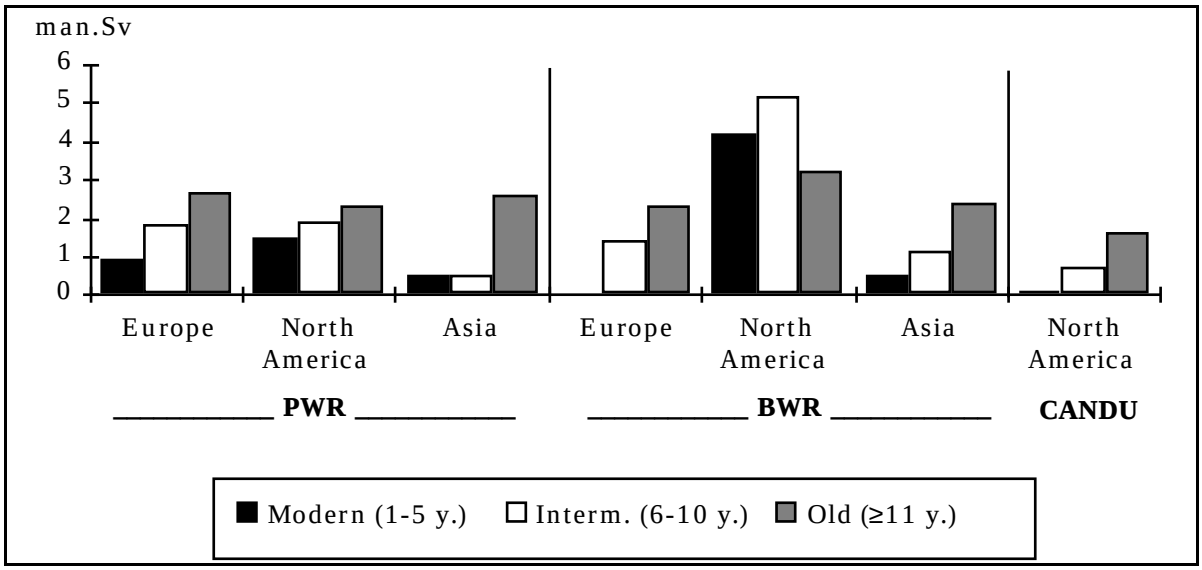

Figure 1. **Annual average collective doses per reactor as a function of age of the reactor in the ISOE regions by type of reactor in 1992**

REFERENCES

[1] ISOE Overview Report, "Nuclear Power Plant Occupational Exposures in OECD Countries: 1969-1991", OECD Nuclear Energy Agency, June 1993.