

# ISOE INFORMATION SHEET

## EUROPEAN DOSIMETRIC RESULTS FOR 2007

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**T**his ISOE Information Sheet presents the average collective doses per reactor (PWRs, VVERs, BWRs) for the period 2005 - 2007 in the European countries participating in ISOE.

In 2007 the average collective dose per reactor for PWRs and VVERs continued to decrease, reaching the lowest value since 3 years, at around 0.56 man·Sv per reactor. Most countries are showing a stable or decreasing trend over the last three years. However, the average collective dose per reactor for European BWRs increased, with a value at around 1.33 man·Sv. Such increase is mainly due to the high doses of Cofrentes in Spain (problems during the replacement of 145 Control Rod Drive Mechanism tubes resulting in an outage dose of 6.9 man·Sv) (see Tables 1 to 3).

It should be noted that there is one operating PWR less in Spain (Cabrera NPP) in 2007 and that JAVYS 1 reactor in Slovak Republic had been shut down in December 2006 but it is still considered in operational status due to presence of the spent fuel.

The evolution of the 3-year rolling average annual collective dose, which provides a better representation of the general trend in dose, shows a continuity of the decrease for PWRs and VVERs, going from 0.70 man·Sv per reactor for 2003-2005 to 0.61 man·Sv per reactor for 2005-2007 (see Table 4).

Regarding VVERs, the Czech Republic showed the lowest 3-year rolling average annual collective dose per reactor in 2005-2007 with 0.17 man·Sv per reactor, followed by the Slovak Republic (0.30 man·Sv per reactor), Hungary (0.43 man·Sv per reactor) and Finland (0.53 man·Sv per reactor) (see Figure 1).

For European PWRs, the data per country shows that with respect to the 3-year rolling average annual collective dose for 2005-2007, three main groups can be distinguished (see Figure 2):

- Belgium, Spain, The Netherlands and United Kingdom:  
0.3 to 0.4 man·Sv per reactor,
- Slovenia, Sweden and Switzerland:  
around 0.5 to 0.6 man·Sv per reactor,
- France and Germany:  
around 0.7 to 1 man·Sv per reactor.

The 3-year rolling average annual collective doses per reactor for BWRs are quite similar in all European countries around 1 man·Sv per reactor, except for Spain recording the high dose with 2.29 man·Sv per reactor; the minimum being Finland with 0.94 man·Sv per reactor (see Figure 3).

Table 1. PWRs average collective dose per reactor by country from 2005 to 2007

Country	Average coll. dose per reactor (man·Sv)		
	2005	2006	2007
<b>PWR Group:</b>			
Belgium	0.41	0.39	0.29
France	0.78	0.69	0.63
Germany	1.32	0.84	1.04
Netherlands	0.20	0.62	0.23
Slovenia	0.07	0.86	0.89
Spain	0.42	0.38	0.50
Sweden	0.63	0.51	0.41
Switzerland	0.66	0.35	0.37
United Kingdom	0.36	0.52	0.05
<b>PWR Sub-Total</b>	<b>0.76</b>	<b>0.64</b>	<b>0.62</b>
Czech Republic	0.18	0.15	0.17
Finland	0.38	0.83	0.36
Hungary	0.47	0.35	0.45
Slovak Republic	0.40	0.28	0.24
<b>VVER Sub-Total</b>	<b>0.34</b>	<b>0.31</b>	<b>0.28</b>
<b>All PWR Group</b>	<b>0.69</b>	<b>0.59</b>	<b>0.56</b>

Table 2. BWRs average collective dose per reactor by country from 2005 to 2007

Country	Average coll. dose per reactor (man·Sv)		
	2005	2006	2007
<b>BWR Group:</b>			
Finland	1.14	1.10	0.59
Germany	1.01	1.14	0.99
Spain	2.32	0.41	4.15
Sweden	1.06	1.09	1.10
Switzerland	0.99	0.97	1.10
<b>All BWR Group</b>	<b>1.18</b>	<b>1.02</b>	<b>1.33</b>

Table 3. Number of outages versus number of operating PWR and BWR reactors from 2005 to 2007

Country	Number of outages / Number of reactors		
	2005	2006	2007
<b>PWR Group:</b>			
Belgium	6/7	6/7	5/7
France	52/58	52/58	52/58
Germany	11/11	11/11	11/11
Netherlands	1/1	1/1	1/1
Slovenia	0/1	1/1	1/1
Spain	5/7	5/7	5/6
Sweden	3/3	3/3	3/3
Switzerland	3/3	3/3	3/3
United Kingdom	1/1	1/1	0/1
<b>PWR Total</b>	<b>82/92</b>	<b>83/92</b>	<b>81/91</b>
Czech Republic	6/6	6/6	6/6
Finland	2/2	2/2	2/2
Hungary	4/4	4/4	4/4
Slovak Republic	6/6	6/6	5/5
<b>VVER Total</b>	<b>18/18</b>	<b>18/18</b>	<b>17/17</b>
<b>All PWR Group</b>	<b>100/110</b>	<b>101/110</b>	<b>98/108</b>
<b>BWR Group:</b>			
Finland	2/2	2/2	2/2
Germany	6/6	6/6	6/6
Spain	2/2	0/2	2/2
Sweden	7/7	7/7	7/7
Switzerland	1/2	2/2	2/2
<b>All BWR Group</b>	<b>18/19</b>	<b>17/19</b>	<b>19/19</b>

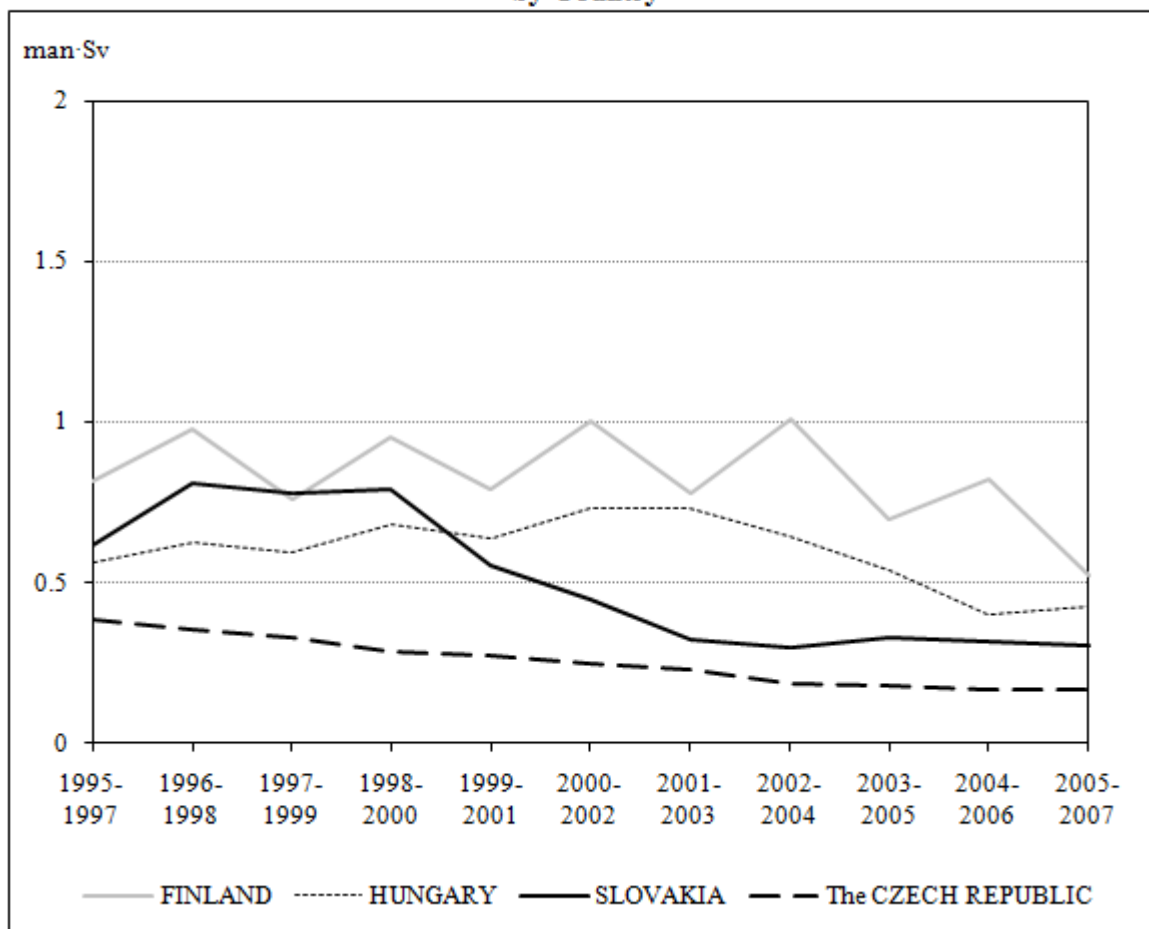
Table 4. PWRs 3-year average annual collective dose per reactor by country

Country	Average coll. dose per reactor (man·Sv)		
	2003-05	2004-06	2005-07
<b>PWR Group:</b>			
Belgium	0.40	0.40	0.36
France	0.82	0.75	0.70
Germany	1.08	1.02	1.06
Netherlands	0.42	0.54	0.35
Slovenia	0.52	0.54	0.61
Spain	0.39	0.37	0.43
Sweden	0.58	0.57	0.52
Switzerland	0.49	0.50	0.46
United Kingdom	0.25	0.31	0.31
<b>PWR Sub-Total</b>	<b>0.76</b>	<b>0.71</b>	<b>0.67</b>
Czech Republic	0.18	0.17	0.17
Finland	0.70	0.82	0.53
Hungary	0.54	0.40	0.43
Slovak Republic	0.33	0.32	0.30
<b>VVER Sub-Total</b>	<b>0.37</b>	<b>0.34</b>	<b>0.31</b>
<b>All PWR Group</b>	<b>0.70</b>	<b>0.65</b>	<b>0.61</b>

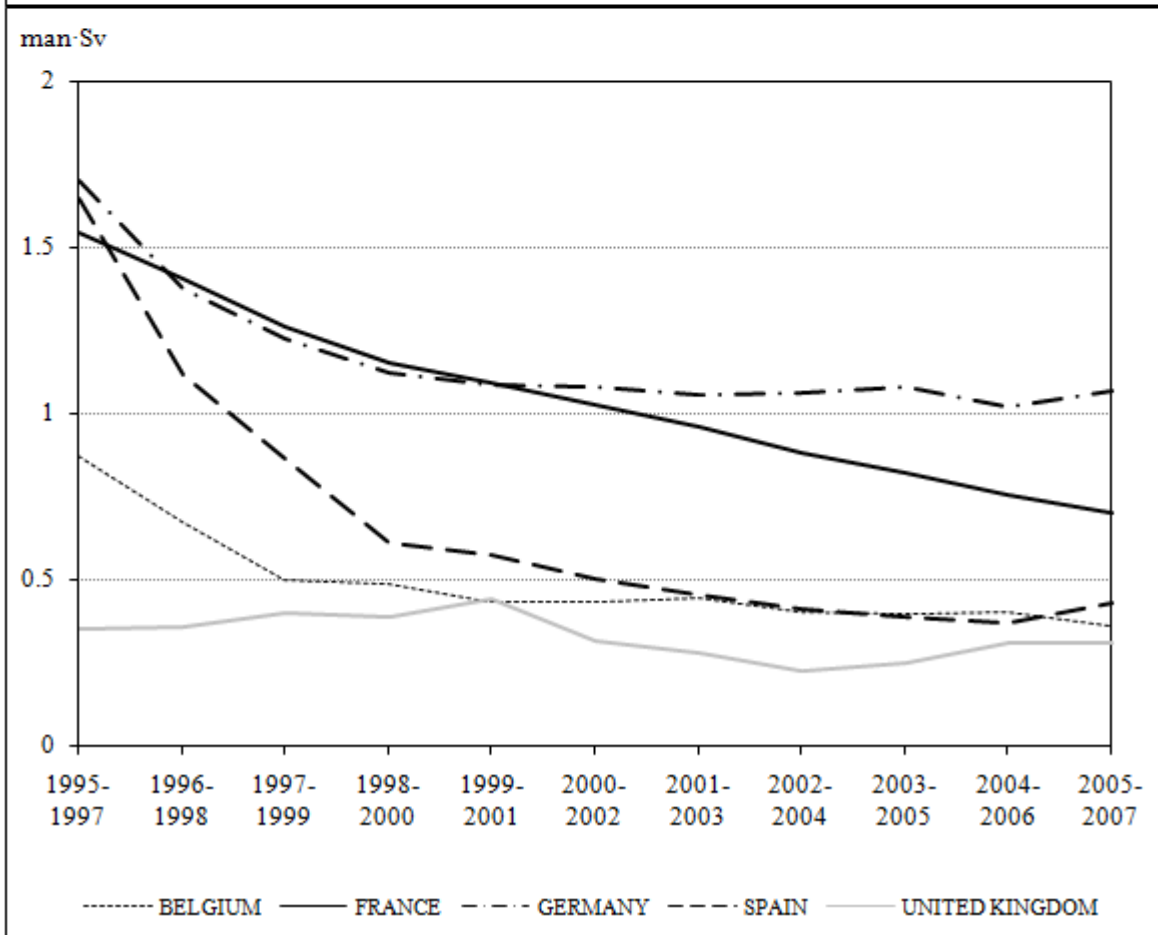
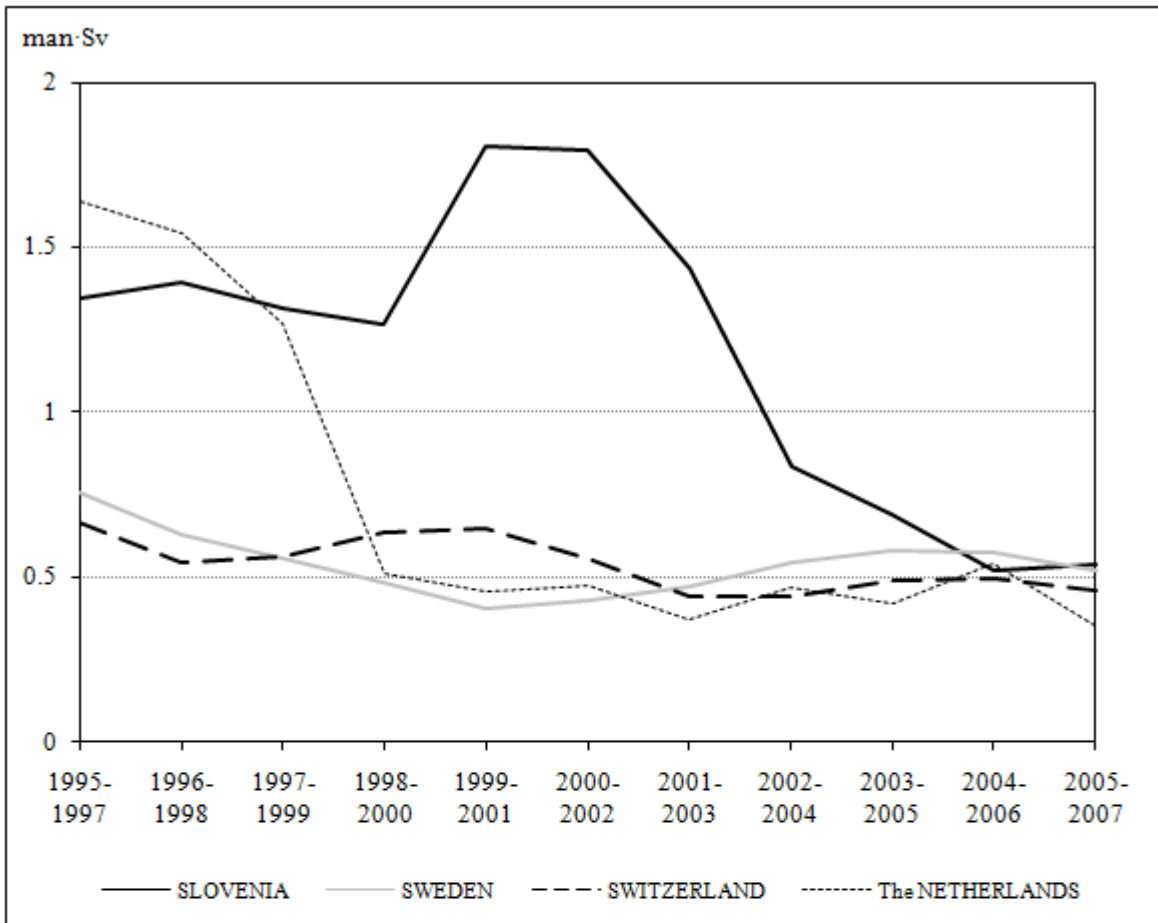
Table 5. BWRs 3-year average annual collective dose per reactor by country

Country	Average coll. dose per reactor (man·Sv)		
	2003-05	2004-06	2005-07
<b>BWR Group:</b>			
Finland	0.81	0.99	0.94
Germany	1.00	1.07	1.05
Spain	1.65	1.06	2.29
Sweden	0.97	0.91	1.08
Switzerland	1.16	1.14	1.02
<b>All BWR Group</b>	<b>1.05</b>	<b>1.01</b>	<b>1.18</b>

Figure 1. Evolution of the VVERs 3-Years Rolling Average Collective Dose per Reactor by Country



**Figure 2. Evolution of the PWRs 3-Years Rolling Average Collective Dose per Reactor by Country**



**Figure 3. Evolution of the BWRs 3-Years Rolling Average Collective Dose per Reactor by Country**

